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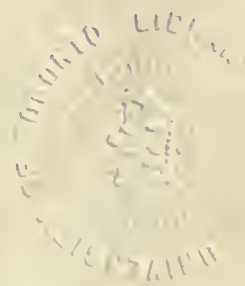
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PANORAMIC VIEW OF THE PLOMOSA PLACER PROPERTIES, PLOMOSA, ARIZONA.

Successful Dry Placer Operations at Plomosa, Arizona

By WILLIAM L. PLUMMER.

Since 1865 the dry placer gold fields adjacent to Quartzite, Yuma county, Arizona, have been worked with more or less profit, on a small scale, through the medium of native dry washer, pick, drill and "muck-stick." The highest values in this district are found in a natural cement which lies in blanket form, from 4 to 20 ft. in thickness, above the bedrock. From the grass roots to this cement the formation consists of a semi-cemented gravel rich in gold when treated on a large scale, but not of sufficient value to tempt the dry washer, who sinks direct to bedrock, and works only about 4 ft. of the richest cement. Half a yard of gravel a day mined, hoisted from the shaft, hammered by hand to liberate gold from cement, and run through the dry washer, is a high average for one man; and as earnings of from \$10 to \$20 a day were of common occurrence in former years, it is not difficult to realize the richness of these placers. Furthermore, the early workers could not mine with any degree of profit to a depth of more than 20 ft.; for this reason there are vast areas that have not given up any of their virgin value.

Chief among the fields of the Quartzsite district are the Plomosa, La Paz, Middle Camp, Ora Fino and La Cholla.

It is said that between 1865 and early in the seven-

ties over \$7,000,000 in gold passed through La Paz alone, then the Yuma county seat, supporting a population of 4000 placer miners. The old inhabitants say the Plomosa field sent out \$2,000,000. Fabulous sums were gleaned from the gravel by hand, and it was commonly known that great sums still remained in the ground. In spite of this fact no practical means of liberating the gold from gravel on a commercial scale had been discovered until within the last 2 years.

The two essentials to an efficient plan are—First: A mill to save the gold-bearing cement and gravel and reject the non-bearing country rock. Second: A system of dry concentration of great capacity.

A mill embodying the necessary principles was invented by Mitts Quenner, a blacksmith, and used with a battery of native dry-washers in placers at El Boluda, Mexico. Its essentials are a cylindrical drum made up of a series of iron bars and gratings, inside of which revolves a shaft, the same being hung with a number of chain hammers in spiral form. The shafting revolves at about 400 rpm. in one direction, while the drum travels at a much lower speed in the opposite direction. Cement and gravel, fed in at one end of the mill is quickly disintegrated, the fines dropping through the gratings to a bin beneath, while the rock and boulders are thrown out of the opposite end of



PLOMOSA MILL AND POWER PLANT.

the mill after having been thoroughly scoured by the action of the hammers.

The Stebbins Dry Concentrator.

The Stebbins dry concentrator has solved the problem of dry concentration. Its makers guarantee a saving of 95% of all free gold. These tables work on practically the same principle as the wet table; however, instead of using water to lift the gravel, and



60-HP. LIDGERWOOD HOIST FOR SCRAPER LINE.

1 to 12 ft. long, with a capacity of 40 tons an hour, down to machines operated by hand, with a 4-ft. deck.

In the Plomosa district a small experimental plant composed of a Quenner mill and Stebbins concentrator was installed in the fall of 1915; and although this plant did not have the excavating and conveying equipment necessary to operate at a profit, it demonstrated the efficiency of both mill and concentrator.

Plomosa is the scene of great activity at present.



ORIGINAL EXPERIMENTAL PLANT.

allow the gold to settle behind the riffles, air is used, it being introduced through small slits in the table deck. The gold and middlings travel along the top riffle to a receptacle, the tailings dropping off the lower side of the table.

Stebbins machines are made in sizes ranging from



HAULING MILL EQUIPMENT BY TRACTOR.

Here the Yuma Con. Co. is installing a 2000 yd. plant and the Plomosa Placer Properties has nearly completed a plant with a capacity of 1000 yds. The Plomosa field averages 30 ft. from surface to bedrock, and, from prospect holes that have been sunk, engineers estimate the ground will average \$1 a yard in



125-HP. LIDGERWOOD HOIST BEING INSTALLED.



CORRUGATED IRON COOLING TANKS.

gold. One shaft sunk by the Yuma Con. near the Plomosa line averaged \$1.40 a yard for 40 ft., where false bedrock was encountered; at 83 ft. gold-bearing cement was again struck and for 15 ft. the ground averaged between \$3 and \$5 a yard.

Activities at the Yuma camp have been confined more to preparation than to installation. Electric power is to be used there, and a system of railways and cars will bring the gravel to the mill.

The Plomosa Placer Properties has 380 acres, and the plant will be in operation about the first of August.

The New Plant.

Although all of the units of this plant have been in successful operation in different parts of the country, it will be the first plant of its kind bringing together all of these units, and much interest is being manifested pending its completion.

The excavating equipment consists of a Shearer & Mayer drag-line excavator having a capacity of 1000 yds. daily. The mast for this rig is erected on the crest of a hill 75 ft. above the placer ground. The track cable extends from mast head to anchors 700 ft. distant. Thus, a circle of ground some 1400 ft. in diameter is commanded by the $1\frac{1}{2}$ yd. bucket. Cables for the equipment are controlled by a Lidgerwood double-drum hoist, power being furnished by a 125-hp. Bessemer oil engine. The reduction plant is located on grades cut into the hill below the excavator mast. Cement and gravel will be hauled up the track cable and dumped into a bin at the hill's eminence. From this bin the gravel will be fed into a Williams-Quenner 36-hammer mill, the boulders being rejected and carried away by belt conveyor, the fines dropping to a boot below where they will be elevated to a bin feeding a No. 12 Stebbins concentrator with a capacity of 40 tons an hour. Gold, middlings and concentrates from the large table will be re-elevated to a second bin from which they will run over a small finishing table. Tailings will be carried off by a belt conveyor which will dump them within easy reach of a Sauerman drag-line scraper which, in turn, conveys them to a large gulley of waste land. This scraper is operated by a Lidgerwood hoist, power being furnished by a 60-hp. Bessemer engine.

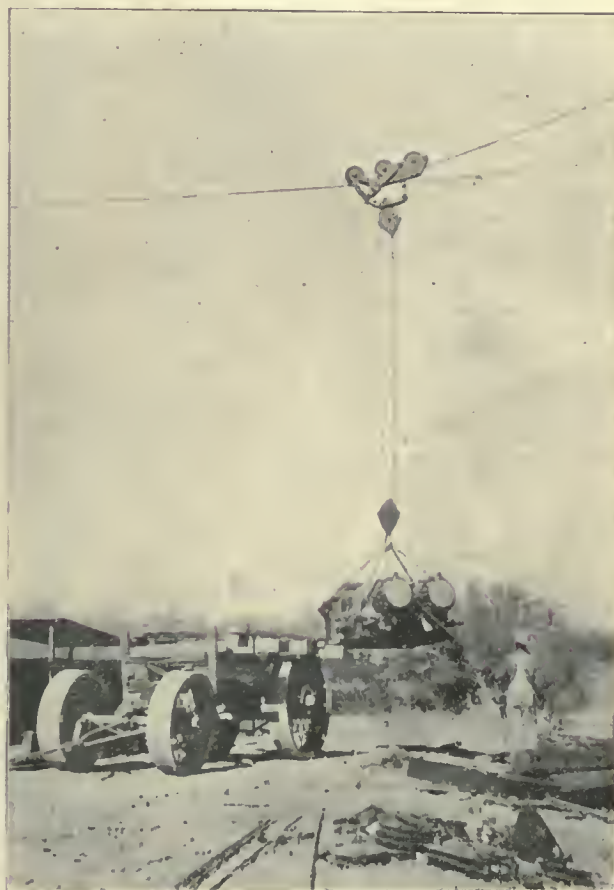
For breaking up cemented gravel in the ground a small compressor and power drill will be used.

The plant is being installed under the supervision of A. Maltman, E. M., who has chosen some of the richest ground in the district upon which to commence operations. He estimates the cost of operation at between 15 and 20 cts. a yard; however, he states that the lead-silver concentrates will more than pay operating expenses. The company plans to triple the capacity the coming year, giving it a daily output of 3000 yds.

At a distance of some 1200 ft. from the mill is a placer run about 100 ft. in depth. This run consists of two deposits, an upper strata of 40 ft. of cement

and gravel and a lower strata topped by a false bedrock some 50 ft. in depth. Directly above the bedrock is a 15-ft. layer of rich gold-bearing cement, which averages \$3 and up a yard. The company is planning to sink a double compartment shaft to this cement, drift it out and convey it to the mill by rail, in addition to the regular work of stripping the ground commanded by the drag bucket to the first bedrock.

The eyes of the mining world are on this new district. Much interest is being shown in the outcome of operations there, which bid fair to add another chapter to the history of gold mining, and to open up vast areas of dry placers hitherto dormant, because no



TAKING HOIST TO HILL BY DRAG LINE.

practical method of operating them had heretofore been discovered.

Tungsten and Antimony from Bolivia.—Exports of metals from Bolivia in the last 2 years have been as follows:

	Tons. 1914.	Tons. 1915.
Tungsten	276	499
Antimony	186	13,085
Copper	3,874	17,872
Tin	37,259	39,312
Bismuth	437	568

Bolivia and Peru have been growing in importance as sources of tungsten since the war started. The expansion in antimony and copper in Bolivia, due to the war, is also striking.

What Mines and Mills Buy in Equipment and Supplies.

Some idea of the immensity of the amount of supplies purchased by American mines and works may be had from the report of the Transvaal mines for 1915, which gives an itemized statement of the supplies used and the cost of same. As this amount was consumed almost entirely by the gold mines of that country, and as this production is only approximately 12% greater than the total gold and silver production of the United States, it can readily be seen that the purchase of supplies by other American mines other than gold and silver will bring the total to a sum reaching into the hundred millions.

Here is the list of the Transvaal gold mine requirements:

	Amount.	Value.
Bags		£ 3,614
Belting		125,790
Bolts, nuts, washers and rivets (lbs.)....	3,106,664	42,872
Brattice cloth		1,121
Bricks		13,575
Brushware		11,154
Candles (lbs.)	10,710,411	218,867
Carbide (lbs.)	5,705,296	65,168
Castings—(a) Brass		32,581
(b) Iron		75,161
Cement—(a) Casks	1,312	2,057
(b) Bags	97,686	32,662
Charcoal		4,262
Chemicals and assay requisites.....		167,015
Coal—(a) Smithy (tons)	20,666	27,587
(b) Steam (tons)	1,825,345	947,113
(c) Other (tons)	23,512	20,369
Coke—(a) Imported (tons)	284	2,532
(b) Local (tons)	1,229	5,238
Compressed air (purchased).....		319,127
Cyanide (lbs.)	10,312,309	538,366
Disinfectants		16,219
Electrical machinery		208,304
Electric machinery spares.....		50,780
Electric power and light (purchased)....		1,077,886
Explosives—		
(a) Blasting gelatine (cases).....	284,872	655,518
(b) Gelignite and gelatine dynamite (cases)	393,617	707,979
(c) Dynamite, No. 1 (cases).....	116	199
(d) Dynamite No. 2 and Ligdyn (cases)	2,017	2,857
(e) Other explosives (cases).....	365	759
(f) Detonators		49,244
(g) Electric detonators (or electric fuses)		265
(h) Safety fuse		148,754
(i) Lighting torches (Tylsa sticks)		14,865
Fencing and wire netting.....		2,220
Fodder for stables—Bran, chaff, mealles, forage, etc		26,949
Foods, etc. (for colored laborers)—		
(a) Beans (lbs.).....	5,642,232	31,216
(b) Rice (lbs.).....	2,063,253	17,537
(c) Meal (mealles, Kaffir corn, etc. bags)	585,758	311,662
(d) Malt and cereals for beer.....		20,420
(e) Meat (lbs.).....	31,108,055	404,348
(f) Fish (lbs.)	376,323	5,169
(g) Salt (bags)	7,485	2,132
(h) Groceries, coffee, sugar, oil, ghee, molasses, etc.		37,307
(i) Sundry food including bread		208,720
(j) Vegetables		51,882
(k) Medicines, etc.		26,167
(l) Clothing		12,161
Hosing (steam, suction and rock-drill)		69,077
Hand tools (picks, shovels, hammers, etc.)		86,142
Iron—(a) Bar and angle (lbs.).....	6,627,972	53,952
(b) Galvanized		11,149
(c) Sheet (lbs.)	126,807	1,567
(d) Pig (lbs.)	348,725	1,804
Lamps and spares.....		14,257
Lead—(a) Pig (lbs.)	219,462	1,861
(b) Sheet (lbs.)	28,853	532
Lime—(a) White (bags)	534,368	122,761
(b) Blue (bags)	11,777	2,099
Lubricants—(a) Oils		68,400
(b) Grease and tallows		67,806
Machinery and machine tools.....		280,484
Machinery spares, other than specified		237,833
Mercury (bottles)	3,017	54,435
Metals (anti-friction)		19,598
Mill screenings		20,780
Motor cars and accessories.....		12,355
Oils, other than lubricating—		
(a) Transformer		2,567
(b) Other		1,294

Oilskin suits		8,560
Paint, tar, driers, etc.....		18,157
Paraffin (cases)	34,571	19,509
Petrol (cases)	13,974	13,139
Pipes and pipe fittings.....		327,247
Rails, crossings, sleepers, etc.....		195,540
Rock-drills	1,742	55,980
Rock-drill spares		200,544
Ropes—(a) Wire		114,489
(b) Cotton and manilla.....		10,444
Screenings, other than mill.....		5,078
Screws, nails, etc.....		22,308
Shoes and dies (lbs.).....	15,246,268	159,552
Skips and spares.....		14,530
Stationery		51,644
Steel—(a) Bar, tool, cast, etc. (lbs.)....	1,563,081	20,416
(b) Sheet (lbs.)	11,974,523	108,911
(c) Hand-drill (lbs.)	4,727,171	67,490
(d) Rock-drill (lbs.)	5,718,442	96,319
(e) Other (lbs.)	384,445	4,981
Timber—		
(a) Building material (ceilings, floorings, doors, etc.).....		22,350
(b) Oregon pitch pine, etc. (cu. ft.)	1,008,314	206,893
(c) Mining poles and round lagging		361,997
(d) Deals (lin. ft.).....	2,745,929	93,815
(e) Fuel		757
Tube mill requisites—		
(a) Pebbles and flints.....		1,099
(b) Liners		49,112
(c) Other requisites		16,150
Trucks and spares.....		94,431
Waste		11,028
Water (purchased)		144,325
Zinc and zinc discs (lbs.).....	8,682,815	234,330
Sundry articles not specified above.....		223,085

Total value £10,889,115

Tungsten from the Argentine.

The Hansa Mines, Ltd., in Argentine, can produce about 50 tons per month of tungsten ore, according to U. S. Consul General W. H. Robertson, of Buenos Aires, and until the outbreak of the war the entire output was shipped to Germany. The mine has been largely controlled by German owners reported to be affiliated with the Krupp interests. The total Argentina exports of tungsten ore from 1909 to 1913, inclusive, amounted to 3319 metric tons, of which 3309 tons went to Germany and 10 tons to Great Britain, in 1909 and 1910. Germany in 1912 took 637 tons, with 536 tons in 1913 and 394 tons in 1914. In 1915 the United States became an importer, taking 135 out of a total of 158 exported. To April 1, 1916, the United States took 146 tons. When the war broke out, cutting off the German market, part of the mine's plant closed down reducing production to a limited figure. Now, however, the Hansa Mines are working at full capacity with the announcement that the entire output for 1916 has been contracted for in the United States.

Ferrovanadium Exports Increasing.

Ferrovanadium exports were the largest in March on record, having been 138,718 lbs. or nearly double the monthly export rate for 1915, the record year. Government data show the following as recent ferrovanadium exports in pounds:

	Per month.
January, 1916	44,782
February, 1916	63,065
March, 1916	138,718
1915	840,265
1914	770,079
1913	604,287

The rate to April 1, 1916, of 82,188 lbs. per month is at the rate of 986,256 lbs. per year—a large increase over that for 1915, the record year.

Counter-Migration of Pulp and Solution in Cyanidation and Acid Leaching

By BERNARD MACDONALD.*

Since "all sliming" has been adopted as the most desirable condition, generally speaking, to which an ore should be reduced in order to obtain the best results in cyanide treatment, the efforts of metallurgists have been directed largely to the improvement of the plant apparatus, and of the methods previously used for the agitation of the slime and for the separation of the solution from the leached-out "barren" solids in the treated pulp.

The equipment specially instrumental in bringing about these objects consists of a circular diaphragm, water-tight at the sides, open at the top and bottom and supported centrally in the upper portion of the tank. This diaphragm extends vertically down below the pulp level to a certain depth designed to meet conditions, which, for this description, is assumed as 8 ft., and above the pulp level to the height of 2 ft. In this position the diaphragm divides the upper position of the tank into two areas, the annular space between the side of the tank and the diaphragm known as the "agitation circle" and the space inclosed within the diaphragm known as the "separatory area."

The solution and solids in the pulp to be treated may be in any suitable ratio, but for a definite description the usual 2:1 ratio is assumed. In this ratio the pulp contains two parts of solution to one of solids by weight, which gives it a specific gravity of 1.26, or about one and a quarter times the weight of the same volume of water.

In operation the pulp to be treated flows in a continuous stream through a feed pipe which delivers it in the agitation circle 2 or 3 feet below the pulp level where it is merged with the pulp in agitation there.

The agitation of the pulp is effected by the mechanical means peculiar to the Parral tank system.

Four transfer pipes, each 6 in. in diameter, are set at quarter points in the tanks, their lower or intake ends reaching within a few inches of the tank's bottom, and their upper or discharge ends emerging about 4 in. above the pulp level. The discharge ends of these pipes are fitted with tees or ells with their discharge openings directed so as to discharge in the same direction around in the agitation circle. Half-inch pipes connecting with the compressed-air main outside the tank are fixed centrally within the transfer-pipes and terminate in a ball-nozzle-valve at a point about 5 ins. above their lower ends. Compressed air having a pressure of say 10% higher than the static pressure due to the pulp depth in the tank is introduced through this connection into the transfer pipes which are operated as air lifts. In operation the transfer pipes throw continuous streams of pulp,

transferring it from the bottom and delivering it on the top of the tank charge. The spouting force of these streams discharging in the same direction at the surface of the pulp mass in the agitation circle sets up and maintains a rotary flow in the pulp which extends from top to bottom of the tank.

This flow and the continuous withdrawal of the pulp from the bottom of the tank and its redistribution over the surface of the tank charge, gives it the required aeration and keeps its solution and solid constituents in proportionate mixture, a condition which is essential for the effective dissolving out of the metals in the solids.

While the agitation of the pulp is going on in the agitation circle the area within the diaphragm remains absolutely quiet, with the result that the solids settle rapidly out of the contained pulp and sink to the bottom of the tank, there coming within the suction range of the transfer-pipes, they are transferred to the surface where they are carried away in the rotary flow. As the solids settle out of the solution within the diaphragm the clear solution remains in hydrostatic balance with the denser pulp in the agitation circle. The pulp, as above stated, having specific gravity of 1.26, will balance a column of clear solution one and a quarter times its own height. Therefore, the 8-ft. column of pulp outside the diaphragm will raise the clear solution to a height of 10 ft., or 2 ft. above the pulp level in the agitation circle. At the height of 7 ft. 6 ins. on the inside of the diaphragm is fixed an annular launder, into which clear solution rising within the diaphragm overflows continuously. From this launder a pipe conducts the clear solution over the top edge of the tank, and delivers it into the agitation circle of the next tank adjoining where it becomes mixed and agitated with the pulp and is again separated from it as above described.

As the solution is thus migrating from tank to tank in each of which it is mixed and agitated with new pulp flowing in the opposite direction, it dissolves out and takes up the metals contained in the solids and thus becomes richer while the solids become poorer as they pass from tank to tank. When the solution is separated from the head tank of the series it is sent to the precipitation room where the values held by it are precipitated and the solution, now barren, is returned to the tail-end tank of the series, where it begins again its migration through the tank series, repeating the same effect above outlined.

The tail end of each series of treatment tanks consists of two tanks used for the settlement of the pulp and decantation of all the solution possible from

*In *N. E. & Chem. Engr.*

the pulp before it is discharged to the filter or dump. The equipment of these tanks is similar to the others, but the pulp is received alternately in them, which allows of intermittent settlement, decantation and agitation by which all the solution consistent with flow-age is removed from the pulp.

The volume of compressed air consumed in operating the transfer pipes is very small, owing to the fact that the pulp is transferred through them from the bottom to the top of the tank charge under practically hydrostatic balance—a lift of only 4 ins. above the pulp level being required. The volume of the streams of pulp transferred may be regulated to any quantity desirable by the valves on the compressed air pipes.

The method of agitation and the counter-migra-

All-Steel 16-Cubic Foot Union Iron Works Dredge.

A new dredge has been built for the Marysville Dredging Co. by the Union Iron Works Co. of San Francisco. This is an all-steel dredge arranged to dig 70 ft. below the water level and carrying a bank of 20 ft. above the water. It has 16-cu. ft. buckets, all manganese steel; the bucket is of special design having parallel base; this is driven by a chain of all cut-steel gearing with herringbone gears for the intermediate. The introduction of the herringbone gears has eliminated all of the vibration caused by the straight tooth. There are quite a number of new features on this dredge, making a marked improvement over the older



ALL-STEEL, 16-CU. FT., UNION IRON WORKS GOLD DREDGE BUILT FOR MARYSVILLE DREDGING CO.

tion of the pulp and solution above described is applicable and especially advantageous in the leaching of copper ores by sulphuric acid solution. In this treatment of copper ores the methods are analogous, almost identical with cyanidation, except that the solution being acid requires acid proof apparatus for the agitation of the pulp and the manipulation of the solution.

For copper leaching the Parral tanks and all their equipment are made of wood and are unaffected by the acid solutions. The almost complete separation of the metal-laden solution from the leached-out pulp that is possible to make in Parral tanks by the method described, which obviates the necessity of filtering—the most difficult part of acid leaching—makes this method of treatment worthy of the serious consideration of those engaged in the hydrometallurgy of copper ores.

boats. Construction commenced Dec. 27, 1916, and the dredge commenced to operate on May 7, 1916. The total weight of the machinery is over 2000 tons, and the total cost over \$400,000.

Manganese Ore Imports.—Manganese ore imports into the United States in March were 26,212 gross tons against 398 tons in March, 1915. For the first quarter of 1916, they are 51,545 tons or 17,181 tons per month, which compares with the average for 1915 of 26,731 tons per month. For the 9 months ended March 31, 1916, they were 307,382 tons against 158,985 tons and 212,270 tons for the same period in 1915 and 1914.

Minor coinage at the U. S. mints during May amounted to \$716,020. There was no gold or silver coinage.

Notes on the Randsburg Tungsten District, Cal.

By J. NELSON NEVIUS.*

Developments in the tungsten district near Atolia and Randsburg, California, are so rapid that any description is out of date almost before it can reach the public. New finds of more or less importance are of almost daily occurrence and the tungsten-bearing district is being rapidly enlarged. It has outgrown the name Atolia, both geographically and geologically, and is more properly called Randsburg district, after the older and better known mining town. As at present developed the district skirts the base and lower slopes of the mountains in which the Yellow Aster gold mine is situated—Atolia lying to the southeast and Randsburg to the northeast, with a low divide separating the towns which are 7 miles apart. Recent discoveries on the west base of these mountains, about 7 miles west of Randsburg, indicate that important deposits of scheelite occur here under different geologic conditions. No scheelite has been reported from the heart of the mountain, although important discoveries have been made on the property of the Consolidated Mines Co., and to the west of that property in the town of Randsburg.

A Poor Man's Camp.

As most of the veins are very small and the scheelite comes to the surface, conditions favor development by individual effort or by a small group of workers, rather than by development companies. As a sack of scheelite 2 ft. high and 10 ins. in diameter is worth something like \$350, and as such a sack could be obtained in a couple of weeks from a tiny veinlet as thick as a lead pencil—it is individual effort that counts. Discovery of a vein 2 ins. wide starts a stampede. The finding of these tiny veins in rock of the same color requires close personal application, and a pair of thick knee-pads would be a desirable addition to the prospecting outfit!

Placer Deposits.

On the flats below Atolia there has been recovered much scheelite in the form of fair sized nuggets, just as gold nuggets are found in the detritus below a gold-bearing vein. Many of these nuggets are several inches in diameter and more or less rounded, so that the name "the potato patch," has been given to this district.

All through the district small plants have been built to recover scheelite from the surface gravel, and if ample water were available this method would be enormously profitable, for panning tests made in a small frying-pan rarely fail to show small nodules of the heavy scheelite. Samples taken from the loose sand of the wagon road crossing the Sunshine prop-

erty showed several such nodules. Also considerable scheelite is recovered by means of drift-mining, or running drifts along bed-rock beneath the accumulated gravel of the arroyos. Both tungsten and gold are thus recovered.

Geologic Notes.

Very little has been written concerning the geology of tungsten deposits—probably because those on the ground are far more interested in finding the mineral than in finding the why and wherefore of its occurrence. Nevertheless, a careful study of the deposits already opened would reveal information highly useful in searching for other deposits. The following notes are given as mere suggestions obtained from a hurried inspection of several of the producing properties, and they seem to indicate that the scheelite occurs under a variety of conditions in the Randsburg district.

The Atolia deposits are in more or less continuous fissures in a granite, and the scheelite occurs mixed with quartz. The veins are well-defined and the mineral occurs in all degrees of purity, but customarily mixed with more or less quartz. The veins have been followed to a depth of more than 700 ft. on the dip, and in places are 3 ft. or more in width.

North of Atolia, near the summit of the low hills, are some shallow shafts showing the granite cut by very narrow dikes of a basic rock and with seams of scheelite from a knife-edge to 2 ins. wide, occurring irregularly along the sides of the dike. Such a discovery was made on the Margaret E. claim on the day of the writer's visit. Tiny excavations showed a poorly defined basic dike about 10 ins. wide and a seam of fairly pure scheelite nearly 2 ins. wide. Other similar dikes were found nearby running in various directions, and in some of them specimens of scheelite were seen. Openings made subsequently on this property have shown other similar deposits, although it is yet too early to draw definite conclusions. A few hundred feet distant from these discoveries, a belt of limestone outcrops along the slope; and as limestone occurs with, or near, nearly all the deposits visited, there seems to be a distinct connection between the two.

Just west of the Sunshine mine, and on the Sum Dum claim is an outcrop of altered limestone of yellowish color, overlying schist. The limestone is about 10 ft. thick and outcrops boldly for a short distance, and is notable for its mottling of an apple green color, probably due to nickel salts. This limestone contains a small amount of scheelite, which can be concentrated by panning. Several samples were panned and all showed some scheelite, which remained in the pan as a white powder; while one sample, without differing

*Editor Mining and Oil Bulletin, Los Angeles.

in appearance from the others, yielded a teaspoonful of scheelite from a 2-lb. sample.

On the Consolidated Mines property, a 2-ft. vein carrying scheelite was discovered on the surface immediately behind the mill. At the time of discovery this vein appeared to be of the same type as the gold vein of the main mine; being a quartz-filled fissure in granite. This, or other similar veins, have been traced to the westward through the town of Randsburg, and are understood to be now yielding important amounts of tungsten.

Seven miles to the west of Randsburg, and on the extreme west base of the mountain, there have been discovered some important deposits along the contact of altered limestone and overlying schist. At the time of the writer's visit the most important of these was the Jones and Virgin group which had yielded several hundred pounds of high-grade ore from very small surface openings. On this property the scheelite occurs in the metamorphosed limestone, at or near the schist contact. There are other small showings in this region, and the whole matter is well worth careful study, as these discoveries enlarge the possibilities of the district very greatly.

The result of these very brief observations, then, indicates that there are three modes of occurrence of the ore; namely, as a constituent of quartz-filled fissures in granitic rock; associated with small basic dikes in granitic rock; and in the metamorphosed limestone, at or near, contacts.

At the present time this district is producing about half a million dollars worth of scheelite per month.

Big Values in Sulphuric Acid.

The production of sulphuric acid, expressed in terms of 50° acid, in the United States in 1915 was 3,868,152 tons, valued at \$29,869,080, together with 189,795 tons of oleum or fuming acid of different strengths, valued at \$2,787,971, making a total of 4,057,947 tons, valued at \$32,657,051.

These figures, compiled by W. C. Phalen of the Geological Survey, include so-called by-product acid, or acid produced at copper and zinc smelter. The production of acid from this source in 1915 was 1,056,830 tons, expressed in terms of 50° acid, valued at \$7,042,126, together with 59,189 tons of oleum of different strengths, valued at \$579,115.

The production of sulphuric acid in the United States in 1915 by grades in short tons was as follows:

Grade.	Quantity.	Value.	Price per ton.
50° B.....	1,518,271	\$10,681,246	\$ 7.04
60° B.....	657,076	4,976,453	7.57
66° B.....	1,019,024	14,211,381	13.95
Other strengths.....	189,795	2,787,971	14.69
Total	3,384,166	\$32,657,051	\$ 9.65
50°, 60° and 66°, reduced to 50°.....	3,868,152	29,869,080	7.72

¹Includes acid reported not only as 50°, but also as 52°, 53°, and 55°.

²Includes stronger acid reported as oleum, etc., carrying varying percentages of free SO₃.

The production of sulphuric acid from copper and zinc smelters in 1915 in tons was as follows:

Source.	Quantity.	Value.	Price per ton.
Copper smelters, 60°.....	360,522	\$2,749,633	\$7.63
Zinc smelters, 60°.....	484,942	4,292,493	8.85
Other strengths	59,189	579,115	9.78
Total	904,653	\$7,621,241	\$8.42
60° acid reduced to 50°.....	1,056,830	.....	.....

In the Survey's preliminary statement on sulphuric acid, issued at the beginning of this year, the output of acid reduced to 50° B. and that of stronger acids differ appreciably from that given above, though the totals differ only by a fraction of 1%. This is due to a lack of differentiation in the returns received at the beginning of the year, whereby a considerable quantity of the stronger grades of acid were not reported as such but were included with 66° acid, were converted to 50°, and then reported in terms of this acid. The preliminary figures, therefore, for 50° acid are high, while those for oleum and the stronger grades are low, as compared with those tabulated, but the totals, as stated, differ only slightly.

During the last few years it has been customary to reduce different strengths of acid to 50° B. whenever sufficient data were available for conversion, but as the production of stronger acid is becoming more important, this will now be classed separately and no reduction will be made in terms of 50° acid. In the preliminary statement, issued early in January, 1916, this separation was not possible.

Too much weight must not be attached to the values given in the tables, for sulphuric acid values have varied widely during the year. Producers who had previously entered into long-time contracts sold acid at prices much below those now current, especially during the last part of 1915. The trade in strong acids was active on account of the demand from the explosives and war munitions industries, but this demand came only after the first quarter of the year and was very strong only during the last half of the year. Before that time some acid plants were shut down. The average values given are therefore much below those which ruled on the market at the close of the year.

The above figures are final so far as the Survey's present information goes, but are subject to change, if necessary, when the printed report is issued. The changes, if any are made, will probably be slight.

Germany's April Pig-Iron Output.—German pig-iron production for April was 1,073,705 metric tons, or 35,790 tons per day, which compares with 1,114,194 tons in March, or 35,942 tons per day—the war record. The April output was made up as follows: Foundry iron, 165,885 tons; Bessemer iron, 13,864 tons; Thomas or basic iron, 687,689 tons; steel-making iron and spiegeleisen, 187,704 tons, and forge or puddle iron, 18,564 tons.

Exports of copper from Atlantic ports for the week ending June 22, were 4359 tons; since June 1 there were 24,296 tons, against 14,390 for the same period last year.

Operations of the Magma Copper Co. at Superior, Arizona

By W. A. SCOTT.

Magma Copper Co., Superior, Ariz., began April 28 to sink from 1200 to 1600 ft. The depth reached June 1 was about 1350 ft. This is a 3-compartment shaft, the collar of which is 1200 ft. in on a main tunnel level. The mine is equipped with a Nordberg double-drum electric hoist, good for 2000 ft., and an electric-driven air compressor of 1500-cu. ft. capacity. Ore is being mined on the surface and on all levels. Carbonate ores, amounting to 1000 tons per month, are being taken from the surface workings, and from there down to and including the 600 level, and shipped direct to smelter. The sulphide

Bleichert aerial tramway, of 8-cu. ft. buckets, which carries the daily tonnage required in one 8-hour shift. All coarse crushing at the mill is also done in one 8-hour shift. The Blake jaw crusher is used for coarse and the Symons 24-in. disc machine for intermediate crushing. The fine grinding is accomplished by a Marcey chrome steel ball mill and a Chalmers & Williams tube mill, the former reducing to 12 mesh and the latter to minus 60. The Marcey product is concentrated over roughing tables, the tailings from the latter passing to the tube mill, thence to the Callow flotation system; the tailings from flotation cells are



MILL AND SURFACE PLANT OF THE MAGMA COPPER CO.

ores, occurring as chalcocite, bornite and chalcopryite, are obtained from 500 to 1200-ft. levels, but the line between carbonates and sulphides cannot be definitely drawn, as the oxidation extends deeper in some parts of the property than in others. Close to 250 tons per day of sulphide ores are being mined; of this, 210 to 225 tons are milled, the remainder being hand-sorted, high-grade ore, which is shipped. Zinc sulphide ore is found between the 600 and 1200-ft. levels, and exists in the same lode as does the copper ore; the two run in parallel shoots and are clearly segregated from each other. For instance, in one place occurs a 5-ft. shoot of 20% copper ore, and within 15 ft. is a shoot of ore running 25% zinc; but there is practically no zinc in the copper ore and no copper in the zinc ore.

The ore is transported from mine to mill over a

reconcentrated on Wilfley slime tables. By these processes 70% of the total recovery consists of table concentrates and 30% of flotation concentrates. The ore milled in 1915 averaged 6.43% copper and 7.45 ozs. silver. The concentrates produced for that year averaging 16.67% copper, 19.05 ozs. silver and \$2.18 gold. The total recovery for 1915 was 86.76% of total content. In making these products the silver goes with both—the table and flotation concentrates. Milling operations thus far have been confined to the copper sulphide ores, with their silver and gold content.

However, the company has practically completed a 50-ton plant for concentrating by tables and oil flotation its zinc ores, estimated to run 15% zinc, 4% lead, and accompanied by some silver and gold. For the zinc mill the same system of crushing and grind-

ing will be employed as is used in the copper mill. The double-deck tables of the Deister Machine Co. and a 3-cell Callow flotation machine will be used for concentration.

The operating force of the Magma Copper Co. consists of the following: W. C. Browning, general manager; E. H. Lundquist, mine superintendent; J. A. Garrett, mill superintendent; A. Robinson, master mechanic; I. A. Ettinger, mine engineer.

The company's 30-mile narrow gauge railroad runs from Magma station to Superior, its tracks extending up to the mill. A consolidation of other properties has been made at Superior, taking in the Alice-May, Lake Superior & Arizona and a part of the Magma group, under the name of the Superior & Arizona, which is controlled by the Magma Copper Co. The property is to be further developed and operated.

Strontium Industry in the United States in 1915.

The manufacturers of red fire and of beet sugar are said to have shown considerable interest in domestic strontium deposits during the last year. If sugar holds its present price the beet-sugar makers might perhaps profitably substitute the strontia method for the one they now use, but the substitution will require considerable time, and its economy must depend on several economic factors which are unknown to the U. S. Geological Survey, by which the statistics of the industry are compiled. The returns received do not show that any strontium-bearing ores of domestic origin were sold in 1915, or that any American deposits were exploited.

The deposits in northwestern Ohio and southeastern Michigan seem to be the best available for early exploitation. Celestite, a strontium mineral, is reported to occur in workable quantities in certain limestone quarries near Toledo, O., though it is not now recovered. The mineral is found in broken and open beds of dolomite, or magnesian limestone. The installation of expensive machinery for its recovery is hardly warranted, but the larger pieces of celestite could be easily hand-sorted from limestone on picking belts, or possibly on the ground, and would probably find a market.

Large deposits of celestite occur in Arizona and California, but they are far from markets and of low grade as compared with commercial ores now used. Plants for making commercial strontium compounds may eventually be built at places where both these sources could be drawn upon, but the development of these deposits must wait on the decision of the sugar refiners to adopt the strontia process.

Most of the commercial ores used in making strontium salts are of high grade, containing at least 95% strontium sulphate. English celestite is at present largely used on the eastern seaboard and is laid down at the works at about \$12 a ton, so the owners

of deposits of strontium ores must not hope for large profits on their crude material.

The principal commercial strontium salts are strontium hydroxide, used in the beet-sugar industry, and strontium nitrate, used in pyrotechnics, in which, however, strontium chloride is also used. Small quantities of certain organic and inorganic salts, such as acetate, lactate, bromide, iodide, arsenite and phosphate, are used in medicine.

Strontium nitrate was formerly used in making some types of smokeless powder, but the powder companies, it is said, now use the salts of strontium only for making illuminating or signal shells, in which the value of the strontium lies in the brilliant red color it imparts to the flame produced by explosion.

The imports of strontium oxide, protoxide of strontium, and of strontianite, or mineral carbonate of strontia, in 1914, as reported by the Department of Commerce, were valued at \$1016, and in 1915 at \$6411. The imports of celestite (strontium sulphate) used by domestic manufacturers of strontium salts are not recorded, as this mineral is classified with other chemicals not specially provided for. Strontium salts are imported free of duty.

Roasting or Sintering Apparatus Using Electric Heating.

A continuous apparatus for roasting or sintering ores working on the down-draft principle and with "electric firing" is patented by William H. Hampton, of New York City. (U. S. patent 1,171,117; assigned to the Conley Electric Furnace Co., Inc., of Wilmington, Del.) The ore or ore mixture is fed from bins into an endless chain conveyor composed of box or trough-like sections hinged together and perforated at the bottom. The ore is then transported along a straight or curved path to a point of discharge. During their course the sections pass over a suction arrangement, which consists of a compartment beneath the conveyor, connected to a suction pump. The top of the compartment is perforated. Above this compartment and above the conveyor is a heating compartment containing electrical resistances. Air passes into this heating compartment, is heated and then passes down through the ore by the suction which causes the down-draft. The heating resistances are made of 60% clay and 40% carbon. If the ore contains sufficient combustible material to need only initial ignition, thereafter burning itself, it can easily be treated by this method. The air necessary to continue the combustion can be supplied from an adjacent compartment either as cold or hot air. If the operation is not to be a sintering one, agitation may be used. It is claimed that ores with less sulphur content than ordinarily used can be roasted and sintered, and that in cases where fuel is needed, less will be used with this process.

Mining and Metallurgical Progress in the S. W.

By SEELEY W. MUDD, E. M.*

The past year which has seen so much of sorrow and tragedy in Europe has been full of romance in the mining and metallurgical operations of this country. The prices of nearly all metals and non-metallic minerals have risen to very high figures; production has been raised to a maximum and still consumers are asking for greater and greater quantities of materials and seem to be able to pay any prices which may be necessary to adequately supply their needs. In addition to great quantities of the more common metals, the western part of our country has been called upon for increasing amounts of the rare metals and of non-metallic minerals.

The changes in many industries have been kaleidoscopic and yet the word kaleidoscopic hardly conveys the proper impression, for these changes have had rational causes and are the logical although unforeseen sequences of the titanic struggle in Europe. The past year and a half has revolutionized our conception of war and its methods and its varied and enormous necessities. We are told that in order to maintain a million soldiers at the front there must be three million workers in the fields, mines and factories. Prior to 1915 probably very few students even of scientific warfare had any adequate conception of the enormous quantities of steel, copper, zinc, lead and explosives that are consumed on a modern battlefield. At the beginning of the war the mining companies greatly underestimated these requirements, but now they have come to understand that the war demand is the dominating factor.

At the beginning of 1915 the mining and metallurgical plants of this country were little if any more than half employed. During the first quarter of that year there was a quickening into more normal life and at present nearly all of these industries are operating above their normal capacity.

Increase in Metal Production.

The steel mills in 1914 made about 22,000,000 tons. They are producing now at the rate of 38,000,000 tons per year and facilities to further increase capacity are under consideration. The unfilled tonnage of the United States Steel Company, almost ten million tons, is greater than at any previous time and the present enormous output is assured for the balance of this year in spite of the fact that the price of Bessemer pig has advanced from \$14.89 in 1914 to \$19.95 in December, 1915.

The copper production for 1915 of the regular refining plants of the United States, notwithstanding the reduced output of the first quarter of that year, was greater than that of any previous year—having been

1,647,000,000 lbs. If the present output of the refineries of this country is maintained throughout this year a production of over 2,000,000,000 lbs. will be attained. This would be an increase of about 25% over the year 1915. The average price of the metal for 1914 was between 13 and 14 cts. per pound, and for 1915 about 17¼ cts. Based on the enormous sales already made for deliveries in 1916, it is estimated that the average price for this year will be 24 to 27 cts. per pound. These remarkable figures suggest a total value of the copper output of our refineries for the year 1916 of \$500,000,000 to \$550,000,000, as compared with \$288,000,000 in 1915.

The zinc situation has been even more radically changed. Normally our country exports little or no zinc—the production of 300,000 to 350,000 tons per year being approximately equal to our own consumption. The output increased very rapidly in 1915 and the U. S. Geological Survey estimated the production as 489,519 tons, an increase of 39% over the production of 1914. With the additional retorts in operation, which are under construction or contemplated, and allowing a production of 35,000 tons for the new electrolytic zinc plant in Butte, we will be producing at the rate of 700,000 tons by the end of this year. This transformation has been brought about by the enormous demand, both foreign and domestic, which has led to an increase in price from about 5½ to an average of 13¾ cts. for the year and a present quotation of about 17 cts. per pound. The same general story with varying details could be told with regard to lead, antimony, tungsten and many other commodities.

Developing Latent Resources.

Our resources have been sufficient to respond to the phenomenal demands remarkably well in many instances and we feel like congratulating ourselves, but we should also be thankful that these demands have made clear some of our national weaknesses and shortcomings. It is extremely important that our nation shall be conscious of its needs so that we may better know how to prepare for national defense.

Unfortunately many of our great chemical and manufacturing industries have depended and still depend upon foreign sources for their supplies of certain materials such as potash, nitrates, chrome, manganese, antimony and magnesite. One of the helpful effects of the war has been to stimulate production of these minerals in the United States.

During the year several strong financial interests have undertaken to secure potash from the kelp of the Pacific Coast and have spent and are spending large sums in trying to solve this problem. Those in control of the Searles Lake deposits have continued

*Address delivered at the annual banquet of the Chamber of Mines and Oil, Los Angeles, Calif.

their earnest work and are now erecting plants there and at San Pedro. If they are as successful as they hope, our country will be entirely free from dependence on Germany for its potash. Such efforts should receive our hearty co-operation and aid so that these industries may become firmly established. The producers of potash in this country must look forward to keen competition in the future for it is well known that the price of German potash prior to the war was arbitrarily fixed by the government and in case of necessity this price can be very greatly reduced and still leave an excellent profit to the German producers.

Normally the magnesite users import about 90% of their material—only 10% being mined in the United States. During the past year the shipments of magnesite from California have increased materially. Whether this California industry will be able to survive the competition of Austrian producers under normal conditions is uncertain, but the California deposits are being developed and our potential resources will probably prove to be sufficient to supply the demands of our country in case of some future emergency.

The production of quicksilver in California has decreased during the past ten years from 30,000 flasks to 13,000 flasks, while the production of Austria increased from 17,000 to 27,000 flasks and in Italy from 11,000 to 30,000 flasks. The import duty decreased from 10 to 7 cts. in 1895 and to 4.8 cts. in 1913. The imports increased from 84 lbs. in 1906 to 614,869 in 1914. During the past year there was only a slight increase of production, notwithstanding the price was doubled.

For many years the large deposits and cheap labor of China and Mexico have made it possible for these countries to control the antimony market of the world. The high price of the metal has induced the operation of a number of mines in the United States and has caused the erection and operation of several small smelting plants, the most important smeltery being located at San Pedro, California. Much of the ore smelted by the latter plant is derived from mines in Kern and Inyo counties.

Atolia, California, has been one of the important producers of tungsten for a number of years, but probably few of us realize what a hive of industry it is today or that its shipments amount to about one-half million dollars per month. The price of 65% tungsten ore is approximately \$5000 per ton—about ten times its normal value.

Southern California has three borax properties which furnish borax for our entire country—aggregating in value perhaps from \$1,500,000 to \$2,000,000.

It is not generally known that Arizona is now producing a small quantity of high grade asbestos, a mineral which is imported in large amounts from Canada. The only other producing mines in the United States are located in Georgia.

The southwest also produces gypsum, diatomaceous earth, soda and soda ash, salt, mineral water, stone and rock products, talc and other minerals

worth between two and three million dollars, in addition to Portland cement valued at three or four million dollars.

In the southwestern portion of the United States the past year has brought new life to our mining sections and especially increased activities at the camps of Oatman and Jerome in Arizona and of Atolia in California and in the zinc producing camps of Cood-springs, Nevada, and Chloride, Arizona.

The Oatman gold district, through important developments, has become very widely known and it is hoped that additional favorable discoveries may be such as to add greatly to the value of its mines.

At Jerome, Ariz., another very great copper mine has been developed, and the effect has been to stimulate speculation and increase prospecting which may result in other important discoveries in Arizona, which state produced in 1915 23% of the world's copper or 38% of that mined in the United States.

Outlook for the Future.

The condition of many industries is now eminently satisfactory, but what of the future? By the end of the war the capacity of our steel mills will be greatly in excess of the probable consumption of our country. In order to maintain reasonable prosperity in these industries, we must be able to produce cheaply and to market much material abroad. It is thought that there will be an excellent demand for copper during the period of reconstruction in Europe and as this must be derived largely from the United States, the copper producers are expecting a protracted period of large production and fair prices.

In the zinc industry for some months earnest, far-sighted efforts have been under way to retain in this country much of the zinc smelting which before the war was done in Belgium and Germany. This must be accomplished within a year or so, otherwise from 30 to 50% of the retorts of the United States will be cold.

Similar conditions prevail with regard to other metals and the wise administrators are not giving their thought to self-congratulation, but to careful plans for the economic struggle of the future.

Referring again to the southwestern portion of the United States, it may be assumed that this section surely will continue to yield its share of the more common metals. It is to be hoped that in addition the production of potash, magnesite, tungsten, chrome, manganese ores and other commodities may gradually increase and become permanent and well established industries. It will not be easy or simple to bring this about. Perhaps sympathetic treatment by the government, cheaper transportation and careful administration may accomplish it. If we in the southwest do succeed in making our country independent of outside sources for more of the vital requirements of our nation may we not assume that we have been of material aid to our country and may we not from day to day feel a patriotic inspiration in our work and not look altogether to the balance sheet?

The Iron Ore Deposits of Cuba and Method of Mining

The principal iron-ore deposits of Cuba are divided into two classes. The hard hematite and magnetite of the south coast mountains, and the soft brown hematite and limonite of the north coast of Camaguey and Oriente provinces. The south coast ore was originally exploited in 1884 by the Juragua Iron Co. Its mines are situated in the hills, 10 to 15 miles east of Santiago de Cuba. About 5 miles farther east are the properties of the Spanish-American

systematically kept up well in advance of mining. Open-cut methods are employed. In the larger mines, steam shovels are operated for removing the overburden. The disposal of waste is simple, as the almost invariable location of the mines is along steep hillsides. Blasting is done at fixed hours, and great care is taken to avoid accidents of all kinds. Drilling in the larger mines is done by tripod drills, using steam or compressed air. The ore is loaded by hand



OPEN-CUT WORKINGS ON A CUBAN IRON PROPERTY.

Iron Co., the largest of the mining concerns. Eight miles west of Santiago, the Ponupo Mining Co. at El Cuero has successfully operated since 1909.

The occurrence of the south coast ore is in irregular deposits usually small and broken up and mixed with siliceous rock. It is mainly a fine-grained magnetic intermixed with specular hematite. Diorite is the most common country rock. The ore is largely a low phosphorus as well as a low sulphur grade. In consequence of the interrupted structure of the ore bodies much waste rock must be handled. Careful preliminary exploration work is always undertaken to insure successful mining operations, and the work is

into the mine cars on account of the necessity for sorting.

Tungsten ores occur with a great many other ores, in Cuban deposits. The presence or absence of tourmaline divides the deposits into two main groups; those free from tourmaline are the more common. More important perhaps is the presence of sulphides. These are never absent, but their relative amounts are not sufficiently well known to make a satisfactory classification; they are mainly sulphides of iron and copper, together with the products arising from their alteration. The most important accompanying ores are molybdenite (San Virgilio, Los

Coloraditos), and bismuthite or carbonate of bismuth (El Aguila, El Salado). Scheelite is generally found in small quantities. There is but one region—Mazan—where cassiterite occurs with wolframite. The cassiterite beds of Salvador do not contain wolframite; their formation belongs to an earlier stage (fissures and impregnations; no quartz-and-mica veins).

The main deposit occurs in the Los Condores mine, in the province of San Luis. The other mines are not of importance; some of them are abandoned, and others have not yet been worked. In Los Condores, the vein yields between 1 and 4% of wolframite. The proportion diminishes as the depth increases (1.28%). The average proportional yield of the other mines is not known.

Mining and Preparation of Feldspar.

In mining feldspar the personal judgment of the operator and his employes regulates the quality of crude material accepted and on the uniformity of this selection the manufacturer depends for the maintenance of the quality of his ware. Fortunately in most of the feldspar quarries the men employed have been trained by long acquaintance with the feldspars of the district, otherwise serious error in selection might easily result. The ordinary process of sorting the feldspar is as follows (Bur. of Mines Bull. 92):

The quarried rock is piled in long rows and then a crew of men provided with light sledges sort the pieces, breaking off the impure parts. By this system, known as "cobbing," the rock is prepared for the mill.

The accepted material is then heaped in an open space, where it is exposed to the weather for a few weeks in order that the rains may carry away any dirt which may be adhering to the broken stone. The length of time allowed for the elements to effect the cleaning of the rock is dependent largely on the urgency of the demand for the crude material. All crude feldspar was formerly subjected to thorough washing but this practice has been abandoned in recent years. Another cause of serious contamination is surface water containing salts which runs down the faces of the quarry and stains the rock. These stains or incrustation on drying adhere so firmly that any ordinary method of cleaning or washing fails to remove them.

The handling of the feldspar from the time it reaches the mill to the time it is delivered on board cars for shipment to the consumer consists of but two steps—crushing and pulverizing. The methods employed to accomplish these two results have changed from time to time, but the result has not changed materially.

When the crude feldspar reaches the mill it is often wet from snow or ice in winter or from quarry moisture in the spring. The general practice is to dry the crude feldspar in a vertical kiln or on a hot plate. Neglect of this point causes the fine particles

to pack and later to cause trouble in the pulverizing process, but the most valuable result obtained is the elimination of fine dirt which sticks to the lumps of feldspar when wet but can to a considerable degree be shaken loose when dried and the feldspar handled with a steel fork.

The dry feldspar is ready for crushing. The processes differ in different grinding plants, but they may be divided into two classes: (a) Those in which the crude feldspar, after being reduced by sledge to 3 or 4 ins. diameter, is fed directly under the rolls of a buhrstone chaser, and (b) those in which the crude feldspar is fed into a rock crusher which reduces the feldspar to a maximum of 1 in. in diameter and then goes to the buhrstone chaser mill, which completes the crushing process.

Rock crushers are of two kinds—jaw crushers, which are intermittent machines, and gyratory crushers, which are continuous machines.

The operator who employs a crusher of either the jaw or gyratory type has to deal with the problem of cleaning his crushed material of iron and steel particles. The simplest and surest method of accomplishing this result is to screen out all the fine material, because the metal is invariably ground off the plates in very small particles. The objection to this method is the large amount of fine material wasted, which in some cases is as much as 10% of the rock crushed.

Apparatus to eliminate iron and steel particles from dry powdered rock have been only fairly successful and have not come into general use. The most successful method is to use a system of magnets and to have the fine material in the form of a slime or slop. The expense of installing such an apparatus and of drying the cleaned slime will add somewhat to the average cost of crushing the feldspar but will show a big saving as against the rejection of all the dust material from the crusher.

Where the jaw or gyratory crusher has not been introduced the primitive chaser mill is used for crushing the crude feldspar.

The chief users of feldspar are the manufacturers of white pottery ware. The manufacturers of glass and enameled metal wares are also extensive users of feldspars. The scouring-soap industry uses a limited amount. An enormous amount is annually consumed in the manufacture of roofing and for poultry grit, these, however, requiring a low-grade feldspar. Pulverized feldspars of the potash varieties are also used as ingredients in some fertilizers and for this use the presence of iron-bearing impurities is not detrimental.

Official Government reports show ferromanganese imports in May to have been 8466 gross tons. This is the largest month this year and compares with an average of 6474 tons per month to May 1, 1916. The May imports were received as follows: 6195 tons through Baltimore, 1198 tons through Philadelphia and 1073 tons through New Orleans.

A New Low-Pressure Turbo Blower.

The Ingersoll-Rand Co. has added to its turbo compressors and blowers a low-pressure machine to handle volumes from 3000 to 35,000 cu. ft. per minute at from 1 to $2\frac{1}{2}$ lbs.

These are particularly adapted to such service as foundry cupola blowing, atomizing oil for oil burners, supplying blast to heating and annealing furnaces of various kinds, blowing air for water gas generators, pneumatic conveying and ventilating. They are of the single-stage, double-flow type and are furnished either electric motor, steam turbine or water wheel driven.

Electric drive is generally employed for these classes of service, and in the case of the I-R turbo blower, the high-operative speed permits direct coupling to motor, a first cost economy.

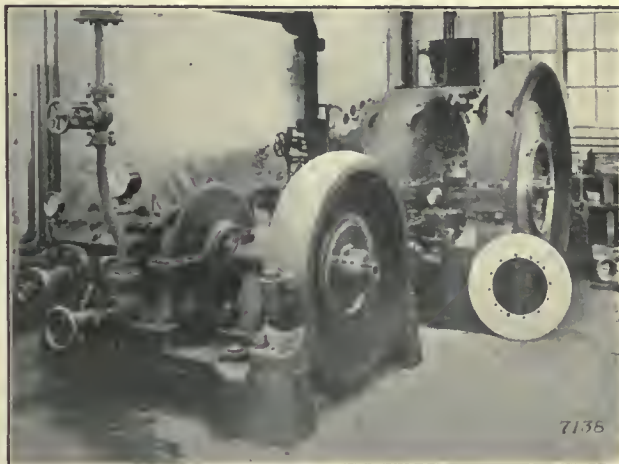
The motor-driven blower maintains constant pressure, while delivering any volume from zero to maximum demand, and proportionately varying the electrical horse power input.

These blowers embody the 4-bearing construction featured in all turbo machines of this make. The casing is horizontally split for ease in installation and subsequent inspection. The assembled casing is doweled and bolted to a heavy sub-base which ordinarily serves for both blower and driving element. The blower occupies small floor space and its vibrationless operation obviates the necessity for foundation bolting.

The impeller is of the enclosed double-flow type, claimed by the manufacturer to secure the highest efficiency. The wheel is machined from a solid, special steel forging. Vanes and covers are of pressed

steel accurately riveted. All rivet heads are driven flush and the entire assembly polished. Every care is taken to reduce skin friction.

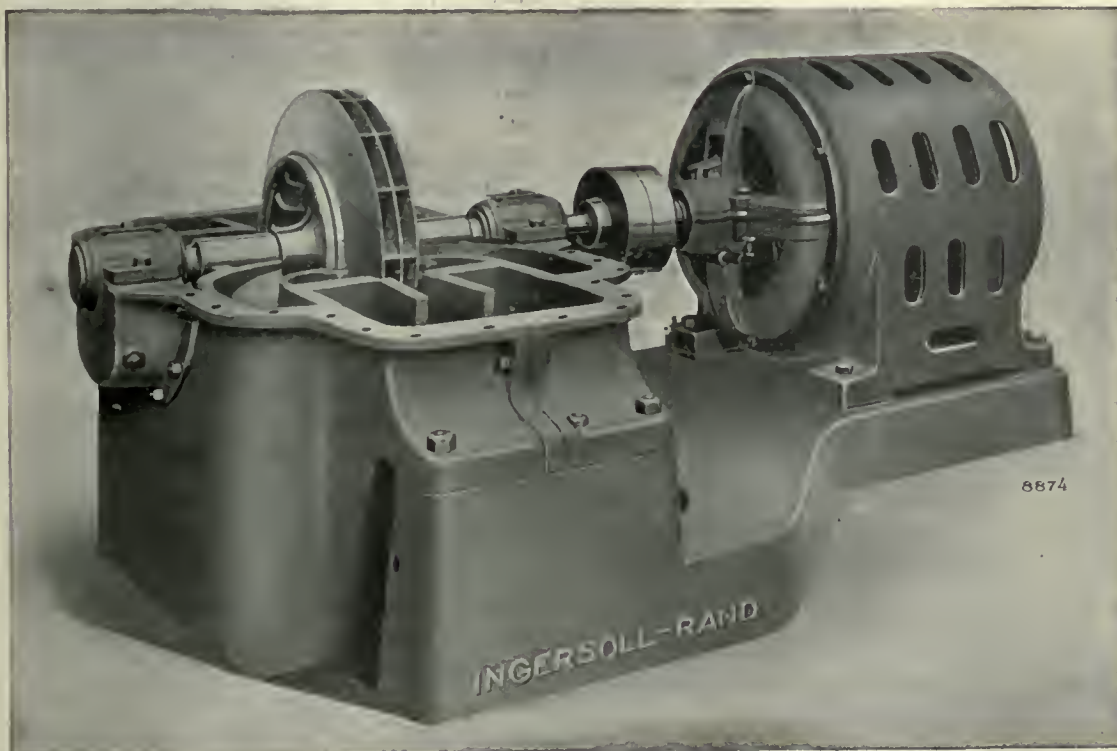
All impellers are overspeeded in a testing machine to insure correct balance, strength and eliminate vibration. Impellers are keyed to a heat-treated, forged-steel shaft. Labyrinth packing is employed to prevent



CENTRIFUGAL TESTING MACHINE.

leakage between impeller and casing. Bearings are ring oiled and both bearings and their housings are horizontally split.

The use of flexible couplings between blower and driving unit is standard practice. Machines are all of the closed intake type. The intake opening is at the bottom and discharge at the top. The flow of air from this type of blower is absolutely uniform, avoiding all



INGERSOLL-RAND LOW PRESSURE TURBO BLOWER SHOWING UPPER CASING REMOVED.

pulsations, which makes it especially desirable for foundry work.

There are no rubbing surfaces precluding the necessity for adjustment to take up wear and minimizes the cost of maintenance. The only lubrication necessary is that of the bearings, all other parts working without friction.

Big Capital Buys East Side Properties at Tonopah, Nev.

After the discovery of the trachyte formation in the Buckeye No. 3 shaft, and the striking of several rich stringers in that property that showed high values in gold, the Buckeye Co. suspended work upon that shaft and closed in a gap by buying the Belmont Extension and Buckeye Eagle ground. This gives the Buckeye-Belmont Co. a total length of nearly a mile and a half on the mineral belt of Tonopah, which adjoins the Tonopah-Belmont on the northwest, the Rescue Eula on the west, and the Halifax on the north, all of them being steady producers.

Recent developments in the Halifax and Buckeye show higher percentage of gold than ever before found in the district. The Halifax shows some good grades of shipping ore running better than 40% of its value in gold, whereas the Buckeye uncovered the top of a low-grade vein that shows \$4 in gold to an ounce of silver.

On top of this important information that the gold values are increasing eastward, comes some important deals in undeveloped properties still further east. The East Union Mining Co., that has held eight or ten claims in idleness for several years, eastward from the Halifax and Buckeye, has sold the control of its stock for \$25,000 and the K. C. group, organized with 1,500,000 shares, sold the control of the issued stock for \$18,300. Interests connected with the Tonopah-Belmont Mining Co. are the purchasers. On top of this, a meeting was called for June 30, of the East End Development Co., still further east. This property is fully equipped and the shaft is down 450 ft., and has been for some time controlled by Belmont interests. Work was suspended there a few weeks ago. Following the suspension of the work, the intermediate properties were bought up. Other properties are under examination, and it is said that \$25,000 is offered for the East Belmont property. With these big interests taking up the development of the eastern properties, increased activities will make a boom in the stocks of all Tonopah east side properties.

When it is remembered that the copper stocks took a great slump at the time copper went down to 10 cts., and the copper mines reduced their operations, it will also be remembered that the stock market for copper shares did not advance materially until copper rose to 20 cts., and from there on up to near the 30-mark copper securities have been exceedingly active and high priced. Shares that sold as low as a few

cents on the dollar, now command many dollars a share.

The same thing is occurring in silver shares. Silver metal has advanced about 50%, yet the silver shares have not responded materially, even with double dividends indicated. But when one thinks of the Comstock mines, and shares commanding over \$4000 a share (\$100 par) at the time that silver was above \$1 an ounce, it is reasonable to expect that when silver reaches the \$1 mark again, that silver stocks will soar as have the coppers.

Mine Production of Lead and Zinc in Wisconsin in 1915.

The value of the mine output of lead and zinc in Wisconsin in 1915 was \$10,486,212. The value of the lead and zinc, together with a very small yield of silver and copper, in 1914, was \$3,291,437.

The quantity of raw zinc concentrates from the mines increased 22%, and as the demand for low-grade concentrates was small, the increased production resulted in the building of several roasting and separating plants. Many leases were prospected by drilling and the erection of new and the rebuilding and enlargement of old concentrating plants will tend to insure an increased output in 1916.

The lead concentrates sold increased in quantity from 2028 tons, valued at \$85,196, in 1914, to 3175 tons, valued at \$171,091, in 1915. The sphalerite concentrates sold increased in quantity from 103,535 tons to 138,996 tons. The value of the sphalerite concentrates was \$5,333,316 in 1915, compared with \$1,924,126 in 1914. The quantity of the zinc carbonate concentrates sold declined from 2758 to 2579 tons.

The metal content of the galena concentrates was 828 tons more than in 1914. The recoverable zinc content of the sphalerite and zinc carbonate concentrates increased 10,290 tons over that of 1914 and the value was \$3,409,190 more.

The average tenor of the sphalerite ore marketed by the mines was nearly 1.5% higher in 1915 than in 1914, and the average price paid for the concentrates was \$20.64 a ton more.

The Benton district was again much the largest producer of both lead and zinc concentrates, followed by Hazel Green and Livingston.

The production of lead and zinc by districts and the tenor of the ore and concentrates in Wisconsin in 1915 are shown in the following tables prepared by J. P. Dunlop, of the U. S. Geological Survey:

	1914.	1915.
Total crude ore, short tons.....	1,387,490	1,934,000
Total concentrates in crude ore:		
Lead, per cent.....	0.14	0.16
Zinc, per cent.....	8.02	7.32
Metal content in crude ore:		
Lead, per cent.....	.11	.12
Zinc, per cent.....	2.8	2.65
Average lead content of galena concentrates, per cent.....	73.7	73.5
Average zinc content of sphalerite concentrates, per cent.....	35.05	36.5
Average zinc content of zinc carbonate concentrates, per cent.....	27.5	24.9
Average value per ton:		
Galena concentrates.....	\$42.01	\$53.88
Sphalerite concentrates.....	\$17.73	\$38.37
Zinc carbonate concentrates.....	\$13.65	\$18.70

Accidents from Misfires and How to Prevent Them.

By EDWIN HIGGINS.*

Of the 10 fatal accidents reported in California mines during the first 4 months of 1916, three of them resulted from missed holes. In addition to these fatalities, several men were seriously injured. Such a large percentage of accidents from misfires is very unusual.

There are many things to be considered in the prevention of accidents of this nature. In the first place, it is necessary that powder, caps and fuse be of good quality. The storage and care of explosives have much to do with their action when put in use. They should not be stored in damp places, nor exposed to dampness after removal from the magazine. Fuse should be observed closely to see that it is not damaged. It should be freshly cut when put into the cap. Capping fuse more than 36 hours before using it is poor practice. All explosives should be used as soon as possible after removal from the magazine.

If the face to be blasted is very wet, it is important that holes be not loaded too great a length of time before blasting. In wet places care should be taken to protect the joint between the cap and fuse. The use of oil or grease for this purpose is very objectionable, for the burning fuse, coming in contact with such material, causes it to form a spray which may easily cause a misfire. Fuse manufacturers supply a satisfactory compound for water-proofing. Also, there is on the market a rubber covering for protecting the cap from moisture. Good roofing paint gives satisfactory results. Ordinary white laundry soap will water-proof a joint for a short period of time.

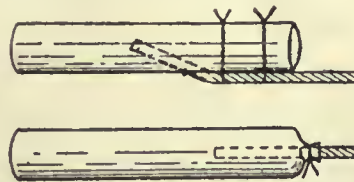
The making of the primer is a very important consideration. The Bureau of Mines has made many and extended tests to determine the best method of making primers. Without going into detail, it may be said these results showed that any method of making the primer necessitating the bending of the fuse at a sharp angle is very undesirable. The double lace, or placing the cap in the bottom of the cartridge and bending the fuse back through 180°, are objectionable. The two methods that resulted in by far the minimum of misfires under all conditions are shown in the accompanying sketch.

After everything possible has been done to insure the proper detonation of the charge, the next matter of importance is to see that misfired holes are handled safely. This appears to be simple enough, but any method that may be devised brings into consideration the human element. There will always be men who, from time to time, will violate rules. Frequently an experienced man will take even greater chances than will a greenhorn. Men who have spent almost a lifetime handling powder have been killed as a result of misfires. In many cases familiarity with powder causes a man to regard danger lightly.

It is second nature to most miners to count the number of reports from a round of holes. It is at this point, however, that many misfire accidents originate. The miner either goes back to a missed hole too soon or he fails to report the misfire. If he does report it, there often develops some mistake in transmitting the information to the proper man on the next shift.

The following plan has been found satisfactory in handling misfires: See that miners count the number of blasts and, if the entire round has not exploded, provided means so that a report can be made to the shift boss of the next oncoming shift as to the number and location of the missed holes. A record may be kept on a bulletin board either underground, or in the change house. Some companies provide printed forms and cause their miners to report misfires to the shift boss, who in turn delivers the printed report to the shift boss of the next oncoming shift.

Misfired holes should be handled under the supervision of the shift boss, or some one experienced in this class of work. To insure safety in recovering a missed hole, the following procedure should be observed: Under no circumstances should any one be



TWO METHODS OF MAKING A PRIMER THAT GAVE THE LEAST NUMBER OF MISFIRES IN BUREAU OF MINES TEST.

allowed to return to the face within 45 minutes of a misfire. An attempt should first be made to fire the missed hole by means of a new primer. If this is not possible, or if it fails, a new hole should be drilled at least 2 ft. from the missed hole in such a direction that it will not encounter the defective charge in the old hole.

The only method of insuring compliance with requirements laid down for the proper handling of missed holes is to use the strictest discipline in every case of disobedience to rules. No matter how valuable a miner may be, he is a menace to himself and those working with him, if he will not use care in the handling of missed holes.

The above short discussion relates chiefly to the prevention and safe handling of misfires. For information on the general subject of storing and handling explosives, the following publications, which may be obtained free of cost on request to the Director of the Bureau of Mines, Washington, D. C., are of interest:

Technical Paper 18. Magazines and Thaw Houses for Explosives, by C. Hall and S. P. Howell.

Bulletin 80. A Primer on Explosives for Metal Miners and Quarrymen, by C. E. Munroe and C. Hall.

Miners' Circular 19. The Prevention of Accidents from Explosives in Metal Mining by Edwin Higgins.

*Chief Mine Inspector, California.

What the Mining Companies are Doing

Butte & Superior

The Butte & Superior Co.'s report for May on its oil flotation plant shows an increased ore tonnage treated, but less concentrates recovered than in April, and a decrease of \$18.24 per ton in value. Comparison follows:

	Tons ore.	Costs per ton.	Zinc con- cen. tons.	Value per ton.
May	50,688	\$3.22	11,658	\$ 65.25
April	50,112	2.84	12,080	83.79
March	52,089	2.69	12,190	83.62
February	49,800	2.52	10,775	93.56
January	49,428	3.05	10,535	101.60
December	45,277	2.93	10,409	86.00
November	47,672	2.91	10,386	90.58
October	43,092	2.75	10,473	79.59
September	37,278	3.19	8,968	81.77
August	40,809	3.38	9,561	80.23
July	41,547	2.95	9,482	75.76

American Zinc, Lead & Smelting Co.

The American Zinc, Lead & Smelting Co. has issued a report to New York Stock Exchange covering its operations for the 4 months ended April 29, 1916, as follows:

Earnings from mines at Cartersville, Mo.....	\$ 226,844
Earnings from mines at Mascot, Tenn.....	830,046
Earnings from mines at Platteville, Wis. (dividends received)	12,995
Total mine earnings	1,069,885
Ballast earnings	14,459
Earnings from smelters at Caney and Dearing, Kan....	1,119,915
Earnings from smelters at Hillsboro, Ill.....	566,456
Total smelter earnings	1,686,371
Miscellaneous earnings	80,555
Electro-static separating department (deficit).....	3,037
Total net earnings	2,848,233
Administrative and general exp. and inc. tax.....	75,651
Balance	2,772,582
Interest received on bank deposits, etc.....	7,025
Net profits before depreciation.....	2,779,607
Transferred to reserve	1,502,000
Four months' surplus	1,277,607

Balance sheet of the American Zinc, Lead & Smelting Co. and subsidiary companies as of April 29, 1916, as reported to the New York Stock Exchange, follows:

Assets—	
Property account	\$ 6,162,467
Investments	582,218
Insurance fund investments.....	32,884
Mascot ore stocks at smelters (sales price).....	363,666
Mascot ore stocks on hand and in transit to smelters (at mining cost and freight).....	191,953
Mascot spelter stocks (sales price).....	918,366
Spelter ore stocks (at cost).....	694,002
Tennessee broken ore underground (cost).....	14,109
Spelter stocks (sales price).....	251,976
Sulphuric acid stocks (sales price).....	8,761
Inventories (at cost)	578,627
Cash	1,949,151
Accounts receivable, manufactured products.....	1,613,823
Accounts receivable, miscellaneous	218,842
Deferred charges to operations.....	124,090
Total	\$13,695,031
Liabilities—	
Capital stock	\$ 4,828,000
Depreciation and reserve funds.....	4,042,360
Insurance reserve fund	32,884
Accounts payable	567,869
Taxes accrued	88,196
Drafts in transit	61,241
Surplus at Dec. 31, 1915	2,796,871
Profit and loss surplus for four months ended April 29, 1916	1,277,607
Total	\$13,695,031

Consolidated Arizona Smelting Co.

The condensed balance sheet of the company as of Dec. 31, 1915, shows as follows:

Assets—	
Unissued stock	\$ 912,500.00
Unissued mortgage bonds	315,000.00
Mortgage bonds (pledged against \$225,000 notes)....	337,500.00
Treasury stock and bonds	147,206.11
Property	9,180,540.26
Inventories	150,025.01
Current assets	139,068.57
Deferred assets	5,573.07
Arizona Exploration Co.	109,713.05
De Soto Power Line suspense.....	3,611.07
General profit and loss	186,632.39
Total	\$11,487,369.53

Liabilities—	
Capital stock	\$ 9,200,000.00
Convertible income bonds.....	912,500.00
Mortgage bonds	1,000,000.00
Notes payable	225,000.00
Current liabilities	104,409.93
Deferred liabilities	4,312.31
Suspense	74.55
Depreciation reserve	1,072.74
Maintenance and renewals.....	40,000.00
Total	\$11,487,369.53

Daly-Judge Co., Utah.

The financial statement of the Daly-Judge Mining Co. for 1915, shows as follows:

Receipts—	
Balance Jan. 1, 1915.....	\$ 440,153.06
Ore sales	1,041,413.74
Interest earned	38,054.12
Total	\$1,519,610.92
Expenditures—	
Mine account—	
Labor	\$135,201.92
Repairs and maintenance.....	21,355.87
Supplies	26,945.21
Explosives	16,049.47
Timber and lumber.....	37,878.96
Fuel and electric power.....	4,614.76
Rails, piping and cars.....	7,083.30
Sundries	1,603.77
Total	250,733.26
Mill account—	
Labor	\$25,186.02
Repairs and maintenance.....	14,223.27
Supplies	13,188.58
Assay office	1,866.61
Fuel and electric power.....	7,298.30
Sundries	2,144.32
Total	63,907.10
Prospecting, exploration and dead work—	
Labor	\$98,663.65
Sundry supplies	38,485.77
Fuel and electric power.....	8,908.76
Leasers' royalties	15,787.44
Total	161,845.62
Ore expense—	
Sampling and assaying.....	\$10,964.35
Hauling	13,501.12
Total	24,465.47
Surveying and engineering.....	3,370.01
General expense, office, taxes, etc.....	23,177.75
Drainage	12,000.00
Impounding	915.15
Dividends	300,000.00
Total expenditures.....	\$ 840,714.36
Balance Dec. 31, 1915.....	678,906.56
Total	\$1,519,620.92

Brunswick Con. Co., Calif.

The following report of operations of the Brunswick Con Co: is shown in the company's report for the year 1915.

Receipts—	
Balances outstanding	\$ 83,034.03
Bullion and sulphurets.....	223,556.80
Contingent expense	170.84
Interest	2,267.56
Insurance	27.60
Mill repair supplies.....	162.35
Mine supplies	674.56
New shaft development supplies.....	95.50
Total	\$309,989.24
Disbursements—	
Dividends	\$ 71,151.66
Mine labor	37,409.51
Mine supplies, power and equipment, etc.....	34,569.96
Mill labor, supplies, etc.....	32,377.53
Other labor and supplies.....	48,301.34
Miscellaneous disbursements	86,179.24
Total	\$309,989.24

For 1915, the working costs amounted to \$6.78 per ton, to which should be added \$1.81 for improvements, making a total of \$8.59, as compared with \$10.45 in 1914. The new mill was in commission only a little over 2 months, and it crushed less than 17% of the total ore milled. Henceforth, it will crush more than the old mill, and, with the increased tonnage thus obtained, the working costs will undoubtedly be reduced to less than \$6 per ton, exclusive of shaft sinking and improvements.

The total production in bullion and concentrates shipped, from 22,004 tons of ore treated, was \$223,556.80, to which should be added \$3,263.34, derived from sales of supplies

and interest on bank balances and invested funds, so the total gross income was \$226,820.14. Expenditures for all purposes, including \$39,751.49 for the new mill, steel head-frame and other improvements, amounted to \$189,070.61, and the profit for the year was \$37,749.53, or \$1.72 per ton. The operating profit was \$72,656.29, or \$3.30 per ton.

Mohawk Mining Co.

The Mohawk Mining Co. produced 20,705,600 lbs. of mineral in 1915, which yielded 76.75%, or 15,882,914 lbs. of refined copper. The following is a summary of the year's business:

Receipts—	
15,882,914 lbs. of copper @ 17 cts.....	\$2,700,843.19
Expenditures—	
Working expenses at mine.....	\$991,872.35
Smelting, freight and offices' expense.....	154,021.67
	<u>1,145,894.02</u>
Showing a mining profit of.....	\$1,554,949.17
Expended for construction.....	43,373.44
Net profit	\$1,511,575.73
Dividend	600,000.00
Surplus, Dec. 31, 1914.....	\$ 911,575.73
Surplus Dec. 31, 1915.....	852,208.98
	<u>\$1,763,784.71</u>
Assets—	
Cash in bank.....	\$ 58,457.44
Cash in Trust Co.....	1,050,000.00
Copper on hand sold.....	620,764.26
Cash and supplies at mine.....	115,849.23
Stock in Michigan Smelting Co.....	80,000.00
Total	<u>\$1,925,070.93</u>
Liabilities—	
Indebtedness at mine.....	\$142,506.10
Accounts payable	18,780.12
	<u>\$ 161,286.22</u>
Balance assets	<u>\$1,763,784.71</u>

Montana Power Co.

The consolidated surplus account of the Montana Power Co., for the 4 months ended April 30, 1916, as reported to the New York Stock Exchange, follows:

Surplus at date of merger, balance Dec. 31, 1915.....	\$ 33,132
Undivided profits, balance Dec. 31, 1915, less payments and adjustments not chargeable to operating expenses of 1916	1,030,866
Surplus income for 4 months to April 30, 1916.....	1,012,213
Total surplus	<u>2,081,211</u>
Preferred dividend, 1 3/4%.....	\$ 169,257
Common dividend, 3/4%.....	291,806
	<u>371,063</u>
Surplus as per balance sheet.....	<u>\$ 1,710,648</u>

The consolidated balance sheet of the Montana Power Co. as of April 30, 1916, as reported to the New York Stock Exchange, follows:

Assets:—	
Property	\$85,373,529
Material and supplies at cost.....	302,117
Accounts receivable	633,885
Cash	1,408,750
Sinking fund deposits	2,178
Deferred charges:—	
Discount on bonds (amortized monthly)....	\$ 2,501,422
Miscellaneous	77,318
	<u>2,578,739</u>
Total	<u>\$90,299,198</u>
Liabilities:—	
Preferred stock in hands of public.....	\$ 9,671,800
Common stock in hands of public.....	26,907,500
Common stock under voting trusts with dividends deferred	22,500,000
Funded debt	27,632,000
Bills payable (Great Falls Power Co.—due to Great Falls Townsite Co.)	150,000
Accounts payable	366,045
Accrued interest	512,612
Depreciation, accident and miscellaneous reserves....	849,092
Surplus	<u>1,710,148</u>
Total	<u>\$90,299,198</u>

Miscellaneous Company Notes.

According to a report recently issued the Rochester Mines Co. is free from debt, has a cash surplus and expects to pay dividends before the year is out. After the payment for its new mill, the buying of leases and development ex-

pense, the total indebtedness of the company Oct.-31, 1915, was \$205,392.43. Present liabilities as of May 15, 1916, are \$30,355.70, with current and working assets of \$40,722.27.

Reports from Juneau indicate satisfactory progress in construction work of treatment plant of Alaska-Juneau Gold Mining Co. At the coarse crushing plant the concrete work has been completed, and steel is now being erected. Good progress has also been made with concrete work on the mill and power plants.

Col. E. A. Wall of Salt Lake has transferred his three-fourths interest in the Kangaroo mining lode in Bingham to the Utah Copper Co. in consideration of \$30,000. The ground will be used by the Utah Copper Co. for dumping purposes. This ground was originally the basis of a big damage suit and the transfer settles the litigation between Wall and Utah Copper which has been waged for years.

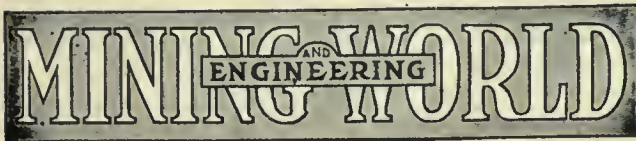
Directors of the Calumet & Hecla Mining Co. have elected officers for the ensuing year as follows: President, Rodolphe L. Agassiz; vice-president, James MacNaughton; secretary and treasurer, John F. Perkins; assistant treasurer, Charles A. Hall; assistant secretary, A. J. Garceau. The office of president has been vacant for over a year, R. L. Agassiz serving as first vice-president and James MacNaughton, second vice-president. Robert F. Herrick was elected a director, succeeding Geo. A. Flagg.

From present indications Granby closed its fiscal year ending June 30 with a production close to 63,000,000 lbs. of copper. The May output, totaling 4,727,929 lbs., was the largest ever turned out by the company. Of the total 3,383,230 lbs. were contributed by the Hidden Creek smelter, while the old Grand Forks plant turned out 1,344,699 lbs. Actual production in the 11 months up to May 31 was 58,717,551 lbs. Granby's earnings based on copper delivered at the highest prices were at one time at rate of \$50 per share. The company has been buying in some of its bonds, thereby reducing the amount of fixed charges. Dividends during the 1915-16 year were maintained at \$6 per annum.

The net profits in 1915 of the Hercules Mining Co., which owns and operates the Hercules mine at Burke, Idaho, were \$1,096,019, although the property was closed down from May 29 to August 29, because of its contract with the American Smelting & Refining Co. having expired on the earlier date. The corporation is controlled by the Day brothers and their associates, who have built the smelter at Northport primarily to treat the Hercules and Tamarack & Custer ores. The report of the Hercules Co. in detail is: Tons extracted, concentrates and crude ore, 49,441.55; gross value, \$3,090,174.75; cost extraction, \$950,852.27; cost transportation and reduction, \$986,218.96; cost betterments, \$57,084.15.

Miami Copper Co. established a new production record in May when it outputted 4,600,000 lbs. of copper at a cost of 8.7 cts. a pound as compared with a cost of over 9 cts. a pound in January. Estimating June production on the basis of May the first half of the year will record a production of over 25,000,000, produced at a cost of slightly less than 9 cts. a pound. The capacity of the company's mill will be increased to permit of a monthly yield of 5,000,000 lbs. of copper. This increase, however, is not expected to become effective until early 1917. It will involve new equipment and a new power plant, work on which has already been started. There has been put into operation a 100-ton experimental mill for Miami's low-grade ore from which an extraction of about 80% has been secured.

The Snowstorm Mines Consolidated, capitalized for 2,500,000 shares at 25 cts. each, has been organized to take over the Snowstorm Mining Co., which owns and for a number of years operated the Snowstorm copper mine at Larson, Idaho, and to acquire under lease and bond the Banner & Bangle and other groups of mining claims near Troy, Mont. Of the capital stock 1,500,000 shares will be issued to Snowstorm Mining Co. stockholders in full payment for the corporation's assets, which are said to include \$150,000 in cash and the mill and mine equipment at the property, which has been worked out and was abandoned several months ago. The machinery will be removed to the Banner & Bangle camp as soon as possible, and utilized in equipping that property.



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*Illustrated.

We Begin Volume 45.

With this issue of Mining and Engineering World begins a new volume—45. The volume just completed with the issue of June 24 comprised 1210 pages, 70 pages greater than that of its nearest competitor devoted to the mining industry, and 246 pages more than the next nearest. In these 1210 pages Mining and Engineering World has reviewed the best practices in mining, metallurgy and kindred industries, especial attention being paid during the 6-months' period to the mining news feature, in which descriptions of operations and occurrences at several thousand properties appeared. The index to volume 44 is in preparation and will be published at an early date. It will be sent those who have received previous indexes and to all others who may ask for it.

Remarkable Dividend Disbursements by Mines and Works.

As was predicted in these columns several months ago, dividend disbursements by American mines and works made a record in June little short of wonderful. According to reports made to Mining and Engineering World, 68 companies disbursed among fortunate shareholders in June no less than \$34,067,016. This is only \$16,392,943 less than was paid during the entire 12 months of 1908 and fully one-third of the amount paid during all of last year. It is a record of achievement never equaled by any other line of industry and speaks volumes for the magnificent earning powers of American mines and works.

Fifteen copper companies made record disbursements in June having divided among shareholders no less than \$15,557,707. This amount should be increased to \$19,737,707 by reason of the fact that the \$4,200,000 declaration of the Kennecott Copper Corporation was made from earnings from its copper properties in Alaska and not from its holdings in other companies. Utah Copper ranks first in the amount disbursed during the month—\$4,873,470; Chino is second with \$1,957,455 and Nevada Con. third with \$1,500,000.

Fifty properties classed as gold-silver-lead-zinc producers, paid during the month \$13,174,486. Of this amount 40 companies operating properties in the United States contributed \$12,087,667; Canada with nine companies disbursed \$1,029,592 and one Mexican company paid a dividend amounting to \$57,227. The great prosperity enjoyed by the zinc producers is evidenced by the fact that the three leaders in this class are Butte & Superior first with \$2,931,492, American Zinc, Lead & Smelting Co. second with \$2,414,000 and New Jersey Zinc third with \$1,750,000.

Three metallurgical companies divided among shareholders in June \$5,354,823. International Nickel, common, leading with \$3,346,768.

Three so-called security-holding corporations

made disbursements during the month totaling \$7,080,000, Kennecott being first on the list with \$4,200,000 to its credit.

The following is a list of the companies paying dividends in June, with the date of payment, amount per share and amount paid.

	June.	Per share.	Amount.
American Sm., pfd.....	1	\$1.75	\$875,000
American Sm., com.....	1	1.50	500,000
American Z., L. & Sm.....	15	12.50	2,414,000
Barnes-Kling, Mont.....	1	.07½	30,000
Big Four Expl., Utah.....	15	.05	20,000
Big Run Zinc, Mo.....	20	.03	3,000
Bunker Hill Con., Calif.....	4	.02½	5,000
Bunker Hill & Sullivan, Idaho.....	4	.40	163,500
Butte & Superior, Mont.....	30	10.75	2,914,492
Caledonia, Idaho.....	5	.03	78,150
Cardiff, Utah.....	1	.25	125,000
Champion, Mich.....	7	6.40	600,000
Calumet & Hecla, Mich.....	24	15.00	1,500,000
Calumet & Arizona, Ariz.....	19	2.00	1,281,846
Chino, N. M.....	30	2.25	1,957,455
Copper Range, Mich.....	15	2.50	895,102
Dome, Ont.....	1	.50	2,000
Frontier, W. Va.....	15	2.00	2,478
Gemini, Utah.....	6	5.00	25,000
General Dev.....	1	1.50	150,000
Golden Cycle, Utah.....	10	.02	30,000
Grand Gulch, Ariz.....	1	.01	7,195
Hecla, Idaho.....	23	.15	150,000
Hedley, B. C.....	20	.50	10,000
Hercules, Idaho.....	15	.20	201,000
Hollinger, Ont.....	16	.20	120,000
Homestake, S. D.....	25	.65	163,254
Horn Silver, Utah.....	30	.05	20,000
International Nickel, com.....	1	2.00	3,346,768
Interstate Callahan, Idaho.....	30	1.50	697,485
Kennecott Zinc, Mo.....	30	.10	20,000
Kennecott.....	30	1.50	4,200,000
Kerr Lake, Ont.....	1	.25	150,000
Joplin Ore & Smelter, Mo.....	12	.05½	22,004
Jumbo Ext., Nev.....	30	.05	71,500
Lucky Tiger, Mex.....	20	.08	57,227
Magma, Ariz.....	30	.50	120,000
National Lead, pfd.....	15	1.75	426,501
National Lead, com.....	30	1.00	206,554
National Z. & L.....	30	.05	25,000
Nevada Con., Nev.....	30	.75	1,500,000
New Idria, Calif.....	30	1.00	100,000
New Jersey Zinc.....	10	5.00	1,750,000
Old Dominion, Ariz.....	29	3.00	486,000
Oroville Dredging, Calif.....	24	.12	84,000
Oroville Union, Calif.....	12	.10	5,215
Phelps Dodge & Co.....	30	6.00	2,700,000
Culbreth, Mich.....	30	4.00	440,000
Rambler-Cariboo, B. C.....	15	.02	35,000
Ray Con., Ariz.....	30	.50	755,639
Reorganized Booth, Nev.....	26	.05	45,393
Right-of-Way, Ont.....	15	.00½	8,427
St. Joseph Lead, Mo.....	20	.25	352,370
St. Mary's, Mich.....	28	2.00	320,000
Seneca Superior, Ont.....	15	.30	143,675
Secor, N. M.....	1	.05	18,867
South Eureka, Calif.....	15	.07	20,999
Standard S. L., B. C.....	10	.02½	50,700
Success, Idaho.....	22	.03	45,000
Tamarac-Custer, Idaho.....	1	.02	40,000
United Globe, Ariz.....	30	18.00	414,000
United Verde, Ariz.....	9	1.70	450,000
Utah Con., Utah.....	25	.75	225,000
Utah Copper, Utah.....	30	3.00	4,873,470
West Hill, Wis.....	6	.20	4,000
Yak, Colo.....	30	.07	70,000
Yellow Aster, Calif.....	6	.02	2,000
Yellow Pine, Nev.....	25	.15	150,000
Yukon, Alaska.....	30	.07½	262,500

But for the unsettlement of internal conditions in Mexico during the past 2 years that country would have been a much larger producer of copper. The amount of the red metal received in this country from Mexico in the nine months ended March 31 was just 50% of the tonnage brought in 2 years ago in the corresponding period, the figures being 47,000,000 lbs. up to the end of March last against 84,000,000 lbs. 2 years ago. Last year there was received but 14,000,000 lbs. in the 9 months, but that period included the general curtailment of production during which the Greene property was shut down tight for half a year.

It has been announced that by July 1 the U. S. Bureau of Mines will have an experimental station at Golden, Colo., the equipment, etc., to be housed in the engineering building of the Colorado School of Mines. A payroll of \$40,000 per annum is connected with this station. Although general metal mining investigations will be made, more particular attention will be given the rare minerals and metals. No work will be attempted with coal or other non-metallic products, the scope being confined entirely to metallic ores and metals. The investigating of oils and natural gases is done in the California station while coal is the principal consideration at the Pittsburgh station. A station for studying clays and other non-metals is being considered. At one time Texas was the favored state in this regard, but later the decision of establishing a station there was abandoned and at the present time this question is open.

A strike is in progress on the eastern part of the Mesabi range. All underground mines in Aurora and Biwabik are closed and many in Virginia, Gilbert and Eveleth are idle or working with short crews. The trouble was started by agitators of the Industrial Workers of the World who demand that the contract system of pay be abolished and flat wages be established. The strike was declared in spite of the fact that recent wage increases amounted to about 8%. If miners do not return to work soon all the underground mines in the Virginia district will be closed by the companies, throwing thousands out of employment.

Copper Production Ceases in Mexico.

The American output of copper will be effected to the extent of 10,000,000 lbs. monthly by reason of the situation in Mexico, the Greene-Cananea mines at Cananea being the last to be shut down. American employees have been taken across the border and the property is under the questionable protection of Carranzista troops. The Moctezuma mine, a Phelps-Dodge holding, with a 4,000,000-lb. monthly production, has also been closed down, these two properties having been outputting close to 10,000,000 lbs. monthly.

Mining is a business that is rich in surprises. Unexpected and difficult situations that tax the manager's ingenuity to overcome them are constantly arising. It is the ability to cope with the unexpected that tests the fitness of a man to direct mining operations. The ways in which difficult problems that have confronted the mining man have been solved are always of interest to other mining men. If you have had unusual experience of this kind write them up; Mining and Engineering World will be glad to publish them. You may be able thereby to save some brother mining man considerable trouble.

PERSONAL.

Walter Harvey Weed is engaged in geological work at Bannack, Mont.

F. T. Hepburn of New York city is at Skagway, Alaska, for the summer.

Amel Mattson has joined the engineering staff of the Winona in the Michigan copper district.

R. C. Wallace, Manitoba provincial geologist, is making an examination of the Rice Lake district.

W. G. Matteson has been appointed geologist for the Empire Gas & Fuel Co., Bartlesville, Okla.

D. Lewers, superintendent of the Florence flotation plant, Goldfield, Nev., has returned from San Francisco.

Erl L. Sproat has become mining engineer for the Moose Mountain Iron Mining Co. at Sellwood, Ontario.

C. H. MacNutt, formerly manager of the Burma Mines Co., India, has resigned and is now in San Francisco, Cal.

A. de-Dekén, Belgian metallurgist and chemist, has returned to his country from a 9 months' visit in the United States.

E. Shaw, metallurgical engineer with the La Leonessa Co., Nicaragua, has resigned and at present is in El Paso, Texas.

Frank Upham, vice-president of the Hecla Co., Wallace, Idaho, and with offices in Los Angeles, Cal., is now in Chicago.

F. A. Knapp, Portland, Ore., manager of the Portoma Mining Co., Wallace, Idaho, has completed a trip of inspection to the property.

P. G. Harrison, superintendent of the National Mines Co., Winnemucca, Nev., is at present in Chicago at the head offices of his company.

Otto Sussman, consulting engineer, New York, and director of the Con. Interstate-Callahan Co., Wallace, Idaho, is now in Spokane, Wash.

President F. W. McNair of the Michigan College of Mines, has returned from a trip to Boston and New York on business for the college.

W. H. Roberts, who lately resigned the superintendency of the Wolverine & Arizona of Bisbee, Ariz., is visiting his early home, Hancock, Mich.

J. A. Force, manager of the Consolidated Mines & Reduction Co., Cripple Creek, Colo., has resigned to devote his entire attention to his private interests.

George H. Garry, engineering geologist for the Tonopah-Belmont Co., Tonopah, Nev., has been inspecting property in the Sheep Creek district, British Columbia.

D. C. Jackling has completed his trip from Seattle, Wash., around Cape Horn with the yacht *Cyprus* and is now in New York, and is expected to leave shortly for Salt Lake City.

E. L. Estabrook has returned from an extensive trip in northern China, where he examined the geology of the country. He is now at Platteville, Wis., as geologist for the Wisconsin Zinc Co.

Harry E. Sparks, recently engineer at the White Pine subsidiary of the Calumet & Hecla, has gone to the Dome Mines Co., Ltd., in the Porcupine district, Ontario, as underground superintendent.

John Barry and John Neyland, this year's graduates of the Montana School of Mines at Butte, are on their way to Tegucigalpa, Honduras, where they have accepted positions with a gold mining company at that place. The mines are located 9 miles from Tegucigalpa and to reach them the

young men will be compelled to travel on horseback for a week after leaving the steamer at Porto Cortez.

Grover Lantz, mining engineer, recently graduated from Stanford University, has been engaged in experimental work at the West End mill, Tonopah, Nev., and has left to be temporarily in Los Angeles, Cal.

A. Sakaguchi and T. Saito, chief engineer and managing director of the Furuwaka Mining Co., Tokio, Japan, have recently been studying mining methods at Bingham, Utah, and are now at Butte, Mont.

C. P. Perin, New York, has left for India by way of London. His mission is relative to the enlargement of the Tata Iron & Steel Co.'s plant at Sakchi, India, and his headquarters while in India will be at Bombay.

H. C. George, formerly chief engineer of the Wisconsin Zinc Co., has been appointed superintendent for the company, which position was recently made vacant when H. S. Snow was transferred to the office of traffic manager.

R. A. Loveland, first lieutenant, and H. W. Clark, sergeant, both mining engineers in the efficiency department; Murdock MacDuff, captain on the Osceola amygdaloid, and A. O. Beck, sergeant, clerk of the electrolytic plant, all of the Calumet & Hecla; J. F. Holmes, corporal; Bernhardt Heine and Meidel Frimodig, students at the Michigan College of Mines, and C. W. Hungerford, sergeant, mining news correspondent, are with Company A, Calumet Engineers, and will shortly go to the Mexican border.

OBITUARY.

John W. Currie, a well-known Utah assayer, died at Salt Lake City May 27. He was born in Salt Lake in 1863 and was engaged in business in that city since coming of age. He was connected in his younger days with F. M. Bishop in assaying and making chemical determinations. Later he engaged, in business for himself. For several years past he has been a member of the firm of J. W. Currie & Co., F. G. Sewell being the other partner.

Harley H. Fate, president of the J. D. Fate Co. of Plymouth, Ohio, manufacturers of the Plymouth gasoline industrial locomotive and a line of clay working machinery, died in the Huron Road Hospital, Cleveland, Ohio, May 27, 1916. Mr. Fate was 42 years old. His death followed a minor operation. Deceased was born in Crestline, Ohio, Feb. 19, 1873, and when 9 years old his father moved to Plymouth, Ohio, where the elder Fate founded the Fate industry, which was the foundation of the J. D. Fate Co. of today, to the presidency of which Harley H. Fate succeeded upon the death of his father in 1902. The business of the J. D. Fate Co. is being conducted by Harry S. Fate, who succeeded his brother as head of the temporary organization; George B. Drennan, secretary-treasurer; H. Ray Sykes, director and acting general manager.

SCHOOLS AND SOCIETIES.

Northwestern University.—A geological field course in the Lake Superior region will be conducted by the Department of Geology in August. The course will be devoted largely to a study of the Pre-Cambrian rocks, with some attention to the Pleistocene history.

Rocky Mountain Coal Mining Institute.—The annual summer meeting of the institute was held in Salt Lake City June 13 to 15. An inspection of coal properties was made June 13. Papers were read as follows: "Safety First," by J. E. Petit, state coal mine inspector for Utah; "Some Notes on Explosives," by F. W. Whiteside, chief engineer for the Victor-American Fuel Co. Officers were elected as follows: A. C. Watts, Utah, president; vice-presidents: J. C. Roberts, Colorado; F. R. Weitzel, New Mexico; A. H. Cowie,

Utah, and W. D. Brennan, Wyoming; F. W. Whiteside, secretary and treasurer.

American Electrochemical Society.—The week of Sept. 25 will be a very important one in the history of chemistry and electrochemistry in America for the Second National Exposition of Chemical Industries will be held in New York all through that week. The American Electrochemical Society will be one of the important national societies which will meet in New York during the same week. Its meetings will be held on Sept. 28, 29 and 30, and the outline of the program has just been announced. It is as follows:

Wednesday, Sept. 27, evening—General reception with registration at the Chemical Exposition, Grand Central Palace.

Thursday, Sept. 28, forenoon—Reading and discussion of papers, general subject, "Made in America"; luncheon. Afternoon—Visiting the exposition. Evening—Complimentary smoker; an invitation will be extended to the members of the American Chemical Society and other visiting chemists and engineers.

Friday, Sept. 29, forenoon—Reading and discussion of papers; luncheon. Afternoon—Visiting the exposition. Evening—Subscription dinner-dance.

Saturday, Sept. 30, forenoon—Reading and discussion of papers; luncheon. Afternoon—Visiting the exposition.

Michigan College of Mines.—The 1916 reunion will be held Aug. 8 to 11 and the following program has been arranged:

Tuesday Afternoon—Addresses (two at most), by the Governor and some distinguished mining man; reception by President and Mrs. McNair.

Tuesday Evening—Nightshirt parade, followed by smoker at the gymnasium.

Wednesday Forenoon—Parade, followed by cafeteria lunch at the gymnasium.

Wednesday Afternoon—Special M. C. M. program, to include addresses by several alumni; business meeting of the Alumni Association.

Wednesday Evening—Class and group dinners.

Thursday Forenoon and Afternoon—Trips about the Copper Country.

Thursday Evening—Informal general party, with dancing.

The following committee has been appointed on speakers: William Kelly, chairman; John W. Black, F. W. McNair, Elton W. Walker, '96, and John Knox, '99.

NEW PUBLICATIONS.

Fuel Briquetting in 1915. By C. E. Leshner. Washington, D. C., U. S. Geol. Surv. Mineral Resources of U. S. II:1; pp. 6.

The manufacture of this class of fuel is still young and little change was noted in the industry during 1915 as compared with 1914.

Fluorspar in 1915, with a Note on Cryolite. By E. F. Burckhard. Washington, D. C., U. S. Geol. Surv. Mineral Resources of U. S. II:6; pp. 9.

In reviewing the situation it is noted that in the last 6 years the production has nearly doubled and imports have been reduced to about 12% of what it was 6 years ago.

Annual Report on the Mineral Production of Canada During 1915. By John McLeish. Ottawa, Ont., Canada, Department of Mines. No. 384; pp. 362.

A general explanation of the methods used for obtaining the data is first given and includes notes on some of the terms used. The production is then reviewed in a general way for the entire Dominion and occupies 33 pages. The remainder of the report is divided into metals, non-metals and structural materials. Under each of these headings the products produced are treated separately and in detail with respect to the various classes into which the material

may be divided and the locality from which it may be produced.

Fuller's Earth in 1915. By J. Middleton. Washington, D. C., U. S. Geol. Surv. Mineral Resources of U. S. II:3; pp. 4.

Its occurrence, uses and production are given. A better condition was noted in the industry during 1915 than in 1914.

Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1915. By James M. Hill. Washington, D. C., U. S. Geol. Surv. Mineral Resources of U. S. I:2; pp. 14.

Conditions and production of the several metal industries with regard to the entire group of states, are first treated separately by metals. The states are then reviewed separately. It is first taken up in general for the entire state and followed by separate reviews of the counties making up the state.

Abstracts of Current Decisions on Mines and Mining. By J. W. Thompson. Washington, D. C., U. S. Bureau of Mines. Bulletin 118; pp. 74. For sale by Mining World Co., 20c.

Omitting the legal text and form, the final results and the justice of the law regarding the case is brought out. Among the general subjects treated are: Minerals and mineral lands; eminent domains; mining terms, corporations and claims; statutes relating to mining operations; mining partnerships, leases and properties; damages for injuries to miners and interstate commerce.

The Feldspars of the New England and Northern Appalachian States. By A. S. Watts. Washington, D. C., U. S. Bureau of Mines. Bulletin 92; pp. 181; illustrated. For sale by Mining World Co., 35c.

The bulletin has not been published entirely for the enlightening of topics for the mine or quarryman only. It is of value in that the manufacturer should know something more than he usually does regarding his raw products in this industry. Besides a description of the occurrence, geology, methods of mining and operations affiliated therewith, the several producing properties are briefly and separately reviewed.

The Inflammability of Illinois Coal Dusts. By J. K. Clement and L. A. Scholl, Jr. Washington, D. C., U. S. Bureau of Mines. Bulletin 102; pp. 74; illustrated. For sale by Mining World Co., 25c.

The subject has been fully covered and the results of much investigating in different fields recorded. In a similar manner to its forerunners this bulletin has analyzed the coal dusts of Illinois. The laboratory equipment is described, as are also the methods of procedure followed in making the tests. Most of the work was done with electrical apparatus. Many tables and curves have been reproduced showing the results of these tests on some of the samples. About 39 pages are devoted to the details of separate samples.

Geology of the Field Map-Area, British Columbia and Alberta. By John A. Allan. Ottawa, Ont., Canada, Department of Mines, Geological Survey. Memoir 55; pp. 312; illustrated.

For the greater part this area, covering the southeast corner of British Columbia and the southwest corner of Alberta, is not of considerable economic importance. There are, however, several districts in which economic deposits are found and these, with the exception of a few copper deposits, are of argentite, galena and sphalerite combined. The ore occurs in the fissures of shear zones in the limestones of all of the Cambrian eras and are stated as being formed by the secondary deposition from solutions. Under the heading of "Economic Geology" the mines and prospects of the country are considered. Though the above is of the greater importance to the mining profession the principal reason for having undertaken this investigation and study was because of the vast and excellent exposure of the Cambrian and other series in this district, and second because of an alkaline intrusive which is found in but few other places in the Rockies.

TRADE PUBLICATIONS.

Continuous Filters Colorado Iron Works Co., Denver, Colo. Pamphlet No. 28-B; pp. 15; illustrated.

The description contained is in the form of an article describing the use and construction of the filter. It is intended to take the place of the filter press in the sliming process. Flow sheets of plants using this type of filter are given with details of the results attainable with it. A list is given in the last pages of the pamphlet showing the different companies using the filter.

Electric Hoists. Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo. Catalog; pp 32; illustrated.

In the introduction it is stated that although several types and special design hoists not listed in this catalog are handled by the company, the catalog will well serve its purpose of bringing before the mining man enough of the various types on which he can base a request for special information. Tables, details and sectional drawings are given, besides a number of illustrations of the different types and descriptions of their unassembled parts.

"National" Mathieson Joint Pipe. National Tube Co., Pittsburgh, Pa. Booklet; pp. 71; illustrated.

This pipe is of the bell and spigot joint type. For some of its more prominent features, uniformity of material, even thickness, true diameter, absence of rivet holes and welds free from slag defects and splits, are noted. The statements are not left by themselves, but are backed with a description of the method of manufacture in which the reasons for being able to supply these qualities are brought out. It is stated that the pipe will stand 200 lbs. pressure when no shocks are apt to occur. With the probable presence of shocks a re-enforcement for the joints has been designed. Besides general discussion and information regarding the use of these pipes, tables of details and specifications are given. By curves the weight of National and cast-iron pipe are compared. The booklet is indexed and over half of its pages show suggestive views of the pipe in the field. Among these is a view showing a reverse curve made with extra fittings.

Ball Mill. The Mine & Smelter Supply Co., Denver, Colo. Booklet; pp. 30; illustrated.

In the first 10 pages the more advantageous points of the Marcy mill are reviewed. This is followed by a detailed account of what duties and results may be attained with the mill and the requirements necessary for such duties and results. It is argued that no secondary crusher is necessary with this type. In most instances the feed recommended is from 3-in. to ½-in. and these may be crushed to as low as 100 mesh. The capacity varies from 25 to 400 tons. As results depend on conditions they here advise that any peculiar situation be taken up with them directly as a special case. The last 15 pages contain a reprint of an article on "Notes on the Practice and Design of Wet-Crushing Ball Mills." Curves have been plotted and the information is in no way bound to the Marcy mill, but is general and will be found of use to all interested in this practice.

INDUSTRIAL AND TRADE NOTES.

The Brown Hoisting Machinery Co., Cleveland, Ohio, has taken an order from the Russian government for six wharf cranes of 30 to 40 tons capacity for installation on the docks at Archangel.

The General Naval Stores Co. of New York advise that hereafter stocks of G. N. S. flotation oils will be carried in Denver and that the company will be in position to fill orders from that point within the next 30 days. John D. Davis, with office at 1550 Glenarm street, Denver, is the company's Colorado representative. This move on the part

of the General Naval Stores Co. will be greatly appreciated, as it will permit of more prompt deliveries to western customers.

The Black Prince tungsten mill, near Boulder, Colo., recently completed and put in operation by the Denver Quartz Mill & Crusher Co. for John T. Duncan is to have an additional unit added, the necessary equipment having been ordered from the Quartz Mill Co. for delivery July 15, and when in operation will increase the capacity of the Black Prince mill to 75 tons per day.

The Metals Production Equipment Co., successor to the Quigley Furnace & Foundry Co. of Springfield, Mass., has opened an office at 530 First National Bank building, Chicago, with Earl E. Adams as western representative. This organization has long made a specialty of pulverized coal installations, such as those which have recently been brought into prominence in the mining field at the plants of the Anaconda Copper Mining Co., Canadian Copper Co. and elsewhere. The company also handles accurate temperature, heat treating and forge furnaces for oil, coal and gas fuel, as well as brass rolling mill products and gray iron castings. Mr. Adams is widely known in the mining field through his connection with the Power & Mining Machinery Co. and other similar organizations, and our readers will be interested to know of his new connection.

PATENTS RELATING TO MINING.

Miner's Tool. Ole Hanson, Lead, S. D. (1,184,746; filed March 17, 1914.)

Miner's Electric Lamp. Angelo Toler, Berwind, Colo. (1,186,454; filed April 24, 1915.)

Safety Device for Mine Chutes. John F. Hume, Redding, Cal. (1,184,958; filed Jan. 10, 1916.)

Mine Loading Machinery. Frank Billings, Cleveland, Ohio. (1,185,050; filed May 1, 1911.)

Miner's Pick. John W. Shallenberger, Canal Fulton, Ohio. (1,186,343; filed Feb. 13, 1915.)

Electrochemical Amalgamator. Samuel S. Rose, San Jose, Cal. (1,186,335; filed March 25, 1915.)

Electrochemical Apparatus. Clarence P. Landreth, Philadelphia, Pa. (1,186,106; filed Oct. 14, 1914.)

Process of Extracting Metals from Their Ores. William E. Greenawalt, Denver, Colo. (1,186,306; filed May 7, 1912.)

Process of Treating Petroleum Residues. Charles S. Palmer, Upper Montclair, N. J. (1,187,380; filed March 2, 1907.)

Metallurgical Furnace. George L. Danforth, Jr., and Samuel Naismith, South Chicago, Ill. (1,185,290; filed Jan. 24, 1916.)

Process of Preparing Pure Zinc Sulphide Solution from Zinc Ores. Shunjiro Araki, Osaka, Japan. (1,185,757; filed Sept. 6, 1913.)

Compressor. Bernhard Krämer, Charlottenburg, Germany, assignor to General Electric Co., New York. (1,185,412; filed July 29, 1913.)

Process for the Treatment of Sulphuric Acid Residues. John S. Blowski and Alfred A. Blowski, Oakland, Cal. (1,186,373; filed Jan. 30, 1915.)

Mining Machine. Albert Ball, Claremont, N. H., assignor, by mesne assignments, to Sullivan Machinery Co., Boston, Mass. (1,185,277; filed Oct. 9, 1906.)

Treatment of Ores. Frederic A. Eustis, Milton, Mass., and Charles Page Perin, New York, N. Y., assignors to Moa Bay Iron Co. (1,185,187; filed Dec. 27, 1915.)

Art of Refining Kaolin and Similar Clays for Use in Making Pottery and Like Products. William W. Simonson, Cincinnati, Ohio. (1,185,254; filed Oct. 20, 1915.)

Concentrator. Charles F. Paige, Oakland, Cal., assignor of one-third to Adolph W. Jones and one-sixth to Harry B. De Mooy, Oakland, Cal. (1,185,129; filed July 8, 1915.)

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Knik.

The right of way has been cleared from Matanuska Junction to Moose creek, and from here about 90% of the distance to King's river has been cleared. The right of way is 100 ft. wide on an average and a good wagon road has been completed beside it. A road is also being run north along the course of the main line from the junction to station 5280. An idea of the magnitude of the work under way may be gathered from the commission's last pay roll. The 1463 names on this roll are divided among the different heads of the departments—440 men are under contract; there are 121 station laborers, making a total of 2024 men. In addition to this there are 206 horses being used in various government work in this connection.

Harry Challstrop and associates have 36 quartz claims on Knik river, and development work is showing good ground. They will drive a tunnel this summer. The development work already done gives them cause for further work. The original lead was found last summer by Carlson and Anderson, who were in a party of contractors doing station work for the commission. Assays of fair samples show an average value of \$24, but the owners expect bigger values when they tap the contact. Several parties have visited the property lately with the view of buying; but no deal has yet been made.

Arthur D. Jett of Sunrise is making drill tests of his placer ground on Six-Mile creek. He is operating one drill at the present time. If the future developments prove as he expects, he will put in more drills. Jett is using a drill manufactured by the Union Construction Co., San Francisco, with some additional features that are improvements of his own and particularly adapted for the drilling of this ground.

Nome.

Spring weather is only just commencing here. The creeks are unusually dry and Bering straits is almost a mass of ice.

A report from the Marshall City district states that Jensen and Madsen have discovered good pay, insuring mining operations in that camp for some time to come. Of late the district has been changed to Fortuna Ledge. Dime creek is showing up fair and there is a small movement of prospectors to that district. Walter Johnson, representing the Union Construction Co., has taken over the Crim-Randt-O'Brien tin property at Lost river, and plans extensive development this season. The purchase price was \$300,000.

Many Iditarod operators are going to Willow creek, a tributary of Kuskokwim river. Tom Aitken was among the original locators of the ground, which is said to have evidence of a fair future.

ARIZONA.

Bisbee.

The Copper Queen Copper Co. has completed its tests by table, vanner and flotation concentration in the mill built for this purpose some time ago. The ores treated were mostly chalcocite and bornite from the locality known as Sacramento hill. The tests demonstrated that satisfactory recoveries could be made by the methods adopted, by concentrating in the ratio of 4 to 1. They also showed an ex-

treme range of values of the ores taken for test. Coarse crushing was followed by concentration over Butchart roughing tables, using Senn vanners for the slimes. The material was then reground in Hardinge mills for the oil flotation machines, consisting of Callow's and Rork's. The one most used was a modified Rork. Of the saving made, 85% was taken from the roughing tables and vanners, 15% being extracted by flotation. While no definite announcement is made by the company as to the construction of concentration mill, it is understood that future plans contemplate doing so. Gerald Sherman, general superintendent, states that when a decision for building a mill is made it will be designed for about 3000 tons capacity.

The Shattuck mine is shipping 550 tons per day of oxidized ore, running 5% copper, to the Calumet & Arizona smelters, Douglas. Special high-grade sulphide ore sampling 30% copper and amounting to 600 to 1000 tons per month, is shipped to the same smelters. Another feature of Shattuck production consists of carbonates and sulphates of lead, occurring partly as separate bodies and in other places on top of the copper bodies, making it practicable to mine it separately. Shipments of these lead ores to El Paso amount to 3 cars per week. A recent car shipment sampled 21% lead, \$2.50 gold and 3 to 4 ozs. silver. The general run of copper ore contains about 2 ozs. silver and 60 cts. gold. The workings have reached a depth of 900 ft., there being nine working levels. The high-grade copper sulphides and the lead ores are taken from the 300, 400, 500 and 600 levels. The mine is producing 1,300,000 lbs. copper per month. Those responsible for the operations are: L. C. Shattuck, general manager; Arthur Houle, superintendent; R. R. Belknap, chief engineer.

Wolverine & Arizona Mining Co. has placed Marc Bailey in charge as superintendent. He is outlining a plan for development. This group is in the southwest part of the district, adjoining properties of Calumet & Arizona, Copper Queen and Shattuck, and is controlled by Michigan people. Bailey formerly was with the Shattuck.

Higgins mine, taken over last February by Thos. Higgins, Los Angeles, is being further developed, and is a regular shipper of ore. June shipments amounted to 2000 tons. There is a wide range of values in the ore. It is a sulphide and runs 3 to 40% copper. Development is mainly from a 2300-ft. tunnel, although a shaft, now at 300 ft. depth, is being sunk. The intention is to put an electric hoist in position. J. J. Flanigan is superintendent.

Tombstone.

Bunker Hill Mines Co., a Phelps-Dodge organization, which took over the Consolidated mines at Tombstone some time ago, is mining ore on the several levels between the surface and the 600-ft. station. The main shaft is 1000 ft. deep, the present water level being at 675 ft. Sufficient water is being pumped for mill work only. The hoist is being operated by compressed air, a Nordberg compressor of 4000 cu. ft. capacity being used for this purpose. The 15-stamp mill is handling 75 tons of ore per day; one more 5-stamp battery will soon be in use. The ore is crushed in cyanide solution, the pulp passing from batteries over Wilfley tables, which take up a lead concentrate. The material is then classified, the sands passing to percolation tanks, the slimes to Parral tanks, the slimes then being washed through Oliver filters. The ore contains gold, silver, lead, zinc and iron-manganese. The mines also produce manganese-dioxide ore, of which about 150 tons per day are concentrated separately. An analysis of these ores shows a content of 25 to 30% metallic manganese, 20% lime, 18% silica, 8 to 12 ozs. silver and 0.4% copper. The concentrates produced are mar-

keted in the east. The manganese mill tailings are shipped to the Copper Queen smelter, where they are used as a flux. A small tonnage of crude ore, running 43% manganese, is shipped without concentrating to steel works in the east. Most of the ore cyanided, as heretofore mentioned, is made up of oxides and carbonates. There are some sulphide ores, however, and these are milled separately, the slime therefrom being concentrated over a Senn pan-motion vanner, which makes a good saving and has large capacity. The different phases of mill work herein indicated are in the nature of experiments, evidently designed to make determinations on which to base future operations on a larger scale. E. Grebe is manager; J. Davis, mining engineer, W. F. Tindall, metallurgist and mill superintendent.

Oatman.

The Oatman mining district continues to be the center of attraction. During the past week the Black Range Co. opened a considerable body of commercial ore on the 300 level. Drifting operations through the week are reported to have been in ore varying from \$18 to \$30 average values, these values secured from sampling across the entire face of the drift. Drifting continues in ore, and it is said that the values are slowly increasing.

Big Jim has enlarged its working crew. Drifts are being run on both the 400 and 485 levels. On the new 485 level the drift to the east is said to be in solid ore. This drift has nearly entered the rich ore shoot opened on the 400 level. Such a rapid increase in values on the 485 level prevail that the operators believe that higher values will be found on this level than on the 400 level to date.

The Pioneer reports notable developments on its 400 level. This property is controlled by Keith & Keith of Boston, and an energetic development campaign is under way. It is reported that in the south drift a body of ore averaging about \$20 has been opened for a length of 35 ft., and is 8 ft. in width. After extensive sampling of the ore bodies in the old workings of the Pioneer, the officials of the company claim that much more than 500,000 tons of mill-grade ore is now blocked out, and that more ore is rapidly being placed in sight. A mill is now in contemplation for this property.

In the United Eastern, work of blocking out ore continues, and the concrete foundation work for the 200-ton mill will soon be completed.

Persistent rumor continues that a find of ore has been made on the new 1400 level of the Tom Reed. Ellis Mallery has started on the work of preparing a complete geological map of the holdings. The annual report of the Tom Reed Co. for the year ending March 31 shows that 5718 ft. of work was done and that 29,916 tons of ore was milled, the average value of this ore being \$22.12, the extraction being 98.6%. The total was \$661,870.68, against an average of \$739,690.21 for the preceding 7 years. The total production to date has been \$5,833,702.17. Dividends paid during the year amounted to \$163,719.90, or 18% on the par value of the outstanding stock. It was estimated that 11,000 tons of ore were blocked out in stopes at the end of the year. Net earnings for the year, \$170,577.98, as compared with \$548,846.15 for the previous year. Income from other sources than mining totaled \$32,580.76, making total earnings slightly above \$200,000, or about 28% on issued capitalization. Mining and milling costs averaged \$11.21, a higher rate than ever before. This is accounted for by increased cost of labor and materials, and a more extensive development campaign.

The crosscut on the 500 level of the Ivanhoe appears to have penetrated the quartz porphyry dike which was entered some 10 days ago, the character of the rock now being extremely good, the gold values carried by much of it seeming to indicate that the vein has been entered on the foot-wall side. The operators estimate the vein to be 30 to 40 ft. in thickness, and have also expressed the belief that the highest values would be found on the hanging-wall side.

The Boundary Cone is drifting in low-grade ore to the north and to the south on the 750 level, and as the downward extensions of the ore shoot opened on the 550 level are neared slowly increasing values are reported.

Work is now being rapidly prosecuted on the Adams property, and the shaft is down about 90 ft. The success of the Black Range has greatly stimulated work on the Adams,

Nellie, Oatman Syndicate, Murdock, Green Quartz and other properties in the Black Range section.

The shaft on the Argo has now attained a depth of 640 ft., and the operators will probably carry it to the 700 point before doing further lateral work.

James C. Ray has just completed a geological survey of the Esperanza Mining Co. ground. This is the most complete geological survey which has ever been made of any property in the district, and is an exhaustive study of the geology, petrology and mineralogy of the southern section of the field.

Etienne A. Ritter has made an extensive study of the Oatman district, and in commenting upon the conditions prevailing there said, in part: "It is my belief that the Oatman district is destined to become one of the greatest gold producing districts in the United States. I believe that time will prove that the Oatman district, like Cripple Creek district, will develop a large number of heavy producers covering a very wide area of territory, rather than being a camp of two or three mines lying along one ledge. Oatman is a deep-mining district, shafts must average from 400 to 600 ft. before lateral work is started. When laterals are started they must, as a rule, be driven some considerable distance to pick up the mineral-bearing veins, and then, as a rule, considerable lateral work must be done in the vein before ore is discovered. Mineral-bearing veins of great lateral extent do not contain rich ore deposits throughout their entire length. Much vertical and lateral development must be done before pay ore in large quantities is found. Every foot of additional development work in the Oatman district brings success nearer. Therefore, in my opinion, the public should continue to have faith in the Oatman district, and those who are interested in the development of various well-located properties there should continue to manifest their faith if only by refusing to part with Oatman securities they hold prior to the time when extensive work should have proved whether or not the various properties are of genuine merit. It is my belief that those people who have faith in the Oatman district, and who are content to await and give the district time will eventually enjoy very large rewards for their confidence."

The officials of the Iowa Mining Co. have recently made an extensive investigation of their property, accompanied by their engineer, Carl O. Lindberg. The retimbering of the old 300-ft. shaft has been completed, and an active development campaign has now been started along the lines proposed. This property has quite a tonnage of ore of low-mill grade blocked out in old workings, but a depth of 500 to 600 ft. will be attained before further lateral work is done.

With its machinery equipment all in operation, shaft sinking on the property of the Oatman United Co. is being rushed night and day. The company has its own electric light plant, and is endeavoring to set a record driving its shaft to the 500 point. Charles S. Sprague, president of the Jumbo Extension Co., is president of the Oatman United, and he has retained J. K. Turner as consulting engineer.

The station on the 350 level of the Lucky Boy is completed and the operators are just starting to crosscut to their vein. Intense silification of the country rock and high gold values found in many stringers cause the operators to feel highly optimistic regarding the outcome of their development work.

CALIFORNIA.

Goldstone.

This new camp, 33 miles northeast of Barstow, is attracting great interest, following several rich strikes of free-milling gold quartz. High-grade ore is being taken from the Goldstone, Red Bridge and Lucky Find properties. None of the claims has been opened to a greater depth than 50 ft. On the Red Bridge a strong shoot of free-milling ore has been opened on surface for a length of 250 ft. As far as work has advanced the ore is free milling and of excellent character. The formation consists of shale, schist and

quartzite, with the dikes and flows composed of igneous rocks. The richest ore is found in the contact, particularly in the schist. Scores of claims have been located and are undergoing development.

Atolia.

Independent producers continue to receive \$45 to \$50 per unit for their tungsten ore, and buyers are again showing interest. The Atolia Co., said to be controlled by the Schwab interests, is still restricting production, but it is generally believed large blocks of the company's ground will be opened to lessees before the end of July. Many of the business houses here are accepting high-grade ore as a medium of exchange.

Sutter Creek.

The Old Eureka Mining Co. has purchased the Wildman-Mahoney-Lincoln group of gold mines for \$205,000. The first payment of \$41,000 has been made and preliminary work started. The property adjoins the Old Eureka mine and it is reported the two may be consolidated and worked from a central shaft.

Unwatering of the Old Eureka shaft has begun with three electric pumps. A 6-in. stream of water is thrown from the shaft and at the present rate of progress the upper workings will soon be open to prospecting. Construction of a steel headframe will soon start, a wooden temporary hoist being now employed.

Jamestown.

The Bacigalupi group of claims has been taken under bond by the Pittsburg-Silver Peak Co. from H. C. Garner and James Diamond. Sinking of a 300-ft. shaft has commenced and from the lower level crosscuts are to be driven to reach the ore body which yielded good ore in old workings. Some good ore is already showing and a pump has been installed. The company is prosecuting extensive work at the Rawhide mine and is constantly adding new equipment to the mine plant.

Tungsten City.

The concentrating mill of the Standard Co. was placed in operation last week and is turning out 72 units of tungsten concentrates daily, valued at \$33 per unit. Developments in the Aeroplane claim continues to uncover good ore and the management is planning the early construction of a tramway from the claim to the mill, at an estimated cost of \$25,000.

Yreka.

Several chrome prospects are being worked in this vicinity. Ore assaying 40 to 45% chrome is exposed at some points, and plans are being made for early shipments. In an old shaft on the Farrish mine, operated by William A. Farrish, Jr., a strong ore body averaging 42% chrome has been exposed and a small force is at work blocking out shipping material.

Redding.

At the annual meeting of the Delta Con. Mines Co. Dr. Sherman T. White was re-elected president and S. D. Furber, secretary and manager. The installation of a 50-ton mill was authorized, including cyanide equipment. The mine lies in the Dog Creek district, near Delta, and is owned by middle west people. Sufficient ore is stated to be exposed to keep the mill running for many months.

The Mammoth Copper Co. is shipping 3 carloads of zinc ore per day to Kansas smelters from its Kennett properties. Much of the ore is high grade. The Kennett smelter is turning out approximately 1,750,000 lbs. of blister copper per month. About 1200 men are on the payroll and an immense amount of new work is going on at the Mammoth, Friday-Lowden, Stowell and Spread Eagle mines.

Rich gravel is being worked on Clear creek, 3 miles southwest of Redding, by the Gardella Dredging Co. Three cleanups have been made in the past 4 weeks and the gravel is averaging 25 to 30 cts. per cubic yard.

Graniteville.

A large compressor has been installed at the Anchu mine and developments with machine drills are progressing on ore of good grade. Considerable new ground has been recently added to the productive area and the management states the property is in the best condition since its discovery. Eastern people are interested. George Mainhart is superintendent.

COLORADO.

Cripple Creek.

A good find was made by the Colonial Mines & Investment Co., now leasing on ground of Stratton's Cripple Creek Co. at Womack hill. A tunnel was being driven towards the El Paso Gold Ring property when a 4½-ft. vein was encountered. Grab samples from the face assayed \$8. This cross-cut tunnel is making for the Reno vein and until it is reached the new find will remain untouched. It is thought to be an extension of one of the C. O. D. leads. The deepest workings from the former Reno shaft were 150 ft. down and the present tunnel will attain a depth of 225 ft. The tunnel is known as the Reno. It starts from the west slope of Poverty gulch and is in 500 ft. Track has been laid to the breast of the tunnel. An air line has been carried over Womack hill, from the compressor plant at the Abe Lincoln mine in Poverty gulch, and is now furnishing air for the machine drills. An electrically driven fan has been installed to ventilate the tunnel workings. No mine buildings have been erected to date, and none are necessary at this time, but an ore house has been planned and will be constructed at the portal of the tunnel, in Poverty gulch, a short haul to the Abe Lincoln loading station of the Midland Terminal and Short Line railroad.

On the Shoo Fly property, also on Womack hill and adjoining the above mentioned Stratton ground, H. M. Gilbert has made a find. He started a crosscut west from the bottom of the 110-ft. shaft. His idea was to open up the source of surface ores, underground. Driving west 30 ft., the formation changed to a sulphide, and values commenced to come in. Gilbert then started a raise into the oxidized zone still heading westward, and at a point 10 ft. farther west and 20 ft. above the level, the vein was entered. Grab samples ran \$28.60 and \$52.60 to the ton, and the ore was hoisted to surface and into the bins. Recent mine samples taken after shooting would indicate that the shoot has only been entered on its edge, for the string of colors in the pan was a good one with the gold, both rusty and bright yellow, showing up coarse. Some colors as large as a big pinhead were noted.

The Laura Lee Mining & Leasing Co. has equipped the main shaft, now 164 ft. deep, with a mine plant, including an electric hoist and compressor. General Manager Al Pierce is now engaged in sinking the main shaft an additional 136 ft., to a total depth of 300 ft. A station will be cut when this depth is attained and laterals carried to exploit the property. It is confidently expected an ore body will be entered. On the Mishey lease from the 120 level to surface sampling old workings in the main vein has revealed \$20 ore.

Work of sinking a 1200-ft. shaft on the Happy Year group has been commenced by the War Eagle Con. Co. The property is on the west slope of Bull and Raven hills. In preparation for this work a 6-drill compressor specially constructed by the Chicago Pneumatic Tool Co. has been installed at the War Eagle shaft house. An air line 1200 ft. in length has been carried over to the Happy Year. By preliminary work with hand steel the new shaft has been sunk 22 ft. The shaft, with three compartments for the manway, skipway and counterbalance, is to be sunk 8 by 8 ft. in the clear and will be square set with Oregon fir. Stations are to be cut 150 ft. apart, so that 8 levels will be turned in the 1200-ft. No lateral work will be attempted from the new shaft until a depth of at least 500 ft. is attained, and then sinking operations will be continuous. The old shaft on the Happy Year mine, abandoned by reason of its caved condition, is accredited with a production of \$40,000 from between the 200 and 400 levels. Development work is also under way at the War Eagle shaft, where thorough exploitation of this territory is in progress.

Leadville.

The Down Town Mines Co. has completed its drainage work through the Penrose shaft by reaching the 874-ft. mark. Dewatering the Down Town basin was the first of this class of work undertaken with electric power. Following the installing of the station pumping plant, mining will be taken

up in earnest. Work in the upper levels has been under way for some time, and all of the big drifts are now in shape for permanent development. Pumping equipment for installation at the bottom level has arrived. It consists of a large 4-stage centrifugal pump, with a capacity of 3000 gals. per minute against a 90-ft. head. It was manufactured by the Providence Machine Manufacturing Co., Providence, the firm that turned out all of the pumps now being used at the Penrose. A 650-hp. motor will propel the pump. This type of motor was patented by the General Electric Co. in June, 1915. The work of enlarging the station will be taken up, as it is necessary to add 8 ft. to the height of the level before installing the motor. This is to allow the greatest possible distance between the motor and the water level, so that in case of accident a relief system of pumping can be put into operation before the water reaches the motor. The station is now 16 ft. high. The flow of water being encountered in the sump is estimated to be about 1700 gals. per minute. One sinking pump, with a capacity of 1500 gals., can almost hold the water in check, so it is believed the station machine which will throw 2000 gals. will have no trouble keeping the property drained.

GEORGIA.

Dahlonega.

The Wallace mine has been dewatered by Findley & Co. and the underground workings are being sampled. One shot broke about 500 lbs. of ore that yielded two pans of specimens showing gold. The vein is larger and better than has been reported. The company is putting in an air line and hoist and will work on an extensive scale as soon as the equipment is installed. The ore will be milled at Crown Mountain mill.

A 10-ton test run is being made at the Tonson mill. The pulp passes over the plates then over a Wilfly table. They will save the concentrates and the tailings, to determine the proper treatment for this ore, which is sulphides. They are also roasting 10 tons and giving it the same treatment to find out if roasting will free the sulphides. There is a large amount of ore on the dump which shows free gold and assays \$10 to \$40. This will be milled as soon as proper treatment is decided on.

IDAHO.

Wallace.

A deal has been closed recently by Frank C. Bailey, secretary of the Spokane Mining Men's Club, and associates to purchase 152,500 shares of the treasury stock of the Vienna-International Mining Co., and they also have taken an option for 2 years on 600,000 shares of the issued capitalization, giving them control of the corporation. Bailey announces that work on the property, adjoining the holdings of the Placer Creek Mining Co., recently taken under lease and bond by him and his associates, will be resumed in a few days, after an idleness of several years. Development plans contemplate unwatering the shaft and drifting for 200 ft., on the 400 level. A shaft then will be sunk 500 ft. and drifting begun at that point. "The property is on Placer creek, 6 miles from Wallace," said Mr. Bailey. "It has been idle since the big forest fire of August, 1910, destroyed its surface improvements and machinery equipment. The property includes three patented claims and three more held by location, besides millsite, townsite and a fine water right. Its best ore showing is in the workings connecting with the No. 3 tunnel level. There is a fine shoot of galena ore carrying considerable iron opened up on the tunnel level, in an upraise to the No. 2 tunnel 90 ft. long, which is in ore all the way, and in the winze sunk to the 400 level, which follows the ore down nearly to the bottom. The paystreak is 3 ft. wide, and of shipping grade. The officers of the company are: President, F. V. Phinney, who has been the company's engineer ever since its inception; secretary-treasurer, Robert A. Marshall; directors in addition, A. B. Livingstone,

W. B. Lively and David Rosenbaum, Robert, Mack, who will be superintendent of the mine, and Bailey will be added to the board of directors at their next meeting, who will also be general manager of the company."

Immediately on being advised of the two attachment suits brought at Wallace against the Marsh Mining Co. on two notes for \$10,000 each by Charles L. Cowell and B. F. Plummer, former directors of the company, W. T. Smith of Duluth, Minn., the recently elected treasurer of the company, wired Vice-President Edward Pohlman that he would personally pay both notes, taking the same security which had been arranged with Mr. Cowell. "The matter will be adjusted in a few days," said Mr. Pohlman, "and will only emphasize the interest taken by the Duluth directors in the affairs of the company and will finally end all connection between the company and its former Missoula directors."

Mackay.

The Copper Basin Mining Co., situated in Copper basin, 23 miles from Mackay, has 4000 tons of high-grade copper ores ready for shipment. They have signed a contract with Kirschners to transport this ore to Mackay with auto trucks, of which he now has on the ground six with seven trailers. Each truck with trailer hauls 10 tons, making 60 tons to each trip.

The Idaho Improvement Co. sold to Gilbert and Bullard of Bingham, Utah, a lead-silver property, situated in Antelope mining district, about 32 miles from Mackay. This property has produced something like \$30,000 worth of ores. Gilbert and Bullard have started work and expect to push the present shaft down another 200 ft., when they state they expect to encounter some very high-grade lead-silver ore. This property was formerly known as the Weiler lead belt property.

The company has also sold to Utah parties the Canaday group, adjoining the Empire Copper Co.'s mines. This is a lead-silver property. This property is shipping a car of ore a day, which the owner states is netting him \$1000. The purchasers state that they can produce 150 tons per day from the start and that with the showing in sight, within 2 months' time they will be able to produce 300 tons at least. This property is 3 miles from Mackay.

The Empire Copper Co. has been producing about 300 tons of copper ore per day. This property is worked by the leasing system and the leasers and company together are producing more ore than the smelter will take on their present contract. This property is located 3 miles from Mackay. The company has dropped down and are now driving a long tunnel underneath all the ore bodies. This tunnel is now in something like 5400 ft. and they have cut two or three veins of a very high-grade, lead-silver ore. This tunnel, when completed, will tap the ore bodies at a depth of over 2000 ft.

The mining district adjoining and around Mackay is just now coming into its own, and prospecting is just starting; new strikes are being reported each and every day and many of the old properties are changing hands, both on cash sales and under bond and lease.

LAKE SUPERIOR.

COPPER.

Houghton.

New Arcadian will hole up to the surface from the new lode, which is thought by many to be the Old Arcadian, and an exploratory shaft started so that this lode can be mined with ease from the 50 level, where it was discovered by the crosscut from the exploratory shaft 1800 ft. south of the first shaft. The drift is so long—265 ft., and quite small, and the distance so slight to the surface—that the shaft will much facilitate the work of exploration. The little that has been opened by drifts on this lode is just as good as where revealed by the crosscut, and the copper is certainly plentiful. The sinking from the 1250, the bottom level, has been begun.

Tremont-Devon has in its third diamond drill hole, the Forrest lode, on which is located the Victoria mine, with 9

ft. of excellent stamp copper, that is far above the average amygdaloid of the district. In this hole the Devon lode, which is just above the Forrest, did not display commercial values. W. M. Gibson, who has had charge of the work here, states that directors feel that with this showing and that of the first hole where there was 11 ft. of good stamp rock grades, calls for further exploration. It is thought that in 2 or 3 months when the directors will take this matter up, that an effort will be made to induce capitalists to take the property over and explore its resources. Few properties in the Copper Country have so much promise in their preliminary diamond drill explorations, and it is probable that one of these lodes at least will prove profitable when it is sufficiently opened to disclose its average mineralization.

Carp Lake will now be thoroughly explored, as Jerry Rourke, the mining engineer, has enlarged his force to 18, and will trench over stratum and break into the cliffs where it is exposed.

Ahmeek has received the mortar block for its two remaining stamps, and also the jigs for the 7th stamp's wash and the stamp will be, unless delays occurs from unforeseen cause, in commission in about 10 days. This addition will mean about 700 tons more daily, and about 4900 tons daily for the seven stamps. It will be difficult to state when the 8th will be ready, as it will have to wait for its jigs, but it is safe to say the delay will not be long.

Contact has passed through Wyandot lode No. 8 at the depth of 1053 ft. in its 5th hole in the recent work, which is No. 21 in the total diamond drilling up to date. The vein is of the same good amygdaloidal character as in the previous holes on this lode, and the formations have been found to be most regular in their occurrence, both as to sequence and thickness, but nothing has yet been given out as to the mineral values.

Trimountain is sinking at No. 4 shaft and is below the 25th level; No. 2 is down to the 24th; No. 2 has been bottomed at the 27th for a long time. No. 2 is the southernmost shaft, as No. 1 was discontinued 4 years ago, because the distance between the shafts was so small, and the expense of sinking a shaft is quite large. As fast as either Nos. 3 or 4 reach new levels, drifts are driven to the other and to No. 2, so as to open up the ground for stoping. No. 4 has always had good ground, also Nos. 3 and 4 from the 19th level down, as has been shown by the good increase in refined copper. This mine, which is in lower grade copper than the Champion and Baltic, is increasing also its production, since the stoping is becoming greater in this new ground. The prospects for the future at this mine look very bright. There is no construction work of any great cost planned out for the future.

Wyandot's mill test is showing much better values than was anticipated and the figures are running high. Some specimens that have come from the 9th, the bottom level, are certainly very rich. These results will undoubtedly enthrall the management so that they will give the lode the most thorough exploration, both laterally and vertically. The rock is rather deceptive and when mined and on the stockpile does not show its real values.

White Pine Extension has been sinking its shaft for about 3 weeks, having discontinued this work for a time in order to complete its shafthouse. Capt. Edward Roscolla, formerly captain at the Adventure, Allouez and other properties, has accepted the same position here, and William Pollard, recently of the Wolverine, has been made master mechanic.

Isle Royale has reached the 31st level with its No. 2 shaft and is now cutting a plat there for the purpose of running a crosscut to the Portage lode, about 150 ft. to the west, when desired. There is no copper under the fault which intercepts the lode at the 29th level, but the shaft is very convenient for the mining of the Portage lode, which carries about the same average values as the Isle Royale lode, there being considerably more mass copper of different sizes, and less stamp grades. The Portage lode thus takes the place of the Isle Royale and gives good copper ground up to the northern boundary.

Houghton Copper is getting better paying values in the

northern drift on the 12th level. The crosscut driven to find the West vein that has such high grades on the Superior, is about 115 ft. in from the winze, and is still in trap, though it is thought that some favorable changes are now occurring. The crosscut to the lode on the 4th level, a distance of almost 300 ft., has just been begun. The southern drift here was rather poor, but it is thought that the northern is entering the good ground passed through in the winze.

IRON.

Virginia.

In view of the propagation of a strike at the underground mines on this range, W. J. Alcott, president of the Oliver Iron Mining Co., said that unless the miners' strike being promoted on the Mesaba range is called off within the next few days, the company will close down all operations at its underground mines indefinitely. There was a voluntary raise made by the company on Feb. 1 and May 1, 1916, so that the miners are now receiving \$3.50 per day.

Ishpeming.

The old Lake Angeline mine, lately acquired by the Cleveland-Cliffs Co., has been given a higher value by the assessors of the state tax commission. At present the mine is not being operated, because the market for the high-grade of ore contained in this deposit is too low.

At the Holmes mine a new ore crusher will soon be in position. Work at the property, the newest in the Ishpeming field, is progressing rapidly. The shaft is down 430 ft. The ore body lies at a considerable depth below this and it will therefore be some time before the body can be put in shape for production.

John Marsch has a contract for and has commenced stripping on the property of the Antoine Ore Co. This is the second contract which has been let by the company. The contract is for the removal of 50,000 cu. yds., making a total of 100,000. The new contract is a continuation east of the present workings and will extend beyond the Cornell open pit, to the banks of Lake Antoine. Marsch will finish his contract at the Indiana mine within the next 10 days. It is rumored that this contract may also be enlarged. The Indiana is mining ore, but as yet is not shipping.

MISSOURI-KANSAS.

Joplin, Mo.

Last week saw the greatest flood the mining district has ever experienced, flooding the mines, washing out bridges, roads, railroads, and destroyed practically three-quarters of the telephone connections of the entire mining district. Several plants suffered from the storm, while a number of plants were struck by lightning and two were consumed by fire. The damage was especially severe in and around Joplin, although the whole district was involved. All streams overflowed their banks and the stream valleys having mines were inundated, filling the shafts to the top, especially along Turkey creek, Center creek and Spring river and their smaller tributaries. It is estimated that about one-third of the mines were put out of commission during the earlier portion of the week. Since the recession of the waters repairs have been made and many of the properties are once more getting back to their usual producing stage.

The hoistmen's strike seems to be gradually dissolving itself into a victory for the mine operators. The decision of the operators to hire new men or train new men for positions rather than meet the demands of the strikers has resulted in fairly good working conditions. Those mines that were down are gradually resuming operation. It is reported that some of the hoistmen who belong to the union have returned to their jobs, accepting the old scale. It is believed that no mine which has been down on account of the strike will be idle during the coming week, unless it is idle on account of being drowned out by the recent flood. So far as can be learned, only one mine in the entire district has met the demand of the Hoistmen's union.

The Wahpahshosah Lead & Zinc Co. has been organized in Joplin and will operate on the sheet ground proposition

west of Joplin. The company has thoroughly drilled a 40-acre tract and has found a fair uniform sheet ground deposit running from 2 to 3% zinc and lead. The company plans the erection of a large 500-ton concentrating plant, and is pushing development of the property as rapidly as possible. Those interested in the company are: J. M. Short, Geo. W. Short, Roy Morrison and A. D. Deshong, all of Joplin, and H. A. Moore of Louisville, Ky.

The mining and milling equipment of the Gibson mine has increased very materially—sinking a new shaft, building two new hoppers, tramway and overhauling the mill. The plant capacity has been increased to 800 tons per shift. Electric hoists have been replaced with first-motion steam hoists, and the underground track system has been revised and extended to its capacity. The Gibson mine on the Metzler land in the west Joplin sheet ground district is one of the larger developed properties in that part of the field. Barber Gibson of Webb City is the general manager.

The Wade Mining Co. has taken a lease on the 120 acres of the Wade land southeast of Joplin, after developing a mine it has started the erection of a concentrating plant. The mill from the Emperor mine at Central City was purchased, and is now being reconstructed on the new lease. The company has a 45-ft. face of ore at the 90 level and expects to recover from 4 to 5%.

At Greenfield, in Dade county, some small operators who have been producing silicate ores and cleaning their ores upon hand jigs have decided to organize a co-operative milling company to handle all of their ores. Owing to the peculiar character of the ore it has been possible to clean it on hand-jigs and make a first-class concentrate; therefore, the prices paid for their ores has not measured up to the prices paid in other camps. The new organization will probably erect a new plant within the next 60 days.

Webb City.

F. C. Wallower has under construction two concentrating plants. The Cumberland No. 1 plant is in Prosperity camp and is being rebuilt to replace one recently destroyed by fire. The erection of this plant has been in record-time, and, barring failure of delivery of machinery, the plant will be completed within 40 days' time. The No. 2 plant was located on a tract of the Zinc Corporation's lease at Webb City, and will be one of the largest milling plants in the district. This plant will be ready to start operations within the next 10 days, and will handle 1000 tons of ore per day.

Barber Gibson and associates are just completing a 500-ton concentrating plant on a 40-acre lease of the Guinn land north of Webb City. The plant will have five jigs, two roughers, one cleaner, one chat jig, and a sand jig. The sludge mill will have 10 sludge tables and sufficient places reserved for five more. The company will handle sheet ground, which is typical of the North Webb City sheet ground field.

The Cisco Mining Co. has just completed a new plant on a 40-acre lease south of Webb City which will have a capacity of 1000 tons. The company is handling sheet and anticipates a mill recovery of 3%. The plant will have six jigs, two being used as roughers, and two as cleaners, while two others will rehandle all of the tailings after being reground.

MONTANA.

Butte.

In the development work between the 600 and 800 levels, which the North Butte Co. has been carrying on in the ground near the Speculator shaft, some important ore bodies have been opened up in both the north and south branches of the Sioux Chief vein. In the north branch on the 700 level a vein from 7 to 11 ft. in width and averaging fully 9 ft. has been opened up that averages 13% copper and 9 ozs. silver. At the time of Mr. Cole's recent visit, the south branch was opened, but nothing had been done on the north branch. The latter has been drifted on for a distance of over 100 ft. and the size and quality of the ore body is being

maintained. The same vein has been opened up on the 800 level by a crosscut, and on that level it shows a width of over 6 ft. that averages 8% copper and 4.3 ozs. silver. Work is now being carried on in the 600 level for the purpose of opening up the same ore body on that level and determining its extent. On this level the south branch of the Sioux Chief has been opened up and work on the development there is going forward steadily. In the North Berlin vein the last assay going East showed 4 ft. of ore averaging 8.8% copper. This vein has faulted to the west, but this work of development to pick it up again is being pushed steadily. In addition to this new development work between the 600 and 800 levels, a force of men is now at work opening up the 400 level. While the developments on the upper levels in new territory are of great importance the work at depth is going steadily forward and if there are no accidents or hindrances the Granite Mountain shaft will be the deepest shaft in the Butte district within the next 60 days. Sinking has been carried on steadily there and last month the shaft was sunk 123 ft. It is down now below the 3400 level and the management plans to carry it below the 3600 with depth sufficient for the sump at that level. The output of the North Butte is being steadily increased. The reports for the month of May show a tonnage of 48,385, from which was secured 2,000,000 lbs. of copper and 89,000 ozs. silver. Reports for June, to date, indicate that it will be a record-breaker, with a total production of copper approximating 2,300,000 lbs. The first week showed over 500,000 lbs. of copper produced.

The prediction that Anaconda will in the current year show net profits of \$45,000,000 might at first seem a rash statement, but the more one examines into the possibilities of this, the biggest single copper producer in the world, on a 25-ct. metal market, the deeper is the conviction that the prophecy is by no means a wild one. These profits would be equal to almost \$20 per share on 2,332,500 shares. Anaconda has produced from its smelter during January, February, March, April and May, 136,400,000 lbs. of copper. If the company is able to continue its monthly output at the rate of 30,000,000 lbs. it would mean that 210,000,000 lbs. covering the next 7 months would be added to the above, making the year's aggregate 346,000,000 lbs. From the above should be deducted say 25,000,000 lbs. of North Butte product upon which the company derives only the equivalent of a smelting profit, leaving 321,000,000 lbs. upon which to calculate profits on a product produced at 10 cts. and sold, say at an average of 24 cts. This would be \$44,940,000. This calculation takes no account of the profits to be derived from spelter or the income to be derived in smelting and refining the Inspiration and Miami concentrates. Silver and gold recoveries are applied as a credit against copper costs, so that of course indirectly, net profits should be materially assisted by the high silver prices of the past six months.

With the winning of its case in the suit brought by Frank Whitman against it, the Butte & Bacorn Co. is preparing to start active operations. The reorganization plans of the company are proceeding satisfactorily and the \$264,000 required has been nearly all subscribed. With this completed, the company will be in shape to resume operations. All of the debts will have been paid, a working capital of \$180,000 available, the company will own outright 278 acres of patented claims and have an option on 47 acres more. There are two shafts on the property, one 860 ft. deep and the other 1000 ft. deep, which will mean a year's time saved in development.

Guided by Managing Director W. L. Creden the party of eastern and middle west capitalists, who arrived in Butte last week, were shown the mill and mine workings of the Butte-Detroit Copper & Zinc Co. Since Creden took hold of the property, which was formerly the property of the old Butte Central Co., in the late spring, the shaft has been unwatered the full 500 ft. and within 10 days it is believed that sinking operations will have been started. The mill has been overhauled and new equipment added to both this and the mine.

Delay in the arrival of the motor trucks which have been ordered by the Boston & Montana Development Co. for the transporting of the ores from the Spain mine at the

French gulch properties to the Washoe smelter at Anaconda has caused some disappointment, as it was expected that the ore would be moving early in June. It now looks as if it would be July 1 before actual shipping operations can be begun.

Although more ore was treated in the oil flotation plant of the Butte & Superior during May than April, several hundred tons less of concentrates were secured at a higher cost and the value per ton dropped \$18.24, according to the report of the operations in May, filed in the federal court in Butte. In May 50,688 tons of ore were treated at a cost of \$3.22 a ton, to secure 11,658 tons of concentrates, valued at \$65.25 a ton. In April 50,112 tons of ore were treated, at a cost of \$2.84 a ton, to secure 12,080 tons of concentrates, valued at \$83.79 a ton. During March 52,089 tons of ore were treated, at a cost of \$2.69 a ton, to secure 12,199 tons of concentrates, valued at \$93.62 a ton. In February 49,800 tons of ore were treated, at a cost of \$2.52 a ton, to secure 10,775 tons of concentrates, valued at \$93.56 a ton.

Libby.

"We have made arrangements with San Francisco parties to install a dredging plant at an expense of \$110,000 on our placer properties near here, dependent only on satisfactory results from extensive prospecting which will first be done," said E. G. Mellander of Libby, who has returned from the coast, where these arrangements were made. "We will organize a new company to take over all of the holdings we have along Libby creek, except the comparatively small amount held by the Bear Creek Placer Mining Co. We paid \$150,000 for the ground of the Libby Placer Mining Co., \$10,000 for that of the Comet Placer Co., \$60,000 for two sections of land and purchased other holdings and now have placer ground extending along Libby creek 10 miles, beginning about 18 miles from that town. Our method of operation is unique. We had no dumping ground, so the gravel taken out with a steam shovel is loaded into a car and lifted by steam engine nearly 100 ft. into a hopper that feeds into a revolving screen. This screen is 4 ft. in diameter and about 28 ft. long. The fine tailings and small gravel go through the screen and into the flume while the coarser stuff goes out at the end of the screen and onto our dump. When the dump becomes too large it may be necessary to move the coarse tailings by a car. This new plant for handling our gravel is just being finished. We will prospect by shafts, sluicing and drills before putting in the dredging plant. This prospecting will be thorough. If the dredge is installed it will handle from 10,000 to 12,000 yds. a day and is in a district where we can operate 10 or 11 months in the year. Our gravel is about 22 ft. to bed rock, and as the values lie in the lower part, we will strip off the first 10 ft. and only run the rest of the gravel through the plant."

NEVADA.

Goldfield.

Developments have been resumed on the 650 level of the Florence and copper-gold ore of excellent grade is exposed. On the 250 and 530 levels work has been in progress several months and a large tonnage is available for extraction. Equipment for the 400-ton flotation unit is being installed and the management hopes to have the plant in commission by July 1.

The Atlanta management has started a westerly drift from the 1750 level to seek the extension of a rich shoot exposed at the 1580 point. The drift will also explore the foot-wall territory west of the main lode. Considerable new work is going on in the upper workings and is opening copper-gold ore of rather low grade. It is reported Atlanta ore will be treated in the new flotation plant of the Florence Goldfield Co., but nothing of an official nature has been given out. It is also considered likely that the Goldfield Con. will devote attention to treatment of Atlanta ores, as both companies are controlled by the same interests.

Virginia City.

For the first time since 1885 direct hoisting from a point below the 2500-ft. levels has begun on the Comstock lode.

Unwatering of the mines to the 2700 point has been completed and for the first time in 30 years the deep workings are open for mining. Drifting from the 2700 level is proceeding in the Ophir and Con. Virginia, with the vein showing some fair quartz. Drifting northerly from the 2700 level of Union Con. is also advancing.

Rand.

An important strike of sulphide ore is reported at a depth of 200 ft. on the property of the Queen Regent Merger Mines Co. 406 ft. from the main shaft. A short crosscut opened a 4-ft. vein giving assay from \$17 to \$44. Late work shows both veins have come together forming a body of good pay ore, late assays showing the gold and talc gangue of the vein carrying \$12 gold and silver, whereas the best ore shows values of \$101.80 gold, 113 ozs. silver, 5.3% copper and 13½% lead, giving total value of approximately \$220. Rand has been noted for its shipments of high-grade ore, approximating \$100,000 to date. The late strike in the Queen Regent showing sulphide and copper ore is considered of great importance by the mine owners, as verifying the prediction of engineers that depth will disclose permanent bodies of payable sulphide ore. The Queen Regent has carried its shaft down another 100 ft. and drifts will be started at once to open up the new ore body on the next level. Already approximately \$20,000 worth of high-grade ore has been shipped from the mine, and the management is now making arrangements for regular shipments.

Lida.

The Florida silver mine, embracing 5 claims and a fraction, has been purchased by Theo Bros. of Goldfield, and arrangements are being made for the installation of flotation equipment. A large tonnage of good-grade ore is exposed in the Florida, but it is of refractory character. Tests with flotation have been satisfactory and it is planned to have the plant in service within a short time. The plant will also treat ore from the Theo silver-gold mine at Hornsilver. A. P. Theo is manager.

Round Mountain.

In the period from March 9 to May 31 the Round Mountain Co. handled 106,600 yds. of gravel and recovered \$40,000 in gold from the sluices. Cleaning of the bedrock will soon commence. The company is operating at full capacity with the two water-supply systems and handling gravel averaging \$1.55 per yard. In the quartz mine good ore shows in the lower workings, and the mill is running on ore from several levels.

Tuscarora.

Equipment for the 100-ton mill to be erected on the Tuscarora mines group has been shipped and the management expects to have the plant in commission in 90 days. A new process will be used and it is planned to increase the capacity to 500 tons per day before winter sets in. The property contains large reserves of silver-gold ore, and is controlled by New York people.

Luning.

With upward of 300 men employed in and around the mines the Luning district is evincing much animation. Shipments are being made from the Champion, Wedge, Houghton, Copper Queen, Never Sweat, Silver Guardian, Mayflower and several other properties. Leasing is active, the Copper Queen alone worked by 12 sets of lessees. Shipments are being gradually increased and the town of Luning is growing steadily.

The Luning-Idaho Co. has completed a new road, facilitating ore shipments from the Hahn tunnel. In the 30-ft. Conte winze carbonate and sulphide ores are showing and indications are thought favorable for the early intersection of a strong body of sulphide ore. The McDavitt shaft is down 120 ft. on the foot wall.

Winnemucca.

An important tungsten discovery has been made in the Eugene mountains, 25 miles southwest of Winnemucca, by J. McCormick of Inlay. A system of parallel veins traverses the granite-lime contact, with tungsten occurring in the form of scheelite. The tungsten-bearing area has been traced for a length of 2 miles and is a mile wide. The ore assays 1 to 25% tungstic acid. J. A. Clawson, John Gross, George H. Copley and other Winnemucca people are interested.

NEW MEXICO.

Mogollon.

At the Iron Bar a crosscut tunnel has just been completed encountering the contact 400 ft. from portal. The vein is 7 to 8 ft. wide and pans well on foot wall. Drifting on the ledge will be started at an early date.

Surface prospect work recently begun on the Queen Vein on Eberle mine has disclosed 18 ins. of silver sulphide ore which also assays well in gold, and is being shipped to custom mill. Results of development work on the Clifton mine have warranted increasing the crew. This latter property was taken over under bond and lease in May.

Socorro Mining & Milling Co.'s operations covering first half of June produced 23 bars of gold and silver bullion and several tons of high-grade concentrates. The company is tearing down part of old custom ore bins and putting in pillars for headframe of aerial tramway to Pacific mine.

Retimbering the Pacific shaft continues below tunnel level. Ore shipments to the Socorro Co.'s mill will be resumed as soon as aerial tramway has been completed.

The Socorro Power & Lumber Co. has a saw mill on Mineral creek and has been delivering lumber to the divide above Mogollon by a board flume several miles in length. A Canadian capitalist and a representative of the Pelton Co. have just visited the property and definite arrangements made to utilize the waste water in generating power. A pipe line will be extended from end of flume down to Mineral creek and will have a head of over 1000 ft. and develop 250 hp. for which there is a ready market. It is expected to have the plant in operation by last of year.

OREGON.

Canyon City.

The company operating asbestos properties on Beech creek has abandoned activities there for the time being. The quality was said to be good, but not sufficient to justify the operation of the property. It lays in small stringers and not in a large enough body. About \$6000 to \$7000 was spent in operations. Some asbestos was shipped to Portland. The last shipment was 7 tons. It has not been made public as to whether or not operations will be resumed.

Bourne.

Jonathan Bourne has disposed of his interests in the Eureka and Excelsior mines here. They have been sold, conditioned upon the properties standing an examination to be made, and for the purpose of an inspection; 30 days are allowed. The shaft will be unwatered and the entire property sampled. Carload shipments of ore will be made for determining a satisfactory method of extraction. The capital will be furnished by the American Zinc, Lead & Smelting Co. The mines were the first to be worked extensively in the district. In 1880, under the management of Captain Donaldson, a fine free-milling plant was built. The ores proved refractory, and not until some years later, when John Longmaid introduced cyaniding, were the ores treated satisfactorily. Longmaid operated under a lease and after his lease expired the mines closed down and have been idle since. The mines are developed by tunnels and a shaft. Some ore reserves are blockd out.

Sumpter.

The Virtue Co. has been initiative in introducing Oregon as a new tungsten producer. The product was obtained from the Cliff mine, about 4 miles from the Virtue mine and mill. The test run is being made on a 50-ton shipment from the Cliff mine to the Virtue mill. The Cliff was opened by Frank S. Baillie and managed by Kenneth O. McEwen, Baillie having lately disposed of his interests to W. E. King. The ore mills well and gives some promise. Five stamps of the second battery of the 20-stamp mill at the Virtue are being used on the tungsten ore. Arrangements have been

made with Manager Romig of the Virtue for a second run later.

SOUTH DAKOTA.

Lead.

During the course of development at the Bismarck mine in the Yellow Creek district, a tungsten deposit has been uncovered. It is not as high grade as that uncovered in the adjoining Wasp No. 2 ground, but is sufficiently rich to warrant continued work. It is of concentrating grade and it is expected that further development will open up enough material of this grade to warrant the erection of a small concentrator. It has been found on the surface at the dome of one of the high points on the property and will be further developed by stripping the ground for a considerable distance. The work is not being confined to tungsten development alone. The low-grade ore exposures also are being examined and sampled, with the hopes of locating an ore body of sufficient value to put the 300-ton cyanide mill in operation. To date the results have been unsatisfactory.

The Golden West Co. is enlarging the scope of its development work. It is installing an air compressor, which will be used in connection with the tunnel work. It is possible shaft sinking will be started in the future. The compressor is capable of working 5 drills. The company is proceeding with the tunnel work, designed to crosscut the ore body which was prospected by churn drill work some years ago. It is said that the ore showing has been satisfactory thus far and the management has confidence of developing a body of commercial mill grade. The ultimate development, however, will result in an extensive opening up of the ground, so as to make available an ore supply sufficient for a treatment plant of fair size.

North Homestake Co. is continuing development started about the first part of 1916. The drift along the strike of the formation is being pushed south on the 600 level and is now 760 ft. from the shaft. It is being run through slate, where more rapid progress can be made than through the quartz and schist formation of the vein. Prospecting is being carried on by running crosscuts at intervals from both sides of the tunnel, penetrating the veins, which lie east and west of the north and south tunnel. The first of these crosscuts were run 125 ft. west and 200 ft. east, respectively. The two main veins, between which the drift is being run, are 120 ft. apart and the drift lies a little to the west of its center. It is the intention to run about 200 ft. farther south, before crosscuts are again run, making the distance from the shaft to these proposed crosscuts 960 ft. The present development is being prosecuted on the theory that the northern extension of the Homestake system of veins will be found, and, so far as known, there has been nothing so far encountered in opposition to the theory. No assay results have been made public, but it is stated that the formation is identical with that of the original Homestake Co.

TEXAS.

Alpine.

Preparations are going forward for the reopening of the Big Bend and other cinnabar mines in the Terlingua district, 90 miles south of here, and adjacent to the Rio Grande, despite the unsettled condition of the border region. The Colquitt-Tigner quicksilver mine in that district, which was operated for a time several years ago, has been placed in working order and is again turning out considerable quantities of cinnabar ore. The property is equipped with a 40-ton furnace. Marlow Wells is in charge. The Terlingua camp is now well protected by detachments of soldiers and the Mexican employes of the mines do not seem to be at all disturbed by the war excitement that pervades the border.

John Harvey, an experienced mining man who came to the upper border country of Texas recently, has discovered

an ancient abandoned silver-lead mine, situated 3 miles west of the Shafter mine, in Presidio county. The antigua promises to be a rich producer of ore. A large body of ore that assays 45% lead, with enough silver and gold to pay for milling, has been found by an exploration of the workings. Harvey is preparing to develop the property on a large scale. The fact that the Shafter mine, which has been operated by the Presidio Mining Co. for more than 35 years, and has yielded a total of about \$15,000,000 of silver during that period, is located not far from this ancient mine, leads to the belief that the discovery may prove to be of much importance.

UTAH.

Park City.

At a meeting of the directors of the Iowa Copper Co. it was decided to increase its capital stock from 500,000 to 1,000,000 shares, 200,000 of which will go to the owners of the property, 100,000 to the present lessees, who have been working through the tunnel for the past 2 years, and 700,000 shares will go into the treasury, 300,000 of which will be for sale, the proceeds to be used for development purposes and to pay indebtedness of the company. The first development work will be the sinking of a shaft. There is a good showing of copper-silver ore. Because of a lack of means and the fear of encountering water, no effort was made to get depth, and what development work has been done has been by tunnel. The stock will be listed on the Salt Lake Stock exchange during the summer.

Eureka.

By extending the 1000-ft. level tunnel of the Chief Con. it is intended to resume development of the Plutus Co. property. Arrangements to this effect have been completed. Plutus consists of 14' claims, practically all of which are patented and are in the heart of the mineralized district in Tintic. For 7 or 8 years little or no work has been done. The Chief Con. Co. will extend its drift on the 1000-ft. level up to the Plutus, which will intersect the northerly end of the Jason claim. This will be done without expense to the Plutus Co. Upon reaching it the Plutus drift will be extended south into Plutus ground on company account. There is now in the Plutus treasury a little better than \$5000 which is available for development. A similar attempt made some time ago with the Victoria Co. failed. Walter Fitch, general manager of Chief Con., is also a director of the Plutus Co. and considerable Plutus stock is held by Chief Con.

A new compressor is being installed at the Lehigh-Tintic Co.'s property. It embraces a Norwalk 2-stage compressor of 376 cu. ft. of air and weighs 8200 lbs. It will be installed at once at the deep tunnel. Already the power company has started to string the wires from the Selma camp, a few miles south. It is estimated this will be completed by July 1. The Lehigh-Tintic is now employing a force of 5 men and when it gets its new power machines going will be in position to make a showing in the course of a few months.

Cottonwood.

The Alta Michigan Mines Co. has been incorporated for \$100,000 and has been formed for the purpose of operating on quite an extensive scale a 5 years' lease on only partially developed ground in the South Hecla mine at Alta. The block of ground is on the Kate-Hays fissure and is penetrated to depth by the Quincy tunnel. The Hays fissure has already been opened and there is some ore in sight. This ground is about 600 ft. west from the Fields-Stewart lease and is 1100 ft. southwest from the Curley-Brain lease on the Skipper fissure. The Fields lease is now producing at the rate of 20 to 25 tons a day. Copper-lead-silver ore is already showing on the block to be worked.

At the South Hecla property on Wasatch range a new find has been made at a depth of 800 ft. The vein is 12 ft. wide and is thought to be better than the Wedge, formerly considered so good. Samples of the ore show about 300 ozs. in silver, with good values in copper and lead. The ore is said by some to average \$75. It is in an east-west fissure,

dipping at an angle of 70°. The fissure is in the soluble white lime, with the overthrust 350 to 400 ft. above where conditions are ideal for a good ore body. At present about 2000 gals. a minute is gushing from the broken up limestone at this point. This will be permitted to drain off for 10 days or so, when the ore shoot will be developed. In the meantime, 3 shifts have been put on the South Hecla Extension drift. All this country has to be timbered and progress is slower. The drift is now headed for the Maix fissure.

Kelton.

The Lucky Boy Mining & Milling Co. has made its first carload shipment of copper ore. It was sorted from ore broken, and it is expected that it will run between 12 and 16% copper, 7 ozs. silver and \$1.20 gold. The company owns 6 claims, unpatented, that are being developed by a tunnel. The tunnel has been driven in 165 ft. and has cut the ore at the breast at a vertical depth of 200 ft. The ore body is 3½ ft. wide and an average of it shows 5% copper. On the dump there is about 100 tons of this class of ore broken, and the ore that is to be shipped has been sorted out of this. The ore occurs in a blanket vein lying between a large iron cropping and a porphyry foot wall. The country rock is limestone in contact with quartzite. Four miles southwest is the Century mine, from which a considerable tonnage of ore has been shipped. At present 5 miners are working on the Lucky Boy.

Bingham.

About the first part of July work will commence on the construction of the new Utah Copper Co.'s leaching plant. Plans have been completed and the site decided on. The initial capacity will be about 2500 tons and it is the intention to gradually increase the capacity as the work progresses. The plant will not be finished before the first of next year. The designs for the steel work, tanks and machinery have been completed. Just what the process of leaching is has not been announced. It will be by some use of sulphuric acid. For several years work has been carried on in the experimental department of the company for a process of leaching. A small plant has been running at the Magna plant for some time so that sufficient data has been secured for the construction of a commercial plant. About 40,000,000 tons of carbonate ore, carrying an average of 1% copper, has accumulated from the development of the mine. This has been a capping over the sulphide ores that are shipped to the mills. It is impossible to treat the carbonate ores by the same process as the sulphides, as the values will float off in the slimes and tailings.

WASHINGTON.

Spokane.

An effort is being made to revive the old Spokane Belle silver mine, 35 miles north of Spokane, near Clayone, one of the oldest mineral locations in this section, and E. H. Belden, local attorney, owner of the property, is planning to form a syndicate to finance further development. Recent assays of samples taken from the dump made during the early period of development more than 20 years ago show values of \$25 in silver, and engineers who examined the workings 2 weeks ago have advised to continue the shaft, now down about 100 ft., to 300 ft., and then crosscut to intersect two other veins that show about 125 and 250 ft., respectively, farther north. The first location of record on the Spokane Belle was made in 1887, and up to 1889 a number of location notices had been posted, but none were permanently established. In 1894, J. W. Larkin and J. B. Welch took possession, and in December, 1895, they organized the Spokane Belle Mining Co., capitalized for 1,000,000 shares at \$1 each. They began development immediately, sinking the shaft and stripping the veins on the surface. Later it was discovered that the land was in the Northern Pacific railway grant, and the railway company instituted proceedings in eviction. The suit was settled by the mining company buying the quarter section on which the claim was located, and title was finally secured in 1896. The property remained idle for 4 years, when it was acquired by

John R. Cassin and associates, who made the shipments to the Northport smelter, but they suspended operations after a few months, and no work has been done since. Belden secured possession in 1906, acquiring title from Spokane county under tax foreclosure proceedings, but it is only recently that he has considered systematic development. There is an excellent stand of timber on the land, much of it of merchantable quality, and a good wagon road provides transportation facilities from the mine to the Deer Park Lumber Co., logging railway, which is but $1\frac{1}{2}$ miles distant.

A new strike, much more important than the original discovery, is reported to have been made June 20 in the Electric Point mine, near Northport. The drift south from the 210-ft. shaft level, or 242 ft. below the outcrop, has broken into the No. 2 ore chimney and reports received state that the deposit has been penetrated for 18 ft., exposing solid galena and mixed carbonates and crystals. The silver values also are much higher than in No. 1 chimney. The remarkable feature of the strike is the presence of so much crystallized lead in the carbonate ore in the No. 2 chimney as to raise the grade from an average of about 22% in the first chimney to 50% in the newly opened ore body. The No. 2 chimney was found on the surface at a point 40 ft. south of the discovery chimney. It has an apparent diameter on the surface of 25 ft. The drift which has broken into it at 240 ft. of depth is just 40 ft. long, and has been in ore for 18 ft. Two men working half a shift took out of the drift $1\frac{1}{2}$ tons of galena and 4 tons of carbonate ore. The galena ore is worth \$75 a ton net, and the carbonate ore about \$50. Northward 180 ft. from the original discovery chimney, which was 35 ft. in diameter at the surface and circular in form, and 59 ft. in diameter at the 100 level, is a third and apparently much larger chimney than either of the others. Without being fully stripped it shows a diameter of 60 ft. The drift from the discovery shaft, which is being run to tap this ore body 250 ft. deep, is now nearly half completed. Shipments from the mine are being made, and five 4-horse teams are now hauling to Boundary, the ore going to the smelter at Trail. President Roy A. Young says he will have 10 teams and a motor truck moving ore by the first of July. Only galena ore will be shipped for the present.

Walter J. Nicholls & Co., of Spokane, who recently acquired options on a number of properties adjoining the Electric Point mine near Northport, following their purchase of a quarter interest in that property, are organizing a syndicate to take over a group of 10 claims which they have started to develop under the direction of Larson & Lakes. A report made on the property by Larson & Lakes states that several promising showings of carbonates, similar to some of the outcrops on the Electric Point, have been exposed on the syndicate's holdings, which nearly surround the Electric Point mine.

WISCONSIN-ILLINOIS.

Platteville.

Returns covering operations at all points in the field for the week ending June 24 show delivery of 142 cars of zinc concentrates, all grades, 5732 tons; 4 cars lead ore, 225,780 lbs., to Federal Lead Co.; pyrites to General Chemical Co. from National Works, Cuba, 610,800 lbs. The gross yield raw concentrates for the week aggregated 9,000,000 lbs.; net deliveries to smelter, 5,316,000 lbs. The base price on blende dropped to \$75. Top grades ruled at \$77. The base ranged down to \$70 for seconds and medium grades, while low-grade in hands of independent operators was not in demand. Much low-grade reserve in the field will come in for separator treatment through co-operative separating plants.

Kistler-Stephens Co., operating with a complete new electrically driven 200-ton milling plant on the Block-House mine, have two bins of 50% concentrates for a trial run of the plant. Chas. Kistler, one-half owner of this property, predicts a recovery of 80 tons of concentrates per 24 hours. This company purchased the Weigle farm of 113 acres and has located big deposits of zinc ore with drills following

months of steady work. On the Alderson farm, $2\frac{1}{2}$ miles southwest of Platteville, a new zinc producer has been developed for this company. The Enterprise Roasters, now in control of Kistler-Stephens, is running with newly installed Dings magnetic separators, and making 3 to 4 cars of high-grade ore weekly. Two cars were sold last week to the M. & H. Zinc Co., LaSalle; 4 cars are held in bin. At the independent zinc ore refinery on the Homestead, known as the Climax Mining Co., composed also of Kistler-Stephens interests, 100 tons of high-grade dressed ore is ready for shipment. Two newly installed Dings machines have been added to the old equipment. Seven cars of green concentrates, held at the Grant County mine, affiliated with the Climax Mining Co., will be delivered to the Homestead separators for treatment. The Grant County mine, after unsuccessful attempts by several mining companies in the past 10 years to develop a producer, is under the management of the Kistler-Stephens Co., making a producer. The ore beds are wider and higher than ever shown before, and a heavy output is now assured.

The Bell Mining Co. is constructing a power and concentrating plant. Klar-Piquette, M. & H., Star, East End, Hodge and West Hill Mining companies are all producing. The West Hill paid a 20% dividend June 8. The Goodfellow Mining Co. is a new mining organization. Wisconsin Zinc Co. is drilling on the Carl farm, and the Goodfellow Mining Co. on the Boll farm. Maple Glenn Mining Co. is engaged in sinking a shaft.

Linden.

The Linden Zinc Co. has secured the plant at Cuba and 20 men have been put to work.

The Spring Hill Mining Co., a recent incorporation, is engaged with 30 men in shaft sinking and mill building; 32 borings on the range are in good ore, few blanks being drawn. Chas. W. Singer, general manager in charge, is authority for the statement that the output will be a 30-ton car of 50% concentrates daily.

Shipments for week of June 24 included a car from Stoner Bros. Co., 25 tons; Ross Bros. Mining Co., 2 cars, 63 tons; Optimo No. 3, 3 cars, 92 tons; Saxe-Pollard Co., 3 cars, 93 tons, all to Mineral Point Zinc Co.; Linden Development Co., 1 car to Cuba, 40 tons.

Benton.

The Sally Mining Co. is now in complete running order, with a new power and milling plant. Chas. Lawyer, et al., of Madison, have secured the mining rights to the Chas. Smith farm and a drilling machine has been put to work. Longhenry Bros. Mining Co. has begun to move concentrates to track, selling 1 car to the Benton Roaster Co. and 3 to the Mineral Point Zinc Co. The Grand View Mining Co., recently incorporated and composed of Indianapolis men, is now operating with a new rig. The Frontier Mining Co. reports a rich strike of jack on the James Horsley farm. One Garford auto truck in 6 days' hauling delivered 520 tons of zinc concentrates to track. The best day's record was 109 tons. The distance covered is 8 miles. The Field Mining & Milling Co. will remill the tailings piles at the Crawhall mine. The Wisconsin Zinc Co. has installed a sludge mill at the Champion mine, 6 tables proving a most efficient factor in extraction of values from slimes and overflow.

Shipments of zinc ore last week is the second best on record, 61 cars, 5,146,000 lbs. Frontier group to Grasselli Chemical Co., 449 tons; New Jersey Zinc to Mineral Point, 9 cars, 372 tons; Fields Mining & Milling Co. to Galena Refinery, 7 cars, 285 tons; Longhenry Bros. Co., 3 cars, 122 tons, to Mineral Point, and 1 to Benton Roasters, 41 tons; Blackstone, Martin and Kittoe mines of the Vinegar Hill, 9 cars, 400 tons; Indian Mound Co. to Wisconsin Zinc Roasters, 8 cars, 300 tons; Wisconsin Zinc Co. to American Zinc Co., 3 cars high-grade, 133 tons, and 6 cars to Lanyon Zinc Co., 270 tons; Champion mine to Galena, 4 cars, 201 tons.

Shullsburg.

McDermott Mining Co. is engaged in sinking a new shaft and pumping machinery has been installed. The Wisconsin Lead & Zinc Co. has secured mining rights on the Weatherby, Richards, Howe and Stephens farms. The Oli-

ver Mining Co. has a zinc producer developed on the Mulcahy farm, power and milling plant, and a magnetic zinc ore separating plant will be added to the surface equipment. The Vinegar Hill Zinc Co. is engaged in drilling out the Thos. Doyle farm. The Wisconsin Zinc Co. is engaged with drill on the Jos. Copeland estate. Drills are working for the Fields Mining & Milling Co. on the Harty farm. Drills are at work on the John Lyon's farm. Metcalf Bros. Mining Co. has secured the mining rights on the Thos. Cherry homestead and ore is now being raised. The State Line Mining Co. has a lease on the Beckwith farm and good success is following drilling. The Mineral Point Development Co., a new organization, is also engaged on the Beckwith farm, and one drill is engaged.

The Winskill, an old-time producer, is shipping again, last week clearing 3 cars for Galena, 147 tons; Rodhams Mining Co. to Lanyon Zinc Co., 31 tons. The Rodhams mine has struck it richer than ever before.

Potosi.

The Wilson mine resumed operations last week after making big improvements to its surface. One car high-grade blende was shipped to LaSalle, 35 tons.

Galena.

Shipments showed improvements last week, the Black-Jack shipping 4 cars, 170 tons; Federal to roasters, 2 cars, 81 tons; Galena Refinery Co., 4 cars high-grade, 140 tons; North Unity to Cuba, 43 tons; Wisconsin Zinc Roasters, 2 cars premium ore to LaSalle, 80 tons; 3 cars to Edgar Zinc Co., 120 tons. The Vinegar Hill Zinc Co. put in operation a new 200-ton plant on the Graham mine. Wisconsin Zinc Co. completed a 200-ton power and milling plant on the Birkbeck. Wisconsin Zinc Roasters received during the week 21 cars raw ore for separator treatment, 892 tons.

CANADA.

BRITISH COLUMBIA.

Granby.

The Granby Con. Mining, Smelting & Power Co., with mines at Hidden Creek and Phoenix, and in Alaska, and smelters at Anyox and Grand Forks, on June 21 declared the regular quarterly dividend of \$1.50 a share and an extra dividend of 50 cts., a total of \$299,970, payable Aug. 1 to stockholders of record July 14. This will make the payments for the current year \$749,924, and will increase the grand total to \$6,476,847. No official announcement has been made as to plans for permanently increasing the quarterly disbursements, but local stockholders are of the opinion that from now on until there is an appreciable decline in copper prices that Granby will continue to pay \$2, or 8% annually on the outstanding capitalization, 149,985 shares at \$100. Net profits of the Granby for the last quarter of 1915 were \$1,026,745. For the first quarter of 1916 they approximated \$1,200,000 and during April were estimated at \$600,000. For the fiscal year ending June 30 they will considerably exceed \$3,000,000, which is more than \$20 a share of issued capital stock. In the same period there will have been disbursed only \$6 a share, the first dividend at the 8% rate falling in the first quarter of the next fiscal year. On Jan. 1 the company's surplus stood at \$962,104. By June 30 it should be in the neighborhood of \$3,000,000. Granby's plant at Grand Forks is capable of caring for the output of the Phoenix mines, besides handling custom ores, but the Anyox plant is being enlarged to accommodate the rapidly increasing production at Hidden creek. The Anyox production of copper matte amounts to 3,000,000 lbs. monthly, and nearly every steamer that docks there carries away a part of a cargo of the metal. At present the mechanical equipment of the smelter is being actuated by a hydro-electric station, but during the winter this is uncertain, and the company now is installing an auxiliary steam power plant that will cost about \$750,000.

Hedley.

The Hedley Gold Mining Co. on June 14 declared the regular quarterly dividend of 3%, or \$40,000, and an extra dividend of 2%, or \$20,000, a total of \$60,000 on the issued

capitalization of 120,000 shares at \$10 each. Disbursement was made on June 30th, to stockholders of record June 24, and the transfer books will not be closed, according to the announcement from John D. Clarke, assistant treasurer, at the head offices, No. 42 Broad St., New York. This will make the payments for the current year \$120,000 and will increase the grand total to \$1,943,520.

Nelson.

W. R. Salisbury of Salmo has taken a bond for \$50,000 on the Neptune and Underhill claims on Bear creek in the Sheep Creek district, about 40 miles from Nelson. The properties have been owned by E. Sapples of Salmo and Michael Scully and J. Campbell of Nelson. They are said to have a fine showing in silver-lead-zinc ores. These claims have been worked and opened up enough to give reliable information on their values. Sapples, chief owner, is the postmaster at Sheep creek, and has been employed with the Queens mines of that district.

ONTARIO.

Cobalt.

According to the May report of Nipissing arrangements are being made to reopen shafts Nos. 86 and 123. Small tonnages of low-grade are blocked out here and are in condition to be stoped. The company mined ore valued at \$291,898 and shipped bullion, including that from custom ores, with a net value of \$420,822.

Little information has been available regarding the Mining Corporation of Canada. A recent report shows that the silver production of the past year amounted to 4,563,956 ozs., against 3,185,124 ozs. in the 9 months ended Dec. 31, 1914. The production for the same period of Nipissing Mines was 4,097,391 ozs., which demonstrates that the Mining Corporation is in the lead as a silver producer. As the corporation was only operating 9 months in 1914, comparisons between 1914 and 1915 are hardly possible, though, judging by the figures, the rate of production was considerably higher in 1915. Of the total production in 1915, 1,584,986 ozs. were derived from 766 tons of high-grade ore and 2,922,383 ozs. from 131,853 tons of low-grade. In the case of the high-grade, the Cobalt Lake property showed a very substantial increase. Whereas the Townsite-City properties contributed 408 tons in 1914, and only 397 in 1915, the Lake property's output rose from 78 to 369 tons. In low-grade ore, however, the reverse was the case. The yield per ton increased from 29.66 ozs. in 1914 to 34.3 ozs. in 1915. This was due in part to the higher grade of the milling ore obtained from the Cobalt Lake mine, in part to improved extraction methods and in part to the introduction of the new operation of cyaniding slimes. The average price obtained for silver was 52.53 cts., against 51.17 cts. in 1914. Combining the higher yield and the increased price, the revenue per ton realized rose from \$15.20 to \$18.10 between the 2 years. Working costs which were \$8.10 per ton in 1914 were increased to \$8.51 in 1915. Profits were accordingly \$10 per ton, or \$7 higher than in 1914. The estimates of ore reserves in the three principal mines are 101,135 tons, 17,000 tons less than at the end of 1914, with 3,937,995 ozs. of silver content, about 63,000 ozs. less than 1914.

MEXICO.

Nacozari.

The Nacozari Con. Copper Co., John G. Alexander general manager, is considering changes in its mill, to provide for concentration with tables and oil flotation. Plans also contemplate a new electric power plant to be driven by oil engines. The character of the ore is shown by a .25½-ton shipment of ore and concentrates to the El Paso smelters in May, which sampled as follows: Lead, 10%; silver, 115.3 ozs.; copper, 1.3%; gold, 0.05 ozs.; iron, 6.6%; zinc, 13%; sulphur, 15%; lime, 11.6%; insoluble, 41%. After deducting freight and smelting charges, this shipment netted the company \$1811.34. The mine is developed and operated through a 2500-ft. haulage tunnel, which is to be extended. The company's main office is at Douglas, Ariz., at present.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Gudgeon, C. W.—*The Scheelite-Gold Mines of Otago, New Zealand*. [The geology is taken and several properties described. Mill flow-sheets and milling and mining costs are given, besides a brief on a wet method for assaying pyritic scheelite for tungsten].—*Proc. Aus. Inst. M. E.*; N. S. No. 21 1916; p 37; pp 14*; 65c.

Watts, A. S.—*The Feldspars of the New England and North Appalachian States*. [Contains description of the geology and separate descriptions of the quarries. Tests for the feldspar are given, as are methods of quarrying, pumping, crushing, concentration, etc.].—*U. S. Bur. of Mines Bull.* 92; pp 181*; 35c.

——— *Zinc Ores, Their Occurrence and Utilization*. [Descriptions of the deposits in various countries are given briefly. Prices of the ore and methods of computing its value are given as well as costs of smelting and methods for the same].—*Bull. Imperial Inst.*, London; p 44; pp 57; 75c.

II. ORES AND METALS

(I) METALS AND ORES

Alloys

Barnitz, H. L.—*The Technical Production of Hydrogen and Its Industrial Application*. [Reprint from *Met. & Chem. Engg.* It is used to make the oxy-hydrogen flame for welding. Several different processes are described in general and some details given].—*Barnitz*, New York; pp 11; 30c.

Moulden, J. C.—*Zinc, Its Production and Industrial Application*. [The different kinds of zinc are taken up and their uses reviewed. A separate table is given showing the many alloys and their proportions and followed by an account of zinc production for 1913 to 1845].—*Jnl. of Royal Soc. of Arts* June 2 1916; p 517; pp 15*; 35c.

Copper

Hill, J. M.—*Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1915*. [The industry and production is reviewed separately for the entire group of states by metals and is later reviewed by states and counties].—*Min. Res. of U. S.* 1:2; pp 14.

Mathewson, E. P.—*Recent Improvements in Concentration at the Washoe Reduction Works, Anaconda, Montana*. [A general detailed description of the crushing and concentration operations in connection with flotation. A flow-sheet is given].—*Canadian Mg. Inst. Bull.* June 1916; p 560; pp 9*; 35c.

McLeish, John.—*Annual Report on the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—*Canada Dept. of Mines, Mines Branch No.* 354; pp 362.

Gold Fields and Mining

Alderson, M. W.—*Mining Possibilities in Colombia, South America—II*. [A general talk on mining in this well-known and old country. Placers are the principal deposits considered].—*Mg. World* June 10; p 1075; pp 2¼*; 10c.

Cundy, W. H.—*Bendigo Goldfield: Its Undeveloped Resources*. [Abst. from *Mining & Engineering Rev.*].—*Monthly Report Chamber of Mines, Victoria Aust.* Mar. 1916; p 63; pp 5¾; 35c.

Gudgeon, C. W.—*The Scheelite-Gold Mines of Otago, New Zealand*. [The geology is taken up and several properties described. Mill flow-sheets and milling and mining costs are given, besides a brief on a wet method for assaying pyritic scheelite for tungsten].—*Proc. Aus. Inst. M. W.*; N. S. No. 21 1916; p 37; pp 14*; 65c.

Hill, J. M.—*Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1915*. [The industry and production is reviewed separately for the entire group of states by metals and is later reviewed by states and counties].—*Min. Res. of U. S.* 1:2; pp 14.

McLeish, John.—*Annual Report on the Mineral Production of Canada 1914*. [Each mineral is reported on separately. The imports, exports, production and

condition of the trade are given].—*Canada Dept. of Mines, Mines Branch No.* 384; pp 362.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

Burchard, E. F.—*Iron Ore Production Fourteen Million Tons Increase in 1915*. [Abst. from a U. S. G. S. Report. The situation is reviewed in detail for the several producing areas].—*Mg. World* June 10 1916; p 1089; pp 1½; 10c.

McLeish, John.—*Annual Report on the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—*Canada Dept. of Mines, Mines Branch No.* 384; pp 362.

Iron and Steel: Foundry and Furnace Practice

Mathews, J. A.—*Electric Furnaces in Steel Making*. [A paper read before the American Iron & Steel Inst. A review of the development of this type of furnace. The principal types are discussed and described, as also are the products from them].—*I. Tr. Rev.* June 8 1916; p 1261; pp 3; 25c.

Vreeland, G. W.—*Handling the Blast Furnace Charge*. [A paper read before the American Iron & Steel Inst. Various types of furnace charging tops are described in detail].—*I. Tr. Rev.* June 8 1916; p 1269; pp 4½*; 25c.

——— *A Complete Blast Furnace in 85 Days*. [The Cambria Steel Co. put in a stack in this length of time. The structure is described].—*Iron Age* June 15 1916; p 1441; pp 3¼*; 30c.

Lead

Hill, J. M.—*Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1915*. [The industry and production is reviewed separately for the entire group of states by metals and is later reviewed by states and counties].—*Min. Res. of U. S.* 1:2; pp 14.

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The imports, exports, production and condition of the trade are given].—Canada Dept. of Mines, Mines Branch No. 384; pp 362.

Silver

Hill, J. M.—*Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1915*. [The industry and production is reviewed separately for the entire group of states by metals and is later reviewed by states and counties].—Min. Res. of U. S. 1:2; pp 14.

McLeish, John.—*Annual Report on the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—Canada Dept. of Mines, Mines Branch, No. 384; pp 362.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Jamieson, G. S.—*On the Volumetric Determination of Tin by Potassium Iodate*. [Gives the results of some analyses made and a complete chemical explanation of the method of procedure].—Jnl. Ind. & Chem. Engg. June 1916; p 500; pp 2; 60c.

Matheson, A. M.—*Notes on the Chemical Assay of Tin Ores*. [Shows the difference between fire and chemical assays on high pyritic tin ores and the impossibility of estimating mill losses by the vanning and fire assay].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 1; pp 7; 65c.

Tungsten

Gudgeon, C. W.—*The Scheelite-Gold Mines of Otago, New Zealand*. [The geology is taken up and several properties described. Mill flow-sheets and milling and mining costs are given, besides a brief on a wet method for assaying pyritic scheelite for tungsten].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 37; pp 14*; 65c.

Miner, F. L.—*The New Milling Plant for the Nevada Tungsten Property*. [A brief description of the deposit and the mill].—Mg. World June 10 1916; p 1078; pp 1*; 10c.

Zinc

Hill, J. M.—*Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1915*. [The industry and production is reviewed separately for the entire group of states by metals and is later reviewed by states and counties].—Min. Res. of U. S. 1:2; pp 14.

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Moulden, J. C.—*Zinc, Its Production and Industrial Applications*. [The different kinds of zinc are taken up and their uses reviewed. A separate table is given showing the many alloys and their proportions and followed by an account of zinc production for 1913 to 1915].—Jnl. of Royal Soc. of Arts June 2 1916; p 517; pp 15*; 35c.

— *Zinc Ores, Their Occurrence and Utilization*. [Descriptions of the deposits in various countries are given briefly. Prices of the ore and methods of computing its value are given, as well as costs of smelting and methods for the

same].—Bull. Imperial Inst., London; p 44; pp 37; 75c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Bailey, E. G.—*Interpretation of Coal Analysis*. [A paper read before the International Railway Fuel Ass'n. A review of what the results of a coal analysis mean].—Pract. Eng. June 15 1916; p 527; pp 2½; 20c.

Fay, A. H.—*Coal Mine Fatalities in the United States in March, 1916*. [A list of permissible explosives, lamps and motors tested prior to May 1, 1916, is also given].—U. S. Bur. of Mines Monthly Statement; pp 22.

Greer, G. E.—*An Underground Mine Stable*. [Detailed drawings, description and discussion on this type of concrete stable are given].—Coal Age June 10 1916; p 998; pp 1¾*; 20c.

Herbert, C. A.—*Steep-Seam Longwall in Illinois*. [An unusual system used where the seams are badly folded by the La Salle anticline. The dip varies from 4° to 40° and there is a bad roof].—Coal Age June 17 1916; p 1050; pp 1*; 20c.

McCrystle, J.—*Underground Mine Roads*. [A list of set rules to be adhered to by the track layers and foremen. They have to do with details, distances, etc., to be noted by the trackmen and surveyors].—Coal Age June 10 1916; p 1000; pp 3¼*; 20c.

McLeish, John.—*Annual Report on the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—Canada Dept. of Mines, Mines Branch, No. 384; pp 362.

Richards, W. B.—*Fighting an Anthracite Mine Fire*. [Describes a fire and the extinguishing of the same at a colliery of the Lehigh Coal & Navigation Co.'s property, Pennsylvania].—Coal Age June 10 1916; p 1013; pp 4¼*; 20c.

— *Scraper Mining for Low Veins*. [A system used by the Lehigh Valley Coal Co., Pennsylvania, for extracting thin seams of coal].—Coal Age June 17 1916; p 1044; pp 1½*; 20c.

Coal Dust, Fire Damp, Etc.

Childs, W. H.—*The By-Products of Coke Making*. [A paper read before the American Iron & Steel Inst. A review of the industry and description of methods in which it is shown that the industry is on the increase].—I. Tr. Rev. June 15 1916; p 3½*; 25c.

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Coal and Coke By-Products

Childs, W. H.—*The By-Products of Coke Making*. [A paper read before the American Iron & Steel Inst. A review of the industry and description of methods in which it is shown that the industry is on the increase].—I. Tr. Rev. June 15 1916; p 3½*; 25c.

— *Hall Process of Cracking Oils*. [An illustrated description of the invention, method and apparatus].—Petro. World June 1916; p 265; pp 2¼*; 35c.

Petroleum

Taylor, W. G.—*Motor Equipments for*

the Recovery of Petroleum. [A detailed description of methods and practical results obtained by using the slip-ring motor for drilling, pumping, etc. Data covering horsepower required and kilowatt consumption is given].—Proc. Amr. Inst. Elect. Eng. June 1916; p 759; pp 14*; 35c.

— *Hall Process of Cracking Oils*. [An illustrated description of the invention, method and apparatus].—Petro. World June 1916; p 265; pp 2¼* 35c.

— *Italy's Petroleum Resources*. [Rivanazzano Field is considered, with data on the present wells and prospects for further drilling].—Petro. World June 1916; p 275; pp 1; 35c.

Fuels Miscellaneous

Leshner, C. E.—*Fuel Briquetting in 1915*. [Little difference was shown from 1914. The industry is still in its infancy].—Min. Res. of U. S. II:1; pp 6.

Miller, B. L.; Singewald, J. T.—*Substitutes for Coal in the Andes, South America*. [Vegetation, peat and turf are the principal fuels used here].—Coal Age June 17 1916; p 1040; pp 4*; 20c.

(B) STRUCTURALS AND CERAMICS.

Cement

Hough, N. G.—*Field Work of the Hydrated Lime Bureau*. [An account of field investigation of various sorts made by this bureau].—National Lime Mfg. Assn. April 1916; pp 7; 35c.

McLeish, John.—*Annual Report on the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—Canada Dept. of Mines, Mines Branch, No. 384; pp 362.

Clays, Ceramics

Bleininger, A. V.—*Testing Clay Refractories*. [A paper read before the New Jersey Clay Weavers' Assn. Besides the description and results of tests, methods for the classification of fire-clay shapes for industrial purposes are given].—B. & C. Rec. June 6 1916; p 1030; pp 3; 35c.

Greaves, Walker, A. F.—*The Design and Construction of Continuous Kilns*. [Drawings of plant construction and details are given, with notes on good operating practice].—B. & C. Rec. June 6 1916; p 1019; pp 3*; 35c.

McLeish, John.—*Annual Report of the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—Canada Dept. of Mines, Mines Branch, No. 384; pp 362.

Concrete

Fechheimer, S. M.—*Modern Ideas on Fireproof Construction*. [Details regarding this form of reinforced concrete construction are given].—Mg. World June 10 1916; p 1081; pp 2½*; 10c.

Greer, G. E.—*An Underground Mine Stable*. [Detailed drawings, description and discussion on this type of concrete stable are given].—Coal Age June 10 1916; p 998; pp 1¾*; 20c.

— *Electric Power for Public Work as Brought Out at the Wilson Ave. Tunnel, Chicago*. [A complete description of electric power used in the tunnel is given. Electricity is here used for hoisting, air compression, rock crushing, haulage, ventilation and lining the tunnel with concrete].—Elect. Rev. & West. Elect. June 3 1916; p 1017; pp 6¾* 20c.

III. TECHNOLOGY

MINES AND MINING

Ore Reserves

Italy's Petroleum Resources. Rivanazzano Field is considered, with data on the present wells and prospects for further drilling].—Petro. World June 1916; p 275; pp 1; 35c.

Rand's Ore Reserves, South Africa. [A compilation of official figures from annual company reports showing 90,000,000 tons in sight].—S. Afr. Mg. Jnl. April 29 1916; p 1; 35c.

Drilling and Boring

Hirschberg, C. A.—*Speed and Economy of the Deep Hole Drill Wagon*. [Details of results obtained and methods used are given, including some figures on costs of operation].—Comp. Air June 1916; p 8003; pp 5½*; 20c.

Taylor, W. G.—*Motor Equipments for the Recovery of Petroleum*. [A detailed description of methods and practical results obtained by using the slip-ring motor for drilling, pumping, etc. Data covering horsepower required and kilowatt consumption is given].—Proc. Amr. Inst. Elect. Eng. June 1916; p 759; pp 14*; 35c.

Dredging

Alderson, M. W.—*Mining Possibilities in Colombia, South America—II*. [A general talk on mining in this well-known, old country. Placers are the principal deposits considered].—Mg. World June 10; p 1075; pp 2¾*; 10c.

Jacobs, E.—*Placer Gold Mining in British Columbia*. [A review of the production of gold from this source in general for the province and detail for the different sections].—Canadian Mg. Jnl. June 1 1916; p 274; pp 2¾*; 35c.

Haulage and Conveying

Green, Raoul.—*Horse Haulage Versus Compressed Air Haulage—A Comparison of Costs*. [The comparison is made with actual figures and discussion].—Canadian Mg. Inst. Bull. June 1916; p 570; pp 5; 35c.

McCrystle, J.—*Underground Mine Roads*. [A list of set rules to be adhered to by the track layers and foremen. They have to do with details, distances, etc., to be noted by the trackmen and surveyors].—Coal Age June 10 1916; p 1000; pp 3¾*; 20c.

Cost of Spur Tracks. [The cost of tracks of several different lengths are divided and given in tabulated form].—Coal Age June 10 1916; p 998; pp ½; 20c.

Accidents

Fay, A. H.—*Coal Mine Fatalities in the United States in March, 1916*. [A list of permissible explosives, lamps and motors tested prior to May 1, 1916, is also given].—U. S. Bur. of Mines Monthly Statement; pp 22.

Richards, W. B.—*Fighting an Anthracite Mine Fire*. [Describes a fire and the extinguishing of the same at a colliery of the Lehigh Coal & Navigation Co.'s property, Pennsylvania].—Coal Age June 10 1916; p 1013; pp 4¾*; 20c.

Safety

Fay, A. H.—*Coal Mine Fatalities in the*

United States in March, 1916. [A list of permissible explosives, lamps and motors tested prior to May 1, 1916, is also given].—U. S. Bur. of Mines Monthly Statement; pp 22.

Emergency Escape-Way for Mines. [A recently patented plan. Its construction is given and detail, as is the way in which it is expected to serve as an escape-shaft].—Mg. World June 3 1916; p 1045; pp 1¼*; 10c.

Rescue and First-Aid

Coldham, J. C.—*Organization and Equipment of a Mine Rescue Station*. [Information is given regarding tests on the endurance of the rescue men and methods of operating for the rescue crew. Equipment and installations are also described].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 9; pp 38*; 65c.

Irvine, L. G.—*First-Aid Treatment of Cases of Gas Poisoning*. [Abst. from the Medical Jnl. of S. Afr.].—E. & M. J. May 20 1916; p 901; pp 1; 25c.

Production

Burchard, E. F.—*Fluorspar in 1915*. [The report shows that the production has materially increased and the imports decreased to nearly a negligible quantity].—Min. Res. of U. S. II:6, pp 9.

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Hill, J. M.—*Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1915*. [The industry and production is reviewed separately for the entire group of states by metals and is later reviewed by states and counties].—Min. Res. of U. S. I:2; pp 14.

Leshner, C. E.—*Fuel Briquetting in 1915*. [Little difference was shown from 1914. The industry is still in its infancy].—Min. Res. of U. S. II:1; pp 6.

Loughlin, G. F.—*Slate in 1915*. [The production decreased 13% during 1915].—Min. Res. of U. S. II:5; pp 13.

McLeish, John.—*Annual Report on the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—Canada Dept of Mines, Mines Branch, No. 384; pp 362.

Middleton, J.—*Fuller's Earth in 1915*. [Treats on the occurrence, uses, production, the industry by states].—Min. Res. of U. S. II:3; pp 4.

Moulden, J. C.—*Zinc, Its Production and Industrial Applications*. [The different kinds of zinc are taken up and their uses reviewed. A separate table is given showing the many alloys and their proportions and followed by an account of zinc production for 1913 to 1845].—Jnl. of Royal Soc. of Arts June 2 1916; p 517; pp 15*; 35c.

Ralston, O. C.—*Statement of Flotation Oils—Market Situation Regarding Flotation Oils*. [A discussion of the market, consumption of oils for flotation, adaptability of the oils and cost of the different kinds].—Mg. World June 10 1916; p 1079; pp 1½; 10c.

Accounts and Bookkeeping

Thum, E. E.—*Cost-Accounting in the Construction and Operation of a Copper Smelter*. [Information obtained from experience at the Anaconda Copper Co.'s

smelter. Details for the distribution of accounts are given, as also are methods of keeping costs].—Met. & Chem. Engg. June 1 1916; p 660; pp 2¾; 30c.

Mining Costs

Gudgeon, C. W.—*The Scheelite-Gold Mines of Otago, New Zealand*. [The geology is taken up and several properties described. Mill flow-sheets and milling and mining costs are given, besides a brief on a wet method for assaying pyritic scheelite for tungsten].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 37; pp 14*; 65c.

Hirschberg, C. A.—*Speed and Economy of the Deep Hole Drill Wagon*. [Details of results obtained and methods used are given, including some figures on costs of operation].—Comp. Air June 1916; p 8003; pp 5½*; 20c.

Cost of Spur Tracks. [The cost of tracks of several different lengths are divided and given in tabulated form].—Coal Age June 10 1916; p 998; pp ½; 20c.

MILL AND MILLING

Crushing, Grinding, Etc.

Gudgeon, C. W.—*The Scheelite-Gold Mines of Otago, New Zealand*. [The geology is taken up and several properties described. Mill flow-sheets and milling and mining costs are given, besides a brief on a wet method for assaying pyritic scheelite for tungsten].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 37; pp 14*; 65c.

Hicks, H. L.—*Quarrying at Rockland Lake, New York*. [The haulage, drilling and power equipment and operations are described in a general way].—Engg. & Cont. June 7 1916; p 512; pp 1¾*; 20c.

Mathewson, E. P.—*Recent Improvements in Concentration at the Washoe Reduction Works, Anaconda, Montana*. [A general detailed description of the crushing and concentration operations in connection with flotation. A flow sheet is given].—Canadian Mg. Inst. Bull. June 1916; p 560; pp 9*; 35c.

Watts, A. S.—*The Feldspars of the New England and North Appalachian States*. [Contains description of the geology and separate descriptions of the quarries. Tests for the feldspar are given, as are methods of quarrying, pumping, crushing, concentration, etc.].—U. S. Bur. of Mines Bull. 92; pp 181*; 35c.

Flotation

Mathewson, E. P.—*Recent Improvements in Concentration at the Washoe Reduction Works, Anaconda, Montana*. [A general detailed description of the crushing and concentration operations in connection with flotation. A flow sheet is given].—Canadian Mg. Inst. Bull. June 1916; p 560; pp 9*; 35c.

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Concentration: Sorting, Sizing, Washing

Gudgeon, C. W.—*The Scheelite-Gold Mines of Otago, New Zealand*. [The geology is taken up and several properties described. Mill flow-sheets and milling and mining costs are given, besides a

brief on a wet method for assaying pyritic scheelite for tungsten].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 37; pp 14*; 65c.

Mathewson, E. P.—*Recent Improvements in Concentration at the Washoe Reduction Works, Anaconda, Montana*. [A general detailed description of the crushing and concentration operations in connection with flotation. A flow sheet is given].—Canadian Mg. Inst. Bull. June 1916; p 560; pp 9*; 35c.

Miner, F. L.—*The New Milling Plant for the Nevada Tungsten Property*. [A brief description of the deposit and the mill].—Mg. World June 10 1916; p 1078; pp 1*; 10c.

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Mill and Smelter Costs

Gudgeon, C. W.—*The Scheelite-Gold Mines of Otago, New Zealand*. [The geology is taken up and several properties described. Mill flow-sheets and milling and mining costs are given, besides a brief on a wet method for assaying pyritic scheelite for tungsten].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 37; pp 14*; 65c.

— *Zinc Ores, Their Occurrence and Utilization*. [Descriptions of the deposits in various countries are given briefly. Prices of the ore and methods of computing its value are given, as well as costs of smelting and methods for the same].—Bull. Imperial Inst., London; p 44; pp 37; 75c.

CHEMISTRY AND ASSAYING

Assaying

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Matheson, A. M.—*Notes on the Chemical Assay of Tin Ores*. [Shows the difference between fire and chemical assays on high pyritic tin ores and the impossibility of estimating mill losses by the vaning and fire assay].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 1; pp 7; 65c.

Analysis

Bailey, E. G.—*Interpretation of Coal Analysis*. [A paper read before the International Railway Fuel Ass'n. A review of what the results of a coal analysis mean].—Pract. Eng. June 15 1916; p 527; pp 2½; 20c.

Jamieson, G. S.—*On the Volumetric Determination of Tin by Potassium Iodate*. [Gives the results of some analyses made and a complete chemical explanation of the method of procedure].—Jnl. Ind. & Chem. Engg. June 1916; p 500; pp 2; 60c.

METALLURGY

Electrometallurgy

Mathews, J. A.—*Electric Furnaces in Steel Making*. [A paper read before the American Iron & Steel Inst. A review of the development of this type of fur-

nace. The principal types are discussed and described, as also are the products from them].—I. Tr. Rev. June 8 1916; p 1264; pp 3; 25c.

Thermic Metallurgy

Burgess, G. K.; Waltenberg, R. G.—*Further Experiments on the Volatilization of Platinum*. [The results of many thermic tests are described, plotted and tabulated].—Jnl. Ind. & Engg. Chem. June 1916; p 487; pp 2¾*; 60c.

— *Zinc Ores, Their Occurrence and Utilization*. [Descriptions of the deposits in various countries are given briefly. Prices of the ore and methods of computing its value are given, as well as costs of smelting and methods for the same].—Bull. Imperial Inst., London; p 44; pp 37; 75c.

Refractories

Bleining, A. V.—*Testing Clay Refractories*. [A paper read before the New Jersey Clay Workers' Ass'n. Besides the description and results of tests, methods for the classification of fire-clay shapes for industrial purposes are given].—B. & C. Rec. June 6 1916; p 1030; pp 3; 35c.

POWER AND MACHINERY

Electricity

Croft, Terrell.—*Rigid Conduit Wiring Hints*. [Contains many drawings and description on the correct methods of installing and using conduits for electric wires].—Pract. Eng. June 15 1916; p 531; pp 3*; 20c.

Fay, A. H.—*Coal Mine Fatalities in the United States in March, 1916*. [A list of permissible explosives, lamps and motors tested prior to May 1, 1916, is also given].—U. S. Bur. of Mines Monthly Statement; pp 22.

Taylor, W. G.—*Motor Equipments for the Recovery of Petroleum*. [A detailed description of methods and practical results obtained by using the slip-ring motor for drilling, pumping, etc. Data covering horsepower required and kilowatt consumption is given].—Proc. Amr. Inst. Elect. Eng. June 1916; p 759; pp 14*; 35c.

Hydro-Electric

Kalenborn, A. S.—*Merced Falls Low Head Hydroelectric Plant*. [A description of its construction and operation].—Jnl. of Elect., Power & Gas June 10 1916; p 445; pp 3¾*; 35c.

Compressed Air

Diserens, Paul.—*Determining the Capacities of Compressors*. [A method for the user which does not require laboratory results for the computations].—Iron Age June 15 1916; p 1438; pp 3*; 30c.

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IV. MISCELLANEOUS

Miscellaneous Costs

Green, Raoul.—*Horse Haulage Versus Compressed Air Haulage—A Comparison of Costs*. [The comparison is made with actual figures and discussion].—Canadian Mg. Inst. Bull. June 1916; p 570; pp 5; 35c.

Ralston, O. C.—*Statement of Flotation*

Oils—Market Situation Regarding Flotation Oils. [A discussion of the market, consumption of oils for flotation, adaptability of the oils and cost of the different kinds].—Mg. World June 10 1916; p 1079; pp 1½; 10c.

Testing

Bleining, A. V.—*Testing Clay Refractories*. [A paper read before the New Jersey Clay Workers' Ass'n. Besides the description and results of tests, methods for the classification of fire-clay shapes for industrial purposes are given].—B. & C. Rec. June 6 1916; p 1030; pp 3; 35c.

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Watts, A. S.—*The Feldspars of the New England and North Appalachian States*. [Contains description of the geology and separate descriptions of the quarries. Tests for the feldspar are given, as are methods of quarrying, pumping, crushing, concentration, etc.].—U. S. Bur. of Mines Bull. 92; pp 181*; 35c.

Metallography

Jeffries, Z.; Kline, A. H.; Zimmer, E. B.—*Determining Grain Size in Metals*. [The authors have evolved a new method for determining the number of grains in a given sample. The properties of iron and steel depend considerable on this].—I. Tr. Rev. June 15 1916; p 1317; pp 3¾*; 25c.

Law, Legislation, Taxation

Thompson, J. W.—*Abstracts of Current Decisions on Mines and Mining*. [Briefs are given regarding cases which occurred from October to December, 1915. Legal phraseology is omitted and justice as brought out in these cases is summarized].—U. S. Bur. of Mines Bull. 118; pp 74; 20c.

History

Mathews, J. A.—*Electric Furnaces in Steel Making*. [A paper read before the American Iron & Steel Inst. A review of the development of this type of furnace. The principal types are discussed and described, as also are the products from them].—I. Tr. Rev. June 8 1916; p 1264; pp 3; 25c.

Societies

Tashof, I. P.—*Kentucky Mining Institute*.—Coal Age June 17 1916; p 1046; pp 2*; 20c.

— *Illinois Mining Institute*. [Account of the summer meeting, May 25 to 27, at Du Quoin, Ill.].—Coal Age June 10 1916; p 1007; pp 1*; 20c.

— *Institution of Mechanical Engineers, England*. [Last ordinary meeting of the year, May 19, 1916].—Engg. May 26 1916; p 492; pp 2; 35c.

— *West Virginia Coal Mining Institute*. [The 17th semi-annual meeting, held June 1, at Bluefield, W. Va.].—Coal Tr. Bull. June 15 1916; p 27; pp 1¼; 25c.

— *West Virginia Mining Institute*. [An account of the meeting, business transactions and papers read].—Coal Age June 10 1916; p 1005; pp 2¾; 20c.

Ore and Metal Markets; Prices-Current

New York, June 29, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended June 28 were as follows:

	New York. Cents	London. Pence.
June 22.....	65	31
23.....	65½	31 3/16
24.....	66½	31 9/16
26.....	65¾	31½
27.....	66	31½
28.....	66¾	31½

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York				London	
	High.	Low.	Avg.	1915.	1916.	1915.
January.....	57½	55½	56.775	48.890	26.875	22.744
February.....	57	56½	56.755	48.477	27.000	22.759
March.....	69¾	56½	57.935	49.926	27.080	23.650
April.....	73½	60½	64.415	50.034	31.375	23.259
May.....	77½	68¾	73	49.915	34.182	23.560
June.....	.....	.....	.....	49.072	.....	21.577
July.....	.....	.....	.....	47.519	.....	22.950
August.....	.....	.....	.....	47.178	.....	22.760
September.....	.....	.....	.....	48.68	.....	23.600
October.....	.....	.....	.....	49.285	.....	23.923
November.....	.....	.....	.....	51.713	.....	24.640
December.....	.....	.....	.....	55.038	.....	26.232
Year.....	.....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Conditions in copper have undergone no startling change since our last report. In fact, there has been such an absence of developments that it is difficult to place before readers a word picture of the situation. Demand for copper has been spasmodic and coming mostly from foreign sources. One of the allied powers came into the market for several lots ranging from 100 to 500 tons, this inquiry being spread among a large number of brokers, all of whom strived to secure 26½ cts. for electrolytic for July delivery, but failed to secure a better quotation than 26¾ cts. from resellers. It is therefore evident that even second hands are now holding firm to a certain level of prices. The fact that some foreign buying is now being done is not taken to indicate that copper is needed abroad, the current buying being mainly an effort to draw out some round lots of resale metal, rather than to force the hands of producers. Domestic copper demand remains entirely absent.

The over-bought condition of the large consumers renders them impotent as factors that may bring a renewal of demand. The producers admit that foreign business alone can be depended upon to create the initial momentum to carry the high tide of copper prosperity well into 1917. Some of the large producers do not expect foreign business to develop before August and possibly not before October. It is evident that the warring nations do not plan to pay high prices for metals unless they are reasonably certain of the war continuing for another year.

Some of the smaller producers lowered their prices slightly on forward deliveries quoting 29½ cts. for August, 29¾ cts. for September, 29 cts. for October, 28¾ cts. for November and 28½ cts. for December. The larger agencies are quoting ¾ ct. above these figures, but in neither case has there been business of a supporting nature. Resellers offered electrolytic for July freely at 27 cts., while for August and September second hands offered at 26¾ cts. Casting copper has also been affected by resellers, liquidation spot being offered down to 24½ cts., with forward deliveries at 24 cts.

Export figures are still being studied with interest. Exports reported from Atlantic ports since the first of the month total 26,798 tons, so that with gulf ports and Pacific coast shipments to be added it is more than likely that June exports will come close to 35,000 tons. In order to co-ordinate with the reported heavy foreign buying exports must run between 35,000 tons and 40,000 tons over the rest of the year. Figuring production at the rate of 190,000,000 lbs. a

month, exports of this volume added to domestic consumption, leaves little surplus material going into stock. Domestic absorption is placed at 120,000,000 lbs. and exports at 65,000,000 lbs. It is now definite that a monthly output of 20,000,000 lbs. in Mexico will be lost until the difficulties are settled.

After maintaining a steady downward trend the London market showed some recovery in standard, but not in electrolytic copper. Standard spot dropped to £97 and futures to £95, while since they have advanced to £102 for spot and £99 for futures. American electrolytic declined £10 to £130 at London last week, which would be equivalent to about 27 cts. New York.

Quotations for copper per pound at New York for the week ending June 28 were as follows:

(For Third Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
June 22.....	27¼ @ 27¾	27¼ @ 27¾	24½ @ 25
23.....	27¼ @ 27½	27¼ @ 27½	24 @ 24¾
24.....	27¼ @ 27½	27¼ @ 27½	24 @ 24¾
26.....	27¼ @ 27½	27¼ @ 27½	24 @ 24½
27.....	27¼ @ 27½	27¼ @ 27½	24 @ 24½
28.....	27¼ @ 27½	27¼ @ 27½	24 @ 24½

NOTE.—These quotations are based on the average of the prices asked by first and second hands.

Quotations for copper per ton at London for the week ending June 28 were as follows:

	Spot.	Standard	Futures.	Electrolytic.
June 22.....	£ 97 0 0	£ 95 0 0	£ 133 0 0	£ 133 0 0
23.....	98 0 0	96 0 0	130 0 0	130 0 0
24.....	98 0 0	96 0 0	130 0 0	130 0 0
26.....	102 0 0	99 0 0	130 0 0	130 0 0
27.....	102 0 0	98 0 0	130 0 0	130 0 0
28.....	103 0 0	100 0 0	130 0 0	130 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month	1916			1915.
	High.	Low.	Average.	Average.
January.....	25.50	23.00	24.101	13.891
February.....	28.60	25.25	27.437	14.72
March.....	28.25	27.25	27.641	15.11
April.....	30.00	28.50	29.40	17.398
May.....	29.75	28.25	29.05	18.812
June.....	.....	.....	.....	19.92
July.....	.....	.....	.....	19.423
August.....	.....	.....	.....	17.472
September.....	.....	.....	.....	17.758
October.....	.....	.....	.....	17.925
November.....	.....	.....	.....	18.856
December.....	.....	.....	.....	20.375
Year.....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January.....	25.50	23.00	24.101	13.707
February.....	28.50	25.25	27.462	14.572
March.....	28.25	27.25	27.410	14.96
April.....	30.50	28.25	29.65	17.057
May.....	29.75	28.00	28.967	18.601
June.....	.....	.....	.....	19.173
July.....	.....	.....	.....	19.08
August.....	.....	.....	.....	17.222
September.....	.....	.....	.....	17.705
October.....	.....	.....	.....	17.869
November.....	.....	.....	.....	18.826
December.....	.....	.....	.....	20.348
Year.....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January.....	24.25	22.00	23.065	88.008	60.760
February.....	27.00	24.12½	26.031	102.760	63.392
March.....	27.75	25.50	26.210	106.185	66.235
April.....	28.00	26.75	27.70	103.681	77.461
May.....	27.75	26.00	26.692	104.794	77.360
June.....	.....	.....	.....	.....	82.350
July.....	.....	.....	.....	.....	74.807
August.....	.....	.....	.....	.....	67.350
September.....	.....	.....	.....	.....	68.560
October.....	.....	.....	.....	.....	72.577
November.....	.....	.....	.....	.....	77.400
December.....	.....	.....	.....	.....	80.400
Year.....	.....	.....	.....	.....	.....

Tin.—Aside from a sudden influx of buying orders, which came on Friday, the market has been dull, with prices steadily declining. The purchases for forward deliveries were made when the London market came higher after a steady downward movement, and it was thought that the bear campaign had been brought to a close. Later developments indicated that this surmise was amiss and the market once more lapsed into dullness, with prices easing off. The situation in tin is varied. The spot position is heavy, due to excessive arrivals and the ample supply held by users. The forward position is uncertain. Consumers intimate that greater supplies of Banka and Chinese tin should affect Straits, and therefore are waiting until Straits' producers are ready to make prices more favorable. The point is whether consumers can hold out long enough. Our consumption has increased heavily, due to greater tin plate production and larger use of solder in automobile plants. Spot tin eased off to 39½ cts. Straits and 38 cts. for Banka, while spot Chinese 99.80% was quoted at 38½ cts. Lamb & Flag 99% could be had at 38¼ cts. on the spot. Straits tin for July delivery was quoted at 39¼ cts., with August offered at 39 cts. and September and October at 38¾ cts., with November and December at 38½ cts.

Arrivals of tin since the first of the month total 4870 tons. The *Rotti* arrived a week ahead of time with 1350 tons Banka tin, thus flooding the market. The stock afloat to this country totals 2727 tons. Adding Atlantic arrivals of 4870 tons to 2468 tons, the stock on June 1.

Tin at London and Singapore has been declining steadily, except for the brief upturn at London on Friday and at Singapore on Monday. The Singapore market dropped £7 15s last week, but advanced £5 to £179 5s at the opening of the current week. Straits tin at London receded £1 5s last week, with an additional decline of £2 10s on Monday, bringing the price down to £174 5s. Straits tin at London at £174 5s is equivalent to 37.10 cts., while Singapore at £179 5s is equivalent to 38.05 cts.

Quotations for tin per pound at New York and per ton for Straits at London and at Singapore for the week ended June 28 were as follows:

	New York		London.	
	Spot.	July.	Straits, spot.	Singapore.
June 22.....	39¾c	39½c	£173 10 0	£174 0 0
23.....	40¾c	40¼c	176 15 0	174 5 0
24.....	40¾c	40¼c	176 15 0	174 5 0
26.....	39½c	39¼c	174 5 0	179 5 0
27.....	39¾c	39½c	172 10 0	175 5 0
28.....	39c	38½c	173 5 0	173 5 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June .....	.....	.....	.....	40.373
July .....	.....	.....	.....	37.493
August .....	.....	.....	.....	34.386
September .....	.....	.....	.....	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	33.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Active foreign buying of lead helped to restore the market and prices are now holding very strong at the top. Russia has been the principal buyer, although other European countries have also made purchases. The Russian government took 1600 tons for early shipment, with 400 tons taken by other countries. This absorption was mainly done around 6.90 cts. New York and in a measure will materially assist the principal producer in adhering to its price of 7 cts. New York, which will become the average for June. In the outside market prices after receding to 6.75 cts. New York, and 6.65 cts. St. Louis, recovered 10 points. Domestic buying has been limited, but the A. S. & R. Co. is understood to have taken some good-sized orders on its average price contracts. Lead producers still feel that the metal will hold its own for months to come. Expectations are that more shrapnel contracts will be placed in this country, which would boom the lead market, but up to the present the Allies have confined their shell contracts to explosive and not shrapnel shells. At London the market declined quite sharply, spot

closing £1 17s 6d lower and futures £2 5s lower than the opening prices last week.

Quotations for lead per pound at New York and per ton at London for the week ended June 28 were as follows:

	New York		London	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
June 22.....	6.80c	7.00c	£30 0 0	£29 10 0
23.....	6.85c	7.00c	29 10 0	28 15 0
24.....	6.85c	7.00c	29 10 0	28 15 0
26.....	6.85c	7.00c	29 15 0	28 10 0
27.....	6.85c	7.00c	29 15 0	28 12 6
28.....	6.85c	7.00c	29 0 0	28 5 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	31.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June .....	.....	.....	.....	5.875	25.750
July .....	.....	.....	.....	5.738	25.611
August .....	.....	.....	.....	4.750	22.150
September .....	.....	.....	.....	4.627	22.953
October .....	.....	.....	.....	4.612	23.932
November .....	.....	.....	.....	5.152	26.240
December .....	.....	.....	.....	5.346	28.884
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—A water spout the first part of the week ending June 24 hindered production to a certain extent in the Missouri-Kansas-Oklahoma district. The Galena, Joplin and Webb City camps were among those most affected. Prices were down, registering \$75 to \$77.50, and there were produced during the week 2,074,640 lbs. of concentrates. This brought the total production for the year to date at 54,119,082 lbs. and these had respective values of \$79,469 and \$2,422,349.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June .....	.....	.....	.....	63.50
July .....	.....	.....	.....	59.00
August .....	.....	.....	.....	47.50
September .....	.....	.....	.....	48.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—A better tone was noted in the market for these ores in the Missouri-Kansas-Oklahoma district. The top price for the week ended June 24 remained as during the previous week, at \$90, but the prices for lower grades was up \$10 to \$70 per ton. Production for the week was 12,092,880 lbs. of concentrates and for the year to date was 349,724,764 lbs. The respective values for these productions were \$474,356 and \$16,842,369.

Calamine continued in fair demand at \$52.50 to \$65 and there were produced during the week 389,260 lbs. of concentrates. With this production, the total for the year to date was 18,745,720 lbs. and the values for the same were \$10,670 and \$698,408.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	63.60
June .....	.....	.....	.....	116.00
July .....	.....	.....	.....	111.00
August .....	.....	.....	.....	60.25
September .....	.....	.....	.....	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—The market has been utterly devoid of business and the fact that prices have only been lowered moderately is due to efforts of sellers to hold up the market, although it is generally known that at all times quoted prices can be shaded. Thus spot is held at 12 cts. New York and 11½ cts. St. Louis, with sellers willing to take ¼ ct. less. The absence of business is beginning to affect the higher grades, on which an official reduction in prices has been

announced. Consumers are closely watching the situation, and it is evident that good buying will develop as soon as prices reach what users feel is rock bottom. Galvanizers are extremely anxious to restore their trade, but withal are not acting hastily. Brass makers are well supplied and can remain out of the market for several months to come. Spelter for July delivery was offered at 11½ cts., with August at 11½ cts., September at 11 cts. and last quarter at 10 cts. The decline at London last week was moderate, spot dropping £2 and futures £4.

Quotations for spelter per pound at New York and per ton at London for the week ended June 28 were as follows:

		New York.		London.	
		Spot.		Spot.	Futures.
June 22	.....	12¼c		£67 0 0	£57 0 0
23	.....	12c		66 0 0	56 0 0
24	.....	12c		66 0 0	56 0 0
26	.....	12c		65 0 0	55 0 0
27	.....	11¾c		65 0 0	55 0 0
28	.....	11½c		63 0 0	53 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1915	1916	1915	1916	1915
January	19.42½	17.30	18.801	6.519	89.840	80.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	.....	.....	.....	22.625	.....	100.320
July	.....	.....	.....	20.803	.....	98.150
August	.....	.....	.....	16.110	.....	68.250
September	.....	.....	.....	14.493	.....	64.400
October	.....	.....	.....	14.196	.....	64.196
November	.....	.....	.....	16.875	.....	88.240
December	.....	.....	.....	16.675	.....	89.153
Year	.....	.....	.....	13.914*	.....	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—There has been a sharp recovery in values, with an active demand from both domestic and foreign consumers. Prices have advanced to \$80 a flask, at which level some dealers have bought, while retailers asked \$85 a flask. The turn in the market was accomplished by English buying. With quicksilver selling at \$80 a flask in London and the market here prevailing at \$68, purchases for export could be made. While the market has recovered, it is not expected that the \$300 price will again be witnessed. Consumers realize that the metal is closely controlled. The banking interests who forced the price reaction by liquidation have completely sold their holdings, but one other banking interest now holds 1000 flasks. The Swedish and Danish governments were buyers of quicksilver last week.

Antimony.—Chinese and Japanese producers of antimony are industriously circulating reports of an active demand, but close investigation develops the fact that business is almost dormant, with sellers willingly taking large and small orders at 18½ cts. for good brands on the spot. Large consumers have had their fingers burnt severely by the rise in antimony and when it is considered that the Chinese and Japanese can sell at 9 cts. with a profit, there is no disposition among users to buy any further supplies. Many consumers are accepting deliveries of antimony for which they arranged to pay from 35 cts. to 40 cts., and dealers who also bought when prices were high are accepting their losses.

Aluminum.—Demand for spot virgin ingots continues quite active, with prices firmly held at the recent advance, viz., 63@65 cts. a pound in ton lots. Sellers quote pure 98-99% remelted at 61@63 cts. and No. 12 alloy remelted at 50@52 cts. Prompt aluminum sheets are firm, higher, and in demand, with sales made at \$85@100.

Pig Iron.—Foreign business continues to be the sole feature of the market, Italy and France taking large amounts, while latterly Spain has come out for a round tonnage of steel-making iron. Domestic business has been quiet, with resale iron affecting the resumption of demand, as consumers will not pay furnace prices when resale iron can be had at \$1@2 less. Thus Birmingham resale iron has been offered at \$13 as against \$15, the furnace price, while at Buffalo resale iron has been sold at \$17.25, with the furnaces asking \$18.50. The recent large domestic purchases were done with resellers.

Ferromanganese and Other Alloys.—Offerings for

ferromanganese for fourth quarter delivery by domestic furnaces at \$175 for 80% have been noted. As the English makers have been asking \$200 for this period it is certain that domestic producers will receive the bulk of the business to be placed unless the foreign makers lower their quotations. One of the English producers instructed its agent to offer 1917 contracts at \$172 seaboard, a reduction of \$3 a ton, but as domestic furnaces are expected to take business at \$125 to \$150, the weak effort to stimulate business caused laughter. Speigeleisen has been fairly active for the second half, with sales at \$50 furnace for 20%. Ferrosilicon continues unchanged at \$83 to \$85 Pittsburgh for 50%.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	3.00	to	3.25
Muriatic, 20 deg.....	3.25	to	3.50
Nitric, 36 deg.....	.075½	to	.08
Nitric, 40 deg.....	.08½	to	.08¾
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured, 183 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.71
Alum—Powdered, lb.....	.05¼	to	.08
Ground, lbs.....	.041	to	.07½
Lump, lb.....	.04	to	.06½
Ammonia—			
Muriate, white grain, lb.....	.08¾	to	.08¾
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06¼	to	.065
Red, lb.....	.55	to	.60
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.15	to	.16
Bismuth—Metallic, lb.....	3.11	to	3.20
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	5.25	to	5.75
Borax—100 lbs., car lots.....	7.50	to	8.00
Coke—Connellsville furnace.....	2.50	to	2.75
Foundry.....	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese—Spot.....	225.00	to	250.00
Last half.....	175.00	to	200.00
Ferrosilicon, 50%.....			55.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.60	to	.70
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
Lead—Granulated, lb.....	.15	to	.15¾
Brown sugar.....	.13¾	to	.14
White crystals.....	.15¾	to	.15¾
Broken, cakes.....	.14¾	to	.15
Powdered.....	.17	to	.17½
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13	to	.14
20 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 20 gr.....	.37½	to	.38
Wood grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.32¾	to	.33¾
Benzine, 53 to 62, gal.....	.29	to	.29½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	80.00	to	86.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.44	to	.45
Carbonate, cal. 96 to 98%.....	1.55	to	1.57
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.50	to	.58
Prussiate, yellow.....	1.25	to	1.30
Prussiate, red.....	4.25	to	4.50
Salt peter—Crude, lb.....	.15	to	.15½
Refined.....	.30	to	.31
Soda—Ash, 58% (43% basis), bbl.....	1.25	to	1.50
Strontia Nitrate, casks, lb.....	.48	to	.50
Sulphur—			
Crude, ton.....	28.50	to	29.00
Flowers, 100 lbs.....	2.50	to	2.70
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	17.25	to	17.75
Crystals, bbls., lb.....	.33	to	.33½
Oxide, lb.....	.49	to	.51
Zinc Chloride.....	.15	to	.22

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OLD DOMINION COPPER CO.'S CONCENTRATING PLANT.

The Old Dominion Copper Co.'s Operations

By W. A. SCOTT.

The main shaft "A" of Old Dominion Copper Co., Globe, has five compartments—two for skip hoisting, two for cages and one for pump columns, steam lines and electric cables. Hoisting in cars has given way to hoisting by $3\frac{1}{2}$ -ton skips. Ore and waste pockets are maintained on the 8th, 12th, 14th and 16th levels. The ore being hoisted to the surface amounts to 1200 tons per day—700 tons being concentrating ore and 500 tons smelting ore. In addition to this a big tonnage of waste is being raised. The principal ore production of the mine is from the 1200, 1400 and 1600-ft. levels. The most of the smelting ore is taken from the west side of the mine, the concentrating ore coming mostly from the east, or United Globe side. Mining and development work is progressing in the Grey mine, in which are the most easterly workings on the Old Dominion vein. Drifts are being pushed east-

ward from Grey shaft on the 10th level to open the vein between the Grey and the Arizona Commercial Co.'s Copper Hill shaft. Development is proceeding in the west section of the mine on the 17th and 18th levels, and soon the footwall extension drift on 18th level will be connected with shaft "A." Three-ton locomotives are used on the 12th, 14th and 16th levels for hauling ore in 20-ton mine cars to skip pockets at the shaft.

The water flow in the mine, which reached its 1916 maximum of 11,000,000 gals. per day in February, has decreased to 6,500,000 gals. Plans are made for installing emergency centrifugal pumps on the 10th and 12th mine levels to supplement the existing station pumps on the 12th. Within the last 6 months the separate pump shaft has been connected from the 10th level to the surface. In the next few months



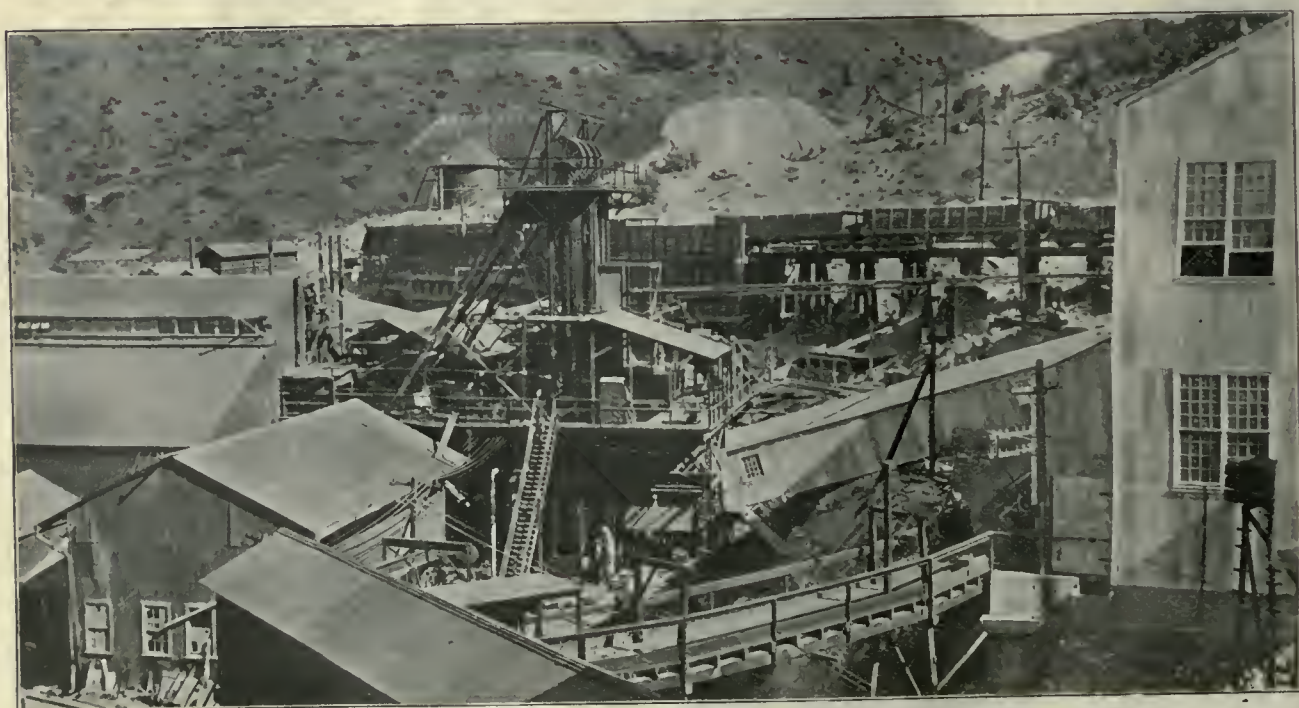
CRUSHER, SAMPLING, MACHINE, POWER AND OTHER BUILDINGS SURROUNDING "A" SHAFT, OLD DOMINION.



OLD DOMINION CRUSHER AND SAMPLING PLANT.



OLD DOMINION CONCENTRATES DEWATERING PLANT.



HEADFRAME AND OTHER EQUIPMENT SURROUNDING OLD DOMINION "A" SHAFT.

this pump raise will be lined with reinforced concrete, and soon thereafter all lines, columns and cables will be transferred from main shaft "A" to this pump shaft. The latter is 7x7 ft., designed to carry a cage in the center, leaving room for water columns, steam lines and electric cables in the corners and next to the walls. It is to have a depth of 1400 ft. and will be dry and fireproof.

Further plans contemplate installing skip-hoisting



OLD DOMINION SAMPLING PLANT.

equipment at the Kingdon shaft, skip pockets having been already cut out for this work.

At the concentrator, 800 tons of ore per day is being milled, 300 tons per day of slime product being concentrated by oil flotation, the equipment for which consisting of a 16-box Minerals Separation machine. The flotation concentrates are thickened and dried by an Oliver filter, reducing the moisture to 17%. A new flotation unit is to be installed in the near future to supplement the present unit. Old Dominion water concentrates, amounting to 100 tons per day, and flotation concentrates amounting to 30 tons per day, are

being shipped to the International smelter at Miami. The mill recovery of 87.7% is divided as follows: Jig product, 41.7%; table and vanner saving, 26%; flotation product, 20%. The coarse table concentration is over Deister Concentrator Co.'s tables, these receiving material from Deister cone classifiers. A new feature of equipment consists of four Senn pan-motion vanners, which are handling the overflow slimes, receiving their feed from Allen cone classifiers. Special tests made on a Senn vanner, prior to installing these four machines, showed exceptionally high capacity and a satisfactory recovery. The five Hardinge mills are used for fine grinding, and a Marathon mill is being installed for similar use.

The Old Dominion smelter, having three blast furnaces and a 12-foot converter shell, is turning out about 2,500,000 lbs. of copper per month, while about 750,000 lbs. of Old Dominion copper is being made at International smelter making a total production of nearly 3,500,000 lbs. per month. The writer is indebted to D. G. Beckett, general manager of Old Dominion Copper Co. for data used herein and for other courtesies.

Production of Gold and Silver in the United States.

The Bureau of the Mint and the Geological Survey have issued the following joint statement as to their final figures on the production of gold and silver in the United States during the calendar year 1915:

	Gold		Silver	
	Fine ozs.	Value.	Fine ozs.	*Value.
Alabama	247	\$ 5,100		
Alaska	808,346	16,710,000	1,054,634	\$ 526,100
Arizona	220,392	4,555,900	5,665,672	2,826,500
California	1,090,731	22,547,400	1,689,924	843,100
Colorado	1,089,928	22,530,800	7,199,745	3,591,900
Georgia	1,684	34,800	141	100
Idaho	56,628	1,170,600	13,042,466	6,506,800
Illinois			3,892	1,900
Michigan			581,874	290,300
Montana	240,825	4,978,300	14,423,173	7,195,600
Missouri			55,534	27,700
Nevada	574,874	11,883,700	14,453,085	7,210,500
New Mexico	70,632	1,460,100	2,337,064	1,165,900
North Carolina	8,258	170,700	1,496	700
Oregon	90,321	1,867,100	125,499	62,600
Philippine Islands	63,898	1,320,900	15,148	7,600
Porto Rico	34	700		
South Carolina	174	3,600		
South Dakota	358,145	7,403,500	197,569	98,600
Tennessee	329	6,800	99,171	49,500
Texas	87	1,800	724,580	361,500
Utah	189,045	3,907,900	13,073,471	6,552,200
Vermont			150	100
Virginia	24	500		
Washington	22,330	461,600	213,877	106,700
Wyoming	672	13,900	2,910	1,400

Total 4,887,604 \$101,035,700 74,961,075 \$37,397,300

*At the average price of silver per fine ounce for the calendar year 1915, \$0.49889.

These figures compare with the production of 1914—\$94,531,800 in gold, and 72,455,100 fine ounces of silver, being a gain in the gold production of \$6,503,900 and 2,505,975 fine ounces in the silver product.

Tin exports from the Federated Malay States for May were 3722 tons against 3823 tons in May, 1915, and 4135 tons in May, 1914. The total exports for the first five months of 1916 were 18,224 tons, as compared with 19,270 tons and 20,599 tons to June 1, 1915, and 1914 respectively.

List of Sketches of Safety Devices.

By EDWIN HIGGINS.*

There is submitted below a list of drawings of safety and efficiency devices, which may be secured free of cost by California mine operators. In asking for any of the drawings, they may be referred to by number:

- 1—Arm and Leg Splints.
- 2—Electric Pull Switch for Mine Bell Signal.
- 3—Safety Hook for Bucket.
- 4—Continuous Ringing Bell for Motors.
- 5—Safety Elevator Gate.
- 6—Automatic Switch to Operate Colored Signal Lights.
- 7—Details of Safety Clutch for Cage.
- 8—Detail Sketch of Safety Catch for Cage.
- 9—Safety Catch for Cage.
- 10—Miscellaneous Parts of Cage.
- 11—Shaft Cover for Sinking.
- 12—Safety Crosshead for Bucket.
- 13—Iron Drill Rack.
- 14—Lock Hook for Bucket.
- 15—Grid Iron for Protection at Collar of Ore Chute.
- 16—Iron Door.
- 17—Alarm Bell for Cage.
- 18—Standard Shaft Gate (Swing).
- 19—Safety Crosshead.
- 20—Removable Bonnet for Skip.
- 21—Cover for Skip.
- 22—Underground Dry Closet.
- 23—Guard for Underground Trolley Wires.
- 24—Shaft Gate.
- 25—Metal Stretcher.
- 26—Semiautomatic Gate for Mine Shafts.
- 27—Underground Stretcher—Homestake.
- 28—Belt Shifter on Lathe.
- 29—Sheet Iron Covers for Locking Boiler Valves.
- 30—Water Gauge Glass Guards.
- 31—Gate for Shaft Collar.
- 32—Protective Railings for Boilers.
- 33—Grinding-wheel Guard.
- 34—Emery Wheel Eye Shield.
- 35—Cage Safety Catch Testing Device.
- 36—Safety Cage for Ladders.
- 37—Tipple for Dumping Mine Cars.
- 38—Stretcher Drill Diagram.
- 39—Cabinet and Rack for Mine Rescue Apparatus.
- 40—Change House.
- 41—Guard for Rip Saw.
- 42—Riley Two Deck Cage.
- 43—Automatic Side Dump Car.
 - (a) Standard Incline Trip.
 - (b) Draw Bar.
 - (c) Lower Hinge of Dumping Mechanism.
 - (d) Door Catch Angles.
 - (e) Side View, Dump Car.
 - (f) Details.
 - (g) Details.
 - (h) Details.
 - (i) Details.
 - (j) Details.
- 44—Underground Dry Closet.
- 45—Guard for Tram Car.
- 46—Underground Latrine.
- 47—Door for Cage.
- 48—Safety Crosshead.
- 49—Shaft Gate.
- 50—Trolley Support Methods.
- 51—Underground Toilet Car.
- 52—Sanitary Dry Closet.
- 53—Candle Holder for Miners.
- 54—Toboggan Stretcher for Underground Use.
- 55—Circular Removable Bonnet for Skips.

In addition to the drawings listed above, there are set forth below the titles of a limited number of clip-pings that are on hand. These are made up chiefly of sketches and descriptive text. They will be mailed on request, free of cost, as long as they last:

- Air Compressor Cooling with Water Barrels (Illus.).
- Aurora's (Nev.) Change House (Illustrated, with cost estimate).
- Drifting with a Stoper (Illus.).
- Improved Safety Door for Dumps (Illus.).
- Bucket-Dumping Device (Illus.).
- Regarding Primers and Misfires.
- Device to Aid in Fuse Spitting (Illus.).
- Proper Way to Spit Fuses (Illus.).
- Bag for Carrying Dynamite (Illus.).
- A Simple Dynamite Thawer (Illus.).
- Burning Empty Dynamite Cases.
- A Fire-Bucket Float (Illus.).
- Coupling Hook for Mine Motors (Illus.).
- Finger Guard on Tram Car (Illus.).
- Safety Hand Grip for Mine Car (Illus.).
- Automatic Landing Chairs (Illus.).
- Spillage and Sinking Pocket (Illus.).
- Crossheads for Bucket Hoisting (Illus.).
- Runaway Tubs or Hutches (Illus.). A safety hook for shafts of slight inclination.
- How to Splice Wire Rope (Illus.).
- Miners' Dwellings (Illus.).
- Concrete-block Mine Houses (Short).
- A Simple Chain Ladder (Short).
- Wood versus Steel Mine Ladders (Illus.).
- Capital Mine Steel Ladders (Illus.).
- A Simple, Strong Chute (Illus.).
- A Substantial Ore Chute (Illus.).
- Types of Chutes and Chute Gates (Illus.).
- Removable Chute Spray (Illus.).
- Drinking Fountain for a Mine (Illus.).
- Water Disinfecting Outfit for Field Use (Illus.).
- Septic Tank for Underground Latrine (Illus.).
- Four-deck Shaft-repair Cage (Illus.).
- Cover for Shaft Ladderway (Illus.).
- Simple Folding Shaft Gate (Illus.).
- Hinge for Shaft Doors (Illus.).
- Shaft Timbering and Headgear on the Mesabi Range (Illus.).
- Light Shaft Timbering (Illus.).
- Locked Signal System (Illus.).
- Bell-wire Arrangement in Sinking (Illus.).
- Gravity Release Electric Signal Box (Illus.).
- Warning Bell for Topman (Illus.).
- Raising a Gin Pole (Illus.).
- Straightening a Tall Leaning Chimney (Illus.).
- Safety Staging Hook (Illus.).
- Methods of Stope Timbering (Illus.).
- Emergency Pipe Wrench (Illus.).
- Timbering for Air-check Doors in Motor-haulage Drift (Illus.).
- Ventilating a Long Drift.
- Water-tank Indicating Gauge (Illus.).

Money losses through poor freight classifications often take place; for instance, drill machines take different rates. One mining company placed an order for two drill machines, price to be f. o. b. mine. Later in the same month the drill machine agent came around and took an order for another two machines same kind, weight, etc. The four came in the same month, but were classified differently. There was quite a difference in the freight rate; in one case the shippers saw to it that the cheapest freight rate was obtained as the machines were bought f. o. b. mine. In the other they had an order for machines from their traveling salesman, nothing being said as to freight rate or point of delivery.

*State Mine Inspector for California.

Relations Between Custom Smelters and Small Mine Owners

By J. M. TURNBULL, M. E.*

The average prospector, small mine owner or manager, and others interested in mining on a small scale, have usually very vague ideas in regard to the operations of a smelter. Their ideas in regard to the values of ore are, as a rule, based on the gross values. If the gross value of the ore, figured on full assay at market prices of metals, is, say \$20, and the smelter treatment rates is say \$5, one would at first sight expect to get a net of \$15, and when, instead, one gets \$8 or \$10, it is natural to feel that there is something wrong, and that all the deductions made by the smelter, which account for the difference, cover a large hidden profit for the smelter—in fact that one has practically been robbed. If, however, one was familiar with how these deductions were arrived at, and had an idea as to what deductions were reasonable and justified, and what ones not, he would be in a better position to see what kind of a deal he was getting, and judge its fairness for himself.

Smelters and the Public.

In answer first to the broad question: Do present day smelters of custom ores make exorbitant charges, or rob the miner? I have no hesitation whatever in answering "No" to this question in general. In the great majority of cases where charges seem excessive there is a good reason back of them. This is partly due to competition, and partly, in common with other large business, due to the fact that in the long run it pays to be reasonably honest. In exceptional cases exorbitant charges may be obtained, but eventually they discourage production, on which the life of the smelter depends, and the modern policy is to encourage the producer with fair rates, and so build up a permanent business, in return for the large capital investment required. While not usually guilty of robbery and extortion, smelters are in business to make a profit, and endeavor to buy and sell to best advantage. The small miner can hardly expect as good rates as the large steady producer, but by knowing something about the business he can often market his ore to better advantage, and get the best contract possible.

Smelter Profits.

The American Smelting & Refining Co., in 1915, did a volume of business amounting to \$225,000,000, on which their net profit was some \$13,000,000, or 5% on the turnover. Of this, however, nearly \$4,000,000 was put back in the form of new construction for 1916. 1915 was a good year, and the profits do not

look very great compared with some of the "War Baby" stocks. The profits were very good, much better than many former years, but hardly look like extortion or robbery.

On a tonnage of over 4,000,000 tons the average net profit was about \$2.25 per ton. In British Columbia our smelters are largely engaged in smelting ores from their own mines, and their total profits are from both mines and smelter, and the smelting profits are not separately given in annual reports. In the case of the Trail smelter, which smelts the largest tonnage of custom ores in British Columbia this tonnage is from 12 to 15% of their total only. I happen to know positively, from my past connection with this smelter that their rates are not extortionate on custom ores.

Having given the smelters a fairly good character, I will now take up certain points in connection with their operations and charges in detail.

Settlements in General.

Theoretically a smelter operates on the idea that he takes your ore, extracts the pure metals from it, and hands them back to you, charging you a fair price for the work of doing so. In practice this is found to be impossible however. Each lot of ore cannot be smelted separately, and its contents kept separate. For economical smelting an average constant mixture must be maintained, so that before the ore ever sees the furnace it is mixed up with other ores, and since ores are received irregularly, some are smelted quickly and others may be delayed some time, in order to keep the furnace mixture reasonably constant. A dozen different ores may be in the furnace at once and the metal produced is merely an average. The average losses can be determined, but no one can tell what the exact loss is on any particular one of them. What the smelter does is to put each lot separately through the sampling mill and assay the sample, determining the metal contents by this assay. The losses can only be assumed in each case from the average loss on all the ores smelted together.

A smelter test on any lot of ore consists of an accurate sampling and assay. There can be no real smelter test on one lot. To ship a carload for a smelter test means therefore that you get an accurate sample, and the smelting quality of the ore is largely judged from the analysis made in the laboratory, long before the ore gets near the furnace. Since metal is produced by the smelter in one lot from many lots of ore, it is practically impossible to separate it into proportionate small lots and hand each mine back its proportion, nor could it be sold in this way to ad-

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vantage, since metal selling is a complicated business, based on large contracts, etc., so that the smelter is compelled to act as selling agent. Selling costs money; therefore the smelter always deducts a market charge from your ore in some form or other.

Extracting the metal from your ore and selling it takes on the average about 3 months; therefore, unless you wish to wait 3 months for your returns on ore, the smelter is compelled to act as banker, and advance you the money on the basis of the ore assay. This means interest charges which are also deducted from you in some form. The price of metals may vary greatly in 3 months, however, so that if the smelter pays you on the basis of the price at the time he receives the ore, he may make a profit or loss on the sale of metal 3 months later, according as the price goes up or down in the meantime.

This method of payment is known as "spot" settlement. It is not usually desired by the smelter, since a slump usually occurs when metal prices are high, when everybody is shipping all he can and the smelter is overstocked with ores, so that the tendency is for the smelter to make a larger loss on the slump than gain on the rising market. To place the risk of gain or loss on the mines, the smelter may make contracts on a 3 months' settlement, that is pay 90% spot and adjust the balance on the price of metals 3 months after receipt, paying you in fact as near as possible on the basis of what they actually receive for the metal.

Treatment Charge.

In quoting you a treatment rate, the smelter makes various deductions, which are supposed to cover marketing costs, losses in smelting and so on. Presumably these are the costs and losses actually incurred by the smelter in operation, acting as your agent, and do not theoretically leave any profit for the smelter, that is from the deductions alone. In addition a straight treatment charge is made, which presumably covers actual cost of smelting plus profit. If the smelter makes an unusually low treatment charge, it probably makes up the difference by high deductions and vice versa. A low treatment charge does not necessarily mean that you are getting your ore smelted cheaply.

In the meantime, what is a fair treatment charge? This depends on the ore, and can only be answered very generally. On copper ores, with immense ton-nages of easily smelted ore, the direct cost of smelting may be as low as \$1.25 per ton, as at Grand Forks. With high-grade concentrates it may run up to \$4 or even more. On the general run of ordinary ores somewhere about \$3 would not be excessive. Adding one or two dollars for profit a charge of \$4 or \$5 is reasonable in most cases, provided an extra profit is not also made on excessive deductions.

On lead ores which require roasting, as most British Columbia ores do, the direct costs of smelting, not including refining, may run as high as \$8 or even more but are even more difficult to average up than

copper, depending on the grade of the ore, and treatment charge is often on a sliding scale varying from \$8 to \$12 in general, which, including profit, is not usually excessive if deductions are fair.

Moisture.

Ores are received at the smelter in railway cars, etc., are first weighed, giving the gross weight, then in turn go through the sampling mill being crushed, run over samplers, etc., in the course of which they dry out to some extent. The sample is taken, part of which is weighed and dried in an oven, and the per cent of moisture determined. From this and the gross weight the dry weight is calculated, the assay is made on the dried sample and payment is made on the dry weight, which is fair and accurate. In the sampling and handling, however, the ore dries out somewhat and there is often a considerable dust loss. To cover these losses the smelter sometimes makes a deduction of about $\frac{1}{2}$ of 1%, which is called yard loss. The loss is real, but just what it really amounts to is hard to determine, impossible in fact. One must judge its fairness by circumstances. It is, however, not a dishonest deduction in principle—it is a question of amount.

Marketing Charges.

What is a fair marketing charge? This is rather a knotty question to answer. Let us see what marketing charges consist of. Refining either lead or copper is usually considered as part of the marketing. Copper refining probably costs about $\frac{1}{2}$ ct. per pound in the east, and somewhat higher in the west, depending on labor and electric power costs largely, as well as scale of operations, say not over $\frac{3}{4}$ ct. Freights from the west to New York would account for another $\frac{1}{2}$ to $\frac{3}{4}$ ct. Three months' interest brokerage and commissions bring the total up to about $1\frac{1}{2}$ to $1\frac{3}{4}$ cts. for the great big fellows, while the smaller smelter might be out 3 cts. or even more. On custom ores the deduction is usually from 3 to 4 cts. per pound. In general the smelter probably plays safe on this and makes from $\frac{1}{2}$ to 1 ct. per pound equivalent to from 30 to 60 cts. per ton on 3% ore. A high deduction on this account is all right if the treatment charge is low by a corresponding amount.

In case of lead, refining is less costly being a minimum of 0.2 ct. per pound under most favorable conditions of cheap fuel and labor. In the west it might run up to 0.5 ct. Freight from the west would be to the east, where the chief market is, another 0.5 or 0.6 ct. besides selling expenses. The Trail, B. C., smelter deducts 1 ct. per pound for marketing, on which they evidently make no profit. American smelters usually deduct $1\frac{1}{4}$ to $1\frac{1}{2}$ cts., and can make apparently low treatment charges on ore in consequence. There is a mutual tariff wall between Canada and the United States on lead, hence marketing conditions are somewhat artificial, whereas in copper there is free interchange. Lead ores as shipped usually contain

from 25% to 70% lead, whereas copper ores run from 1% or 2% up to not over 10% or 15% as a rule, hence the marketing charge on lead usually figures out much higher per ton of ore, even though less per pound of metal.

Metal Deductions.

Smelters usually make deductions from the metal assay to cover losses in smelting. In the case of copper, losses are chiefly in the slag, and partly mechanical, flue dust handling, etc. Slag in the furnace seems to hold a certain minimum amount of copper varying to some extent with the grade of the ore. Considering all the operations which time prevents my considering in detail, the loss seldom runs very much below 0.3%, and may be considerably more on high grade ores. We may take 0.3% as a fair average deduction on which the smelter is not making much if any profit. Except on high grade ores, 20% to 30% copper or more, any deduction over about 0.3%, represents a profit for the smelter. In many cases it will be found that the smelter is making a deduction of 1 to 1.3% usually with a low treatment charge to correspond.

Lead deductions are on quite a different basis, chiefly because lead and lead compounds, unlike copper, are volatile at furnace and roasting heats. Lead smelters make various rates. The Trail smelter pays 90% of the lead; that is it deducts 10% for losses, which losses mostly occur in smoke. Certain United States smelters smelt Mexican lead ores in bond and are required to export the equivalent amount of lead metal. The U. S. Government therefore checks them up, and makes an allowance for losses in smelting and refining. In 1914 these were as follows: Balbach, New Jersey, 8.52%; Perth Amboy, N. J., 22.32%; El Paso, Texas, 18.56%. This is pretty good evidence. In the case of Trail, I know that the losses are away over 10%, that is why they are spending so much money on Cottrell smoke plants to reduce the loss.

As a matter of fact the losses depend on the ores; they are much less on very pure ores. In Missouri they may be less than 5%, but on impure zinc ores such as we have in Canada, in the west, 10% is a fair deduction, more than fair in fact.

On silver and gold the deduction is usually 5%, at which figure there is little profit or loss for the smelter on the average, so that we need not go further into it.

Penalties and Bonuses.

Lead furnace slags can carry about 6 or 7% zinc without much detriment. Above this point the zinc has two bad effects, first it tends to carry silver into the slag, and second it tends to make the slag infusible and pasty, which results in slow furnace running, greater slag losses, and difficulties in running, which add materially to the costs and troubles, of which there are plenty in lead smelting in any case, and cuts down capacity. This rapidly gets worse as the zinc gets higher. With over 12 to 15% zinc it becomes next to impossible to run the furnace at all. A smelter

which gets low zinc ores on the average can stand a few lots of high zinc without much detriment, and should not charge a high zinc penalty. Where the high zinc are a serious matter and necessitate a high zinc area serious matter and necessitate a high penalty, even with which they are not desired very much. The usual penalty is 25 to 50 cts. per unit (1%) on all zinc over 8% to 10%. The miner should of course take the difference in zinc penalty into account in comparing rates.

Silica Iron and Lime.

In order to run a furnace properly the smelter must keep an even balance between silica on the one hand and iron and lime on the other. If he cannot get this balance in the available ores, he is compelled to make the balance with barren fluxes, such as quartz iron ores (free from sulphur if possible to obtain) or limestone. Few smelters can get an even balance, or self-fluxing mixtures, from ores only, and have to offer special inducements in order to attract the kind of ore they need, and make it possible to ship low grade ores of the needed class, by offering a bonus on the kind of material they need. They usually at the same time charge a penalty on ores of opposite character.

The proper method is to have the penalty and bonus equal and opposite, usually 5 to 10 cts. per unit, payable or chargeable on the excess of one side over the other, that is silica excess over iron plus lime or vice versa.

United States Dredges in Malaysia.

Dredging operations in the Federated Malay States and Siam have for the past few years assumed considerable importance. Recovery of tin is the principal object sought. Practically all of the operators are English companies, and chief among these is one known as Malayan Tin Dredging, Ltd., which has approximately 1200 acres of tin-bearing lands in the Kinta valley at Batu Gajah station, Perak. The property has been drilled throughout at close intervals and four special Lobnitz bucket dredges are now in operation, with another to be put in service in the near future. It is estimated by the company that one of these machines will clean up 8 to 10 acres per year. A number of dredges of American build were constructed during the year for companies operating in the peninsula. These include one 7-cu. ft. Bucyrus dredge with steel hull, for a company known at Tin Bentong, which will be installed at Kuala Lumpur, and one 5½-cu. ft. Bucyrus dredge, also with steel hull, for the Tin Mines of Siam, Ltd., a subsidiary of the East Asiatic Co. of London. This dredge will be used in the Pong district of Siam.

The impurities in many copper ores impair the accuracy of the electrolytic assay, and the tedious operations for their complete removal tend to cause loss.

The Chisana-White River District, Alaska.

The discovery of gold in stream gravels on several of the headwater tributaries of Chisana river led to a stampede of prospectors into this district in 1913 that recalled to old-timers the early days of placer mining in the territory. This district is described by Stephen R. Capps in Geological Survey Bulletin 630.

Upper White River valley was first brought to the attention of mining people by the discovery of native copper on Kleisan creek, and it was not until gold was found on Bonanza creek, in 1913, that the district began to be thought of as a source of gold rather than copper, though gold quartz veins had been staked in this very locality at least 6 years before 1913. When, late in the summer, the men who found the gold on Bonanza creek returned to Dawson for supplies their discovery leaked out, and several thousand gold seekers rushed into the country, many of them without equipment or provisions and unaccustomed to the rigors of an Alaskan winter. The small supplies of food then in the region were soon exhausted, prices rose to prohibitive figures, and sufficient provisions were not available even for those who could afford to buy them. Fortunately, the district was well supplied with game, so that for weeks many lived on a diet of rabbits and ptarmigan. In 1914 most of those who had been disappointed in staking valuable claims or disgusted with their experiences left the district, and the real business of mining began.

The rocks of the Chisana-White district are of many types. The high mountains of the Wrangell and St. Elias ranges, on the west and south, are composed dominantly of igneous rocks, but the Nutzotin range, in which the gold-bearing gravels were found, is composed primarily of sedimentary beds, which are cut by dikes and intruded by large masses of crystalline igneous rocks, and contain also some surface lava flows.

The whole area is strongly glaciated. During the last retreat of the glaciers the melting ice left morainal material throughout the district. Large deposits of outwash gravels were laid down and are still accumulating in the valleys of the glacier-fed streams. Talus, peat, muck and some volcanic ash, as well as normal stream deposits, making up the post-glacial materials in the areas that are not now receiving glacial and glacio-fluvial deposits.

The productive gold placer gravels of the Chisana district are found within a small area, nearly all the gravels that have been profitably mined lying within a circle 5 miles in diameter. Bonanza, Little Eldorado, and Skookum creeks have produced most of the gold mined. The short mining season, comprising only 90 to 100 days, and the remoteness of the district from lines of transportation combine to make mining expensive. Gold has been mined actively, however, and the total production of the district up to and in-

cluding the year 1914, was probably not far short of \$300,000.

New Mexico Metal Production in 1915.

The output of New Mexico mines in 1915, as reported by the Geological Survey, had a value of more than \$19,000,000. Detailed production was \$1,461,005 in gold, 2,005,531 ozs. of silver, 76,788,366 lbs. of copper, 4,542,361 lbs. of lead and 25,404,064 lbs. of zinc (in terms of spelter and zinc in zinc oxide). These figures show an increase of \$289,309 in gold, 228,086 ozs. of silver, 17,480,441 lbs. of copper, 2,778,720 lbs. of lead and 7,000,672 lbs. of zinc. The value of the metals, except silver, was higher than in 1914, the total being \$19,279,368, against \$11,049,932 in 1914, an increase of \$8,229,436.

Copper has always been a valuable metal in production of New Mexico mines. In 1915 the yield of 76,788,366 lbs. of copper represented a value of \$13,437,964 of total state output of all metals, which was valued at \$19,279,468. Since 1910 the increased production of copper has been due principally to activity of the Chino Copper Co., which mines with steam shovels a large area of low-grade copper deposits at Santa Rita and mills the ore at Hurley in a wet-concentration-flotation plant of five sections. In 1915 this plant treated an average of 6520 tons of ore a day, total output having been 2,379,800 tons, the largest quantity treated in any one year by this plant since it began operations. Average content of the ore treated was 2.155% copper. Total production of concentrates was 158,444 tons, corresponding to a ratio of concentration of 15.02 tons of ore to produce one ton of concentrates. Total quantity of copper contained in concentrates was 68,293,893 lbs., corresponding to an average concentrate grade of 21.551% in copper and a recovery of 28.697 lbs. of copper per ton of ore represented an extraction of 66.588% of copper content. The net cost of copper produced in 1915 was 7.12 cts. per pound, compared with 7.6 cts. per pound in 1914. Net operating profit amounted to \$6,688,729. Dividends paid during the year 1915 amounted to \$2,609,860, and surplus earnings were \$4,304,124. The total dividends up to and including 1915 aggregated \$6,697,995.

A considerably increased yield of copper was made by the matting plant of Santa Fe Gold & Copper Co. at San Pedro, Santa Fe county, which was operated only 1 month in 1914, as against 8 months in 1915.

Low's iodide method is one of the most accurate, practical methods yet devised for the assay of copper, although the more simple cyanide assay is also excellent if properly carried out.

Ammonia, as ammonium sulphate, is produced cheaply as a by-product in the manufacture of coke in by-product ovens.

Mining Possibilities in Colombia, S. A.—IV

By MATT. W. ALDERSON.

The person who thinks of doing business in South America must familiarize himself with conditions and govern himself accordingly. Herein we have failed in the past and most of the trade of this splendid part of the world goes to foreign countries. Colombia has about one-sixth as much territory as the United States, with but one-twentieth of the population. It has no railways of any consequence in comparison with ours. In the entire republic there are less than 700 miles of railway and these are on 13 different lines, the shortest 8, and the longest 92 miles. In the mining sections all transportation is over trails. The Royal Highway is a mule trail, and the trails would be considered im-

grades; they go up ridges to the summit of a range, thence along on the top and down when necessary to a lower level. Oftentimes they are steeper than the ordinary roof of a house. They are supposed to be self-draining, but this doesn't always work out in actual practice. Where the ridge is of clay and water and gets to running down in the trail, it at times cuts out a veritable canyon, and when it gets so deep it cannot be traveled, a new trail will be made along the edge.

In Colombia the soil is not cultivated and if the government were to depend on what it could get out of persons living a real country life, it wouldn't be able to maintain itself a day. The average country



AT FOOT OF HYDRAULIC ELEVATOR, SEGORIA MINE, COLOMBIA.

passable in almost any other country. Everything transported any distance must be on the back of a pack animal. This means that the average load should not exceed 200 lbs.

One would think that where everything into the interior, away from the navigable rivers, is transported on pack animals, the persons using them would be adepts. But they are not. Pack saddles are practically unknown. A simple pad stuffed with grass is placed across the back, and the load is tied on in anything but a thorough fashion. If it sags down on one side the driver hunches it up, and perhaps loosens the rope a bit, and tightens it up again. As a result, it is practically impossible to find a pack animal in good condition.

The trails do not go along valleys or on easy

home is well built, but as a general rule it wouldn't be of value to anyone but the owner. There is no other improvement on the land, and all that could be gathered up on the homestead wouldn't sell for as much as \$2. The politicians, as with us, figure they must get revenue out of the dear people in some way, and they put a heavy tax on imports. Goods are taxed when they come into the country, are sometimes subject to a second tax from the Department (corresponding with our State), a third tax from a district and a fourth from the city of their destination. The import taxes are not on the net weights of a package, but on the gross. As a result, some American goods sell in Colombia at four or five times the retail price in the United States. The result is considerable criticism, but in reality the political life and ways in



MONITOR IN OPERATION AT HYDRAULIC ELEVATOR IN COLOMBIA ON RIO GRANDE.

Colombia are not so rank as with us. The people there are simply more honest and do not cover things with pretense, as we do.

Goods shipped into the interior of the country must not only be in packages of limited size and weight, but they must be securely packed. I have stood on the deck of an ocean steamer and seen packages marked "fragile" all over them in big letters, loaded in a swing with about 2000 lbs. of hardware and dumped into

the hold of the boat. What do big signs on a package means to a man who can't read English, or who doesn't care if he can?

All kinds of stories are told of Americans who do fool things in making shipments to this country. It appears there are too many of us who think we know more than the person who places the order. For instance: One man ordered a shipment of fountain pens. He was specific in his order to ask that the pens



HYDRAULIC ELEVATOR AT SEGORIA MINE, COLOMBIA.

be taken out of the holders and shipped in a separate package. The person who filled the order wasn't going to do any such fool thing as that. He shipped the same as he would anywhere else. His customer had to pay duty on the penholders and the enclosing box as if the entire weight were solid gold. If he has any sense will he not place his next order somewhere else?

The person who expects to do business in South America must speak the Spanish language. He may think he can hire an interpreter, but if so he will lean on a frail reed. He will be practically in the same position as a Spaniard would be coming among us. How many could he find that could be of help to him? One man seeking a job from me said: "I spit Inglese." I didn't hire him. I let him spit at somebody else. A man hired for me was little better. He was not familiar with mining terms in either Spanish or English and so was practically worthless. Most who can talk fairly well—and they are very few and far between—become so interested in the questions you ask and the information elicited, that they fail to pass on to you what you are seeking to find out. Sometimes these men will elaborate on your statements, perhaps with the intention of having what you say put into more pleasant words, but I have noticed that persons who elaborate are not generally reliable, and are certainly not to be trusted to give specific, definite information or instruction.

If I were to put the question to people I know as to the character of the working class in Colombia, I would receive different answers. I presume those answers would vary in proportion to the experiences of those persons and the sections they have been in. Possibly in the mountainous part of the country where there seems to be more white and Indian in the blood than in the lowlands, where there is more of the Negro, the people are more energetic and enterprising. My observations of persons in the mining section is that for politeness, frankness, unselfishness, kindness of disposition and a general spirit of contentment, they throw the residents of the United States away in the shade. I was not prepared for this. I had had experience in the early seventies with some residents of Mexico and had found them cruel, treacherous and unreliable. Part of the difference is no doubt explained in the fact that the Indian blood in these people is that of the famed Incas, a people the very reverse in character to the savages of our own country and Mexico.

There are no newspapers outside of the large cities, and a place of several thousand inhabitants will receive less mail in a week than a country place of 50 persons would receive in a day in the United States. News goes by word of mouth and what one person knows the entire community knows.

I have had persons with me on trips offer to climb a mountain and bring down samples for me. I didn't let them do it, but if I had I am sure it would have been what they claimed it to be. In talking of certain properties I have asked men if the property they owned was as good as such an one, and without hesitation they

would say the property of the other man was the richer and better, when that was the case.

In examining one property I wished a certain part of an old level reopened. The owner of the property was not in affluent circumstances and I thought possibly he might like to do the work. He said he would but he would need a man to help him. Asked as to compensation, he said his helper would have to have \$1 a day and I could pay him 80 cts. I thought there must be some mistake but he explained that he was not a practical quartz miner himself and would need such a helper. Can you imagine such a proposition from a mine owner in the United States?

I would not think it wise to trust extensively in such a country as Colombia for the business man would have an impossible task collecting in what was due him in times of stress, but there are occasional business men who stand out with an exceptional record



WOOD CARRIERS SUPPLYING CAMP.

for probity and business ability. I give an illustration: A prominent mining company has as its agent one of the business men of a nearby town. Every Saturday night he is furnished with the pay-roll and he is supposed to pay the men. The company gets no receipt from any one of the men paid; has no means of knowing, in fact, that any single one of the men has received the money due him, and yet in 6 years it has not had a single man say he has not received his money. This way of doing business would seem to those accustomed to our way of doing things lax to the point of danger, but it works out in actual practice.

A clean-up of thousands of dollars is sent by one man for 100 miles or more and he brings back the cash with no thought that he will be interfered with in any way. These people trust each other as we would never think of trusting in the United States, and their confidence seems never misplaced. Some of them live in houses having nothing but a roof. There is nothing of what we call exclusiveness.

The working people in Colombia live a simple life.

They are not provident, they have no idea what frugality means. They have no accumulations, nothing of value. They wear clothes so patched with pieces of different colors as to throw a premium crazy quilt in the shade. They sleep with about all they have on their persons. In bunk houses the bed is no more nor less than a shelf on the wall. If the section is where the sleeper may feel chilly along towards morning, he doesn't provide himself with covering of any kind; he boards up the space between his shelf and the one above, excluding all the air he can. They dress up and go to the village to attend mass and make purchases of food on Sundays, and men working for me always came to their work dressed in clean clothes every Monday morning. Some of them would "deelight" our Teddy. One of the men who worked for me, the first part of whose name was John of the Cross, had been married 14 years and had a child to show for each year. My man Jesus was father to 13, and my man Joseph and Mary had 10 to provide for.

Wages for day laborers are from 70 cts. up. Good quartz miners sometimes command \$1 a day, but the average pay-roll in any other kind of work will be less than this. One may well be surprised that good workmen can be obtained at such prices, especially when necessary food supplies are high. Following are ruling prices per 100 lbs. for some of the staples: Flour, \$13; corn, \$4.50; beans, \$16; rice, \$9; potatoes, \$4; sugar, \$13; unrefined brown sugar, \$4. Persons have asked me how people live who get such low wages and have to pay such prices. The question is not how people live who get these wages, but how do those persons live who do not get them.

Capital in South America is scarce and commands a high premium. One lady I could name has \$10,000 in one of the capital city banks of Colombia on which she is paid 1% a month by the year. Banks lend money at 1½ to 2% a month. A village of 4000 inhabitants borrowed \$5000 to put in an electric light plant and pays 2% a month for the money. The Republic tries to own its own railroads, and was 40 years building 120 miles. There is a gap of a few miles between the two sections that it may take another 40 years to finish, though the work progresses steadily, 150 men being employed, as an experienced railroad man puts it, "taking out dirt with teaspoons for shovels."

The man from the United States is expected to leak money every step he takes. He is everywhere recognized as a rich man. How can he be otherwise than rich? Has he not come from a far-away land? Has it not cost much money to make the trip? The ordinary individual knows that even if he could get continuous employment at his home in South America at the best wages obtainable it would take an ordinary lifetime for him to save up enough to make a trip to the United States and back. How rich and how much more fortunate, then, must be his brother of the north?

In ports and some other places one must be on guard against paying two or more prices for things. A superintendent visiting a large city for the first time was advised to be sure to ask for the discount. When he went to pay for his purchases he would say:

"There's a discount on this bill, isn't there?" "Yes, 16%." The American will always pay more than he should if he doesn't "know the ropes."

One who has made his home for some time in a section of Colombia where the laboring class predominates will miss something in the women of the United States on his return. They will not look natural without cigars in their mouths, a prayer book in their hands, or a bundle on their heads. In our country smoking is considered an elegant and graceful accomplishment for men, and most of them consider a cigar as essential to their good appearance and entry into the best society. For some reason we have not reached the logical conclusion that what is elegant and worthy of acceptance by our men should also be essential to the appearance and comfort of our women and children. The South Americans who live away from the big cities have. Every one—men, women and children—smokes; not pipes, but cigars made of real tobacco not lacking in any of the elements of strength and stench desired and approved by the most fastidious smokers. Every one in our country shows in his attitude when smoking that he is doing something of great importance. The women and children in South America exhibit this same great pride in accomplishment.

The South American, as is the case with his North American prototype, will let the most important business wait while he lights his cigar. I have known a Colombian postmaster to give his North American guest a cigar and stop to light it for him when 50 persons were in front of the railing waiting for their mail. Persons familiar with life in Colombia would naturally think that food and clothing were the most vital necessities of the common people, but they are not. The average person, man, woman or child, may get along with very little of either—many, in fact, do not have a single unpatched garment—but he cannot get along without his cigar.

These observations must not be taken to apply to all the people of South America. In the large cities may be found many persons who are as refined and free from bad habits as persons in the best communities of same size in the United States. The foreigner doing business in Colombia who has ample funds and who is disposed to be fair in his dealings, may be sure of square treatment in every way. And the courtesy of the people is charming. I have had a business man close his store to take me to a person I wished to see. I have asked directions and have had a boy sent to show me, or the man himself has left his work to go with me into a part of the city or country with which I was not familiar. Some of the customs of the country are different from what we have been accustomed to, and may provoke a smile, as some of ours might cause these people to smile. But is it not everything if one must do business with persons to find them obliging, industrious and honest? Such are the people in Colombia. They need capital for the development of their country, and the man who risks it there will receive all the appreciation he deserves and all the aid towards getting remuneration that he should expect.

Chemistry and Metallurgy of Tungsten

By M. L. HARTMAN.*

The directions for making the qualitative reduction test are as follows: Boil at least 0.2 gram of finely divided material in a small test tube with concentrated hydrochloric acid until about one-half of the acid is evaporated. Dilute with an equal volume of water, add a piece of metallic tin, and heat if necessary. A fine blue color in the solution, or a blue residue, indicates the presence of tungsten. If this test gives negative results, about 0.5 gram of the material should be fused in at least four grams of sodium carbonate. (This may be done with an ordinary Bunsen burner in a metal crucible or before the blast in a porcelain crucible.) Dissolve the fused mass by boiling water in the crucible. Acidify the aqueous solution with an equal volume of concentrated hydrochloric acid, add a piece of metallic tin, and warm if necessary. The volume of the solution should not be more than 10-20 cc. A fine blue color in the solution or a blue residue indicates the presence of tungsten. In either case, if reduction is continued long enough, a brown color is obtained.

These tests if properly used will show the presence of tungsten in materials as low as 2%, and by using special precautions will detect tungsten in even lower grade materials.

Columbium (niobium) is the only element at all likely to give a blue color under the conditions of this test. This blue can be distinguished from the blue of tungsten oxides by the fact that it disappears when the blue solution is diluted with water. Vanadium also gives a blue color when solutions of its salts are reduced, but tartaric acid will cause this reduction, whereas it will not reduce tungstic oxide. Molybdenum on reduction goes through a series of color changes from violet to blue to black. Titanium gives a violet color. No other elements will ordinarily interfere with the test for tungsten.

The following three methods are the ones in most common use for the quantitative determination of tungsten in ores. The first two are quoted from A. H. Low's "Technical Methods of Ore Analysis." The third is a method preferred by some analysts.

Hydrofluoric Acid Method.—Treat 0.5 gram of very finely powdered ore in a small platinum dish with equal parts of strong HCl and HF acids. Digest on a water bath until solution is complete, adding more of each acid from time to time if necessary. It may require from one to several hours to effect complete decomposition of the ore. Usually a perfect solution may be obtained. Any tin oxide present will be unaffected. Finally, evaporate to about 15 cc. with an excess of HCl. A yellow precipitate of H_2WO_4 may separate during the final evaporation, owing to the

expulsion of the hydrofluoric acid that holds it in solution. This will do no harm, provided it can be removed from the dish. Transfer the solution and any precipitate to a 6-oz. flask, add 20 cc. HCl acid and 8 cc. strong nitric acid. Boil down to about 10 cc. This will expel any remaining HF and precipitate the tungsten as tungstic acid. Dilute with 50 cc. hot water and allow to simmer at a gentle heat for about half an hour or until the tungstic acid has settled clear. Filter, wash with hot water, slightly acidulated with HCl, and then dissolve the tungstic acid on the filter by pouring warm dilute ammonia over it, using as little as possible, and washing the filter with the same solution. Receive the filtrate in a weighed platinum dish. Evaporate the solution on a water bath to dryness, and then ignite the residue at a red heat, cool and weigh as WO_3 . The cold residue should be a bright yellow color. Multiply the weight of the WO_3 by 0.793 to obtain the weight of tungsten, from which the percentage in the ore may be calculated.

Fusion Method for Tungsten Ores.—Fuse 0.5 gram of the very finely ground ore with 2 to 3 grams of sodium-potassium carbonate in a platinum crucible for from one-half to three-quarters of an hour. Dissolve the fused mass in boiling water. The tungsten goes into solution as sodium or potassium tungstate, together with alkali silicate, and also stannate, if tin is present. The residue contains the iron, manganese, calcium and magnesium. Filter and wash with hot water. Rinse the residue into a beaker, and warm with dilute HCl. If gritty particles remain undissolved, filter them off through the filter last used and wash with hot water. Dry and ignite the residue, and again fuse it with the mixed carbonates. Dissolve the fused mass as before, filter and unite the filtrate with the first filtrate.

Having thus obtained an aqueous solution of alkali tungstate, add to it an excess of nitric acid, and evaporate to dryness on a water bath. Again add a little nitric acid and evaporate to dryness a second and third time. Finally heat the residue in a drying oven at 120° C. for some time and then moisten with strong nitric acid and allow to stand for 15 or 20 minutes. Now add a hot 5% solution of ammonium nitrate and filter the mixture, washing well with ammonium nitrate solution slightly acid with nitric acid to remove all the sodium and potassium salts. Finally wash once or twice more with a hot, very dilute ammonium nitrate solution and then dry the filter and contents and transfer the latter as completely as possible to a weighed platinum crucible. Moisten the paper with a strong solution of ammonium nitrate, dry it and incinerate over the crucible in a coil of platinum wire. Ignite the whole, now, with free access of air. If the tungstic acid is not pure yellow when cool, moisten

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with a few drops of nitric acid and repeat the ignition.

The ignited tungstic acid may contain silica and stannic oxide. The former may be removed by warming with a few cc. HF, evaporating to dryness and igniting. The residue consists of pure tungstic acid or tungstic acid and stannic oxide. The amount of the latter is usually so small as to be negligible. If desired, the tin may be volatilized as stannic chloride by ignition with ammonium chloride. The stannic chloride is decomposed by the moisture of the air and stannic oxide may be deposited on the outside of the crucible. To prevent this, place the crucible in a larger one, and keep the outer crucible covered until the ammonium chloride is completely expelled. Now heat the inner crucible with free access of air until its contents become of a pure yellow color. Cool and weigh. Repeat the ignition with six or eight times as much ammonium chloride as there is precipitate, until the weight of the residue WO_3 becomes constant. The tungstic oxide becomes dark on igniting in the absence of air and only assumes its true color and weight on igniting with free access of air.

The weight of the WO_3 multiplied by 0.793 gives that of the tungsten.

Aqua Regia Method.—One gram of the finely ground ore is treated with about 50 cc. aqua regia in a 4-oz. flask. The solution should be heated but not boiled, and the flask should be frequently shaken. When the solution is evaporated to 10 or 15 cc. it is diluted with 50 cc. hot water and allowed to stand for a half hour. The solution is then decanted through a filter paper, and the residue washed several times by decantation, using about 50 cc. hot water each time. The wash water should be slightly acidulated with hydrochloric acid. Add about 20 cc. ammonium hydroxide solution to the residue in the beaker and when the yellow tungsten acid is dissolved, decant through the filter paper. The ammonium hydroxide solution is best made by adding 200 cc. strong ammonium hydroxide with 1000 cc. water and adding a little hydrochloric acid (about 10 cc.) to form some ammonium chloride. The residue is transferred to the paper by means of this solution, and washed thoroughly. The silica should be white. If it showed signs of incomplete decomposition before transferring to the paper, it should be heated with aqua regia again and treated as before. The ammoniacal solution is evaporated to dryness in a weighed platinum dish, ignited gently to drive off the ammonium salts, and finally heated strongly in the burner flame. Cool, moisten with hydrofluoric acid, and again evaporate to dryness, ignite, and weigh as tungstic oxide.

Accurate methods of analyses and their careful use avail nothing if corresponding care and accuracy is not taken in sampling the material assayed. Errors introduced through careless sampling are in most cases far greater than creep in from the use of inaccurate methods.

Second National Exposition of Chemical Industries.

That the chemical industries are alive to the situation they now occupy in the sum of affairs is evident by the great numbers of firms that have engaged space at the Second National Exposition of Chemical Industries to be held at the Grand Central Palace, New York, during the week of Sept. 25-30, 1916.

The advisory committee of the exposition has been increased and is composed as follows: Chas. H. Herty, chairman, Raymond F. Bacon, L. H. Baekeland, Henry B. Faber, Francis A. J. Fitzgerald, Bernhard C. Hesse, A. D. Little, R. P. Perry, Wm. Cooper Procter, E. F. Roeber, George D. Rosengarten, T. B. Wagner, Utley Wedge, M. C. Whitaker, and Charles F. Roth and Adriaan Nagelvoort, managers.

The managers anticipate an even greater number of visitors to attend this second exposition. The numerous chemical and engineering societies that last year had their attention divided with the attractions of the exposition and the engineering congresses on the Pacific coast, and the first exposition of chemical industries in the east, have this year united and arranged to hold their annual meetings in New York during and in conjunction with the exposition.

The American Chemical Society will hold its annual meeting during the whole week—the program for the meeting is now being arranged and the committees appointed.

The American Electrochemical Society have arranged to hold their meetings the latter part of the week, Sept. 28, 29 and 30, being the dates chosen, and at least one of these days will be devoted to papers that will add greatly to and form a memorable session.

The Technical Association of the American Pulp and Paper Industry is arranging the meeting for this week. This is a young and unusually active institution within the American Paper and Pulp Association and composed of the technical men engaged in the manufacture of paper and its by-products—they consist of chemists, engineers, chemical engineers, plant superintendents and foremen—those who are actually doing the things.

The Bureau of Commercial Economics at Washington is again co-operating with the exposition by arranging a most elaborate program of motion pictures covering subjects dealing with the industries depending on chemistry. Many of these films will have their premier showing at the exposition.

There will be other things innumerable that will prove attractive, entertaining and educational and with all these things and the great interest already aroused for the exposition, it should be a very much greater success than the one last year.

We sometimes learn by telling others what we know. It keeps our minds active and suggests things we would like to find out from others.

Metallurgical Disposal of Flotation Concentrates

By R. J. ANDERSON.*

The flotation process has revolutionized the metallurgy of the base metals, particularly copper, lead and zinc, and from recent commercial practice bodes to extend its application to such an extent so as to replace the cyanide process at least in part, if not in whole, in some places. Oil flotation has had a radical influence on both mill design and on smelting operations, particularly copper practice, and the successful disposal of flotation concentrates is an important phase of the new metallurgy. This disposal involves the problems which deal with the handling of concentrates as produced by the different flotation processes and the subsequent smelting of the concentrates. This, then, gives rise to two divisions of the subject, namely, (1) handling of concentrates and (2) smelting of concentrates.

The Handling of Concentrates.

Froth Breaking.—Flotation concentrates—i. e., the froth entangling the valuable sulphides (and gangue in subordinate amount) plus water—is an unsmeltable product as such. The first step in the disposal operations requires a breaking of the froth, particularly if it be a mechanical froth, such as is produced by the Minerals Separation, Hebbard-Harvey, Janney or similar mechanically agitated machines. The pneumatic froth of Callow or Towne-Flynn is ephemeral and breaks of itself when removed from the influence of the injected air (although, of course, its stability is influenced by the kind of oil used) and is, therefore, more easily handled. The mechanical froth, however, is thick and more or less permanent, and its disposal has presented serious difficulties.

A common practice for froth breaking, which is quite effective, simply calls for the spraying of water on the froth as it flows to its launder. In a number of instances bucket elevators have proved quite efficacious; the splashing and striking of the buckets causes the froth to break up. At the Herculaneum plant of the St. Joseph Lead Co. there have been installed pugmills for this purpose. In addition, these mills insure a steady stream of concentrate feed to the mixing belt, whereby the flotation product is mixed uniformly with the usual feed for the Dwight and Lloyd sintering machines. The method of running the concentrate over tables of the Wilfley or Card type has been tried and is successful in breaking up the froth. Froth may also be effectively broken by the addition of reagents such as acid or lime, or even by adding more oil. In regard to this latter, if an excess of oil is added to a successfully operating flotation unit the froth may be practically "killed." A filter of the pressure type, such as the Kelly, Shriver

or other, will break up the froth in the dewatering operation.

Dewatering.—All flotation processes produce a wet, sloppy, frothy concentrate which is extremely difficult to handle and ship unless dewatered. The skillful and economical disposal of flotation concentrates preparatory to shipment and smelting is, therefore, an important problem. In discussing dewatering practice, certain machines have found their way into the mills and certain methods have been adopted which probably embody the tendencies toward a future standard practice. Some of the apparatus used for dewatering include the following, viz.: settling bins, filters (pressure or vacuum), drag classifiers, screw classifiers and thickeners.

The practice of settling the froth in bins, while a common one, does not reduce the moisture sufficiently low for shipment by rail, unless for short distances. The mill of the Utah Leasing Co. at Newhouse, Utah, has large bins of 200-ton capacity for settling the concentrates. Practically all of the larger plants have come to the use of filters, either of the pressure or vacuum type, or both.

The functional utility of the filter lies in its ability to reduce the moisture content of the material treated to practically any desired percentage. Pressure filters of the Kelly type can take the flotation froth direct and perform the function of froth breaking and dewatering in the same operation. The pressure filter is becoming more bothersome to operate, because it is intermittent in action and requires constant attendance. Although the pressure filter can reduce the moisture content to as low as 6%, the vacuum type finds more favor. The vacuum filter is represented by the so-called Oliver and Portland types. This type of filter is not well adapted to the immediate dewatering of froth concentrates, because such product will not cake well on account of its high percentage of moisture—60 to 70%, and occasionally considerably more. The pulp feed for vacuum filters should have a ratio of 1 to 1. If the froth be first broken and then dewatered in a Dorr tank, the vacuum filter can be used, and it is preferable to the pressure type by reason of its continuous operation and low operating cost. The vacuum filter in practice can make concentrates of any moisture content to as low as 8 to 10%. Where concentrates are to be briquetted such a low percentage of moisture is not necessary, but should be as high as 15% or more.

An example cited recently in the current technical literature, which gives a method of dewatering flotation concentrates, is the practice of the Inspiration mill in Arizona.¹ Here the concentrates from the flotation

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¹See this journal, Jan. 1, 1916, p. 1.

processes and from the tables converge to a drag classifier; the coarse product from this machine is sent to an Oliver filter and the fine product to a V-shaped smelting tank, where it is thickened. The thickened and settled fine from the tank then goes to the filter. The filter cake from the Oliver machine is trammed to a bin and thence loaded into bottom-discharge railroad cars for shipment to the smelter. At the Miami mill in Arizona the flotation concentrate is thickened in Dorr tanks and the thickened product then conveyed by bucket elevators to a group of 12-ft. x 12-ft. Oliver filters. The caked concentrate is scraped off over a steam-heated plate and then removed to a steel storage tank preparatory to shipment to the smelter.

A type of machine brought out in recent years by one of the western companies which is applicable to the dewatering of flotation concentrates is the so-called Ovoca classifier. This is a classifier of the screw type. The froth is broken down effectively, giving a continuous clear overflow solution at the weir and a continuous discharge of dewatered concentrate—moisture, 15-25%. A screw dewaterer is in operation at the Oneida Stag mill at Idaho Springs, Colo. At this place the flotation concentrates plus the table concentrates are passed through a screw dewaterer and the two are thus mixed and dewatered in one joint operation. The dewatering machine removes from 60 to 70% of the slimes with the coarser table product and the overflow removes the balance of the slimes. This latter goes to settling boxes and is there settled and thickened.

The practice of washing flotation concentrate is a development as yet new in American practice. The leading consideration in washing is the removal of part of the insoluble matter whose presence in the final concentrate detracts from its grade. Washing is employed at a New South Wales mill in Australia. Here the flotation product is led into settling bins and washed by means of spray water playing on it as it enters. The effect of this is to disintegrate the froth so that the sulphides sink to the bottom and at the same time part of the floated gangue is carried over the lip by the moving stream of water.

Drying.—This is an important consideration in flotation practice, particularly if the concentrate is to be shipped long distances. The mills, unless indeed they be very large mills, with their smelter on the ground, are often as far as 750 miles from the smelter which consumes their concentrates. Every pound of water in the shipped product has to be paid for as freight, hence the moisture content should be low. Often a wet concentrate is not a marketable product as such, and always excess moisture adds extra cost to the labor of handling. The advantages accruing from dewatering and drying lie in the following, viz.: (1) by reducing the moisture and thus obviating the paying of freight on water, (2) by preventing the loss of slimy concentrates due to leaking tanks and cars and the messy sloppage which comes with the handling of wet material, and (3) by avoidance of delay from

the freezing of concentrates in cold weather. A difference of 3 or 4% lower moisture content may mean the saving of many dollars in the costs of loading and freight.

The practice of handling flotation concentrates at the Engels mill in California is interesting in its uniqueness.² The floated concentrate is first removed to a settling tank outside of the mill building for settling and thickening; the thickened product from here goes to an 8-ft. x 8-ft. Oliver filter, which makes a cake containing 10 to 12% moisture. On account of the long distance which this concentrate has to be shipped, namely, to the Garfield smelter, near Salt Lake City, it is desirable to reduce the moisture to the loss-by-dusting point—about 5 to 6%. To accomplish this an unused drag classifier was being remodeled so that heat could be applied beneath it; the dried concentrate is then sacked in canvas bags and loaded via tramway onto a caterpillar tractor for conveyance. Part of the journey to the railroad is accomplished by motor trucks where the roads are good. At the railroad the sacks are emptied into railroad cars for shipment to the smelter.

The Smelting of Concentrates.

The new conditions imposed by the character of the flotation concentrates forced a change in the details of furnace operation, and hence the metallurgical treatment of such concentrates is an entirely new subject. In the case of copper concentrates the product is improved in copper grade and simultaneously in iron and sulphur and impoverished in silica and alumina, when compared with either direct smelting ore or intermediary mill concentrates. The amount of flux required is then correspondingly lessened, as the charge is usually more fusible. The extreme fineness—*i. e.*, slime character of flotation concentrates—produces a product in which the alumina (if it be present) is in a colloidal condition, and no clay is needed for a binder in briquetting; at the same time its fineness makes drying and filtering difficult, and its wetness makes briquetting impossible without dewatering. At the Braden mill, Chile, elsewhere mentioned, the table concentrate was only fairly fine but was very infusible, due to high silica and alumina; on the other hand, the flotation concentrate was not only very fine and wet but also of a lower silica content, which made it more easily fusible.

In regard to the smelting of flotation products there are several methods which have been in commercial use, namely: (1) direct smelting, (2) sintering and smelting, (3) nodulizing and smelting, and (4) roasting and smelting.

(1) *Direct Smelting.*—This was and still is in part the practice at the Braden mill, Chile, South America. The concentrates were settled but not filtered (this was previous to the arrival of the filter presses) and charged into the blast furnaces direct. In spite of the

²Note—This mill is described in *Mining and Engineering World*, June 24, 1916.

fact that the charge was more fusible than before, the coke consumption increased considerably. The reason for this was that extra heat was required to evaporate the moisture, and, further, that the wet charge "blanketed," so to speak, and was more or less impervious to the blast penetration. The practice of drying and preheating concentrates preparatory to furnace smelting shows an economy of fuel over charging raw concentrates.

(2) *Sintering and Smelting.*—Sintering of flotation concentrates before smelting is comparable to any common sintering operation. At the Herculaneum plant of the St. Joseph Lead Co., already alluded to, the lead flotation concentrate is mixed with the lead table concentrate on a mixing belt, and the mixed product is deposited to sintering machines—Dwight and Lloyd. At the Braden mill, mentioned in the foregoing, the sinter plant consists of four units; each unit is simply a concrete box 50x4 ft., on top of which is placed a cast iron grate similar to a boiler grate. An exhaust fan creates a strong down-draft. The concentrate, spread on the grate in a layer 4 to 6 ins. in thickness or less, is ignited by a layer of shavings or sawdust. Once started, the charge roasts from the combustion of the sulphur and becomes agglomerated into a hard cake, which is broken into pieces 6 to 8 ins. in size. The sintered product thus broken is ready for the blast furnace.

(3) *Nodulizing and Smelting.*—Nodulizing is a continuous process which reduces, by roasting, the sulphur content of the concentrates and produces nodules or balls of the roasted charge. A nodulizer consists of a revolvable steel tube lined with fire brick, similar in appearance to a rotary dryer of the Ruggles-Coles or other type, 8 ft. to 10 ft. in diameter and from 50 ft. to 120 ft. long. The tube is slightly inclined with a slope of about 1 in. per foot toward its discharge end. Firing is accomplished with oil, gas or powdered coal. In the nodulizer the concentrate is heated by the firing and also by the burning of the sulphur in part; the charge soon assumes a sticky, viscid constituency and, due to the revolving, rolling motion of the tube, is "balled" into nodules of varying sizes, which are discharged red hot and thence fed to the blast furnace. The nodulizer thus dries the concentrates and reduces the sulphur content to any desired amount pending on the length of the tube and its diameter—i. e., the time necessary for a unit charge to pass through the tube. The smelting of the nodulized concentrate imposes no new conditions on normal blast furnace operations.

(4) *Roasting and Smelting.*—This is best depicted by Anaconda practice as set forth at length in recent technical literature.³ The installation of flotation at the Washoe works necessitated the roasting of an augmented tonnage of sulphides, and consequently the roasting plant had to be enlarged. The roasters are multiple-hearth furnaces—seven hearths in all—of the

MacDougal type, having a shell diameter of 25 ft. and an inside diameter of 23.5 ft. The flotation concentrates and the fine table products are mixed together, thus insuring a uniform roaster feed. The hot calcines are charged to reverberatories. The practice of firing reverberatories with powdered coal has shown a fuel economy over blast furnace smelting; moreover, the reverberatories demand a fine charge, so that the development of coal dust as a fuel, when applied to these furnaces, has come in proper time to be of great aid in smelting the fine product produced by flotation.

Coal Output of Wyoming in 1915.

The production of coal in Wyoming in 1915 was 6,554,028 tons; an increase of 78,735 tons, or more than 1%, as compared with 1914, according to figures compiled by C. E. Leshner, of the Survey. The greatest increase was in the Rock Springs field, in Sweetwater county, and amounted to more than 122,000 tons. Hot Springs and Converse counties also had increases, but all other counties recorded small decreases. The total value of the coal decreased nearly 5%, from \$10,033,747 in 1914 to \$9,555,804 in 1915.

The increase in the Rock Springs field is attributed to a strong demand for coal by both the railroads and the domestic and steam coal users during the last half of the year, and to the fact that there were no labor troubles or lack of railroad cars.

Normally a considerable quantity of Wyoming coal from the Sheridan field reaches market in northern Montana, Idaho and Washington (in and about Spokane), but Canadian coal now admitted duty free is reported to have partly replaced it, and to that cause the decreased production in Sheridan county is partly due. Abundance of water in the Black Hills for the hydro-electric plants cut off a part of the market for Wyoming coal. The number of men employed in the coal mines decreased from 8118 in 1914 to 7244 in 1915, but the average number of days worked increased from 192 to 201.

Refining Molybdenum.

Courtenay De Kalb, Tuscon, Ariz., has devised a method of refining molybdenum from its concentrate by a hydro-metallurgical process, by which is obtained a product free from copper, lead and arsenic, and containing only traces of phosphorus. This method, a patent on which has been allowed, is a simple one, the cheapest solvents in the market being employed. The estimated cost of refining is less than 20 cts. per pound of metallic molybdenum produced. The process is to be further tested on a commercial scale at eastern metallurgical works. De Kalb refers to the wide occurrence of molybdenum throughout the southwest, and thinks that, as a by-product, this metal may be produced so cheaply as to make it a steady competitor of tungsten.

³See this Journal Jan. 1, 1916, p. 3.

What the Mining Companies are Doing

Lake Copper Co., Michigan.

The report of the Lake Copper Co. for the fiscal year ended April 30, 1916, shows a production of 1,581,071 lbs. of copper sold at average price of 20.149 cts. a pound. Profit for the year was \$87,018. Surplus was \$254,164, compared with \$167,145 on April 30, 1915. Income account follows:

Receipts:	
Copper sold	\$318,581
Interest	5,498
Miscellaneous receipts	916
Sale of land	1,325
Assessment account	7,686
Total	\$334,007
Expenditures:	
Running expenses at mine.....	\$202,896
Smelting, freight to market copper and general expense	30,688
Ontonagon County taxes.....	11,302
New equipment	2,101
Total	\$246,987
Excess receipts over expenditures.....	\$ 87,018
Surplus May 1, 1915.....	167,145
Surplus April 30, 1916.....	\$254,164

Operating results compare with year ended April 30, 1913, the latest year of continuous operations, as follows:

	12 mos. end. April 30, 1913.	9 mos. end. April 30, 1916.
Tons rock stamped.....	*83,109	59,848
Pounds mineral produced.....	2,153,128	2,511,216
Pounds mineral per ton rock stamped.....	25.9	41.96
Refined copper produced.....	1,300,562	1,581,071
Per cent refined copper in mineral.....	60.08	62.96
Pounds refined copper per ton rock stamped	15.39	26.42
*12,141 tons came from stock pile.		

Uncle Sam Co., Utah.

The annual statement of receipts and disbursements of the Uncle Sam Mining Co. for the year ended May 31, 1916, shows cash on hand amounting to \$8703.51. The statement shows as follows:

Receipts:		Tons.	Value.
Ore sales, zinc ore.....	183,396		\$ 6,824.31
Ore sales, lead ore.....	520,744		7,973.14
Total			\$14,796.45
May Day Mining & Milling Co. dividends.....			33.11
General expenses (Sundry receipts).....			52.00
Cash on hand, June 1, 1915.....			9,333.10
Total			\$24,214.66
Disbursements:			
Ore sales, paid lessees and expense on ore.....			\$ 8,568.66
Mine expense			2,179.79
Mine labor			2,511.38
Assaying			75.40
General expense			702.84
Salaries			1,200.00
Taxes			273.08
Totals			\$15,511.15
Cash on hand, June 1, 1915.....			8,703.51
Total			\$24,214.66

Butte & Superior.

Butte & Superior Co. for purposes of taxation reports for fiscal year from June, 1915, to June, 1916, net proceeds \$10,497,079, against net for year from June, 1914, to June, 1915, of \$2,648,450.

The net proceeds for the year just closed showed within about \$100,000 of being four times about what they were the year before.

Report shows 591,562 tons of ore were mined of the gross value of \$20,271,949, or an average of \$34.269 per ton; cost of extracting, \$5.488 per ton, or total, \$3,246,276; cost transportation, \$2.15 per ton, or total of \$1,272,117; cost reduction, \$0.7149 per ton, or total of \$4,229,117. Expenses were as follows: Labor, \$2,217,755; supplies, \$1,028,521; construction work, \$605,823; improvements at Black Rock mine, \$414,034; total of \$4,266,134.

Treatment of the ores is done at Bartlesville, Okla.; Caney, Kas., and East Helena, Mont.

Inspiration Con., Arizona.

All but \$81,300 of the two issues totaling \$10,500,000 of Inspiration Con. Copper Co. bonds have been turned into stock. There now remains outstanding \$74,000 first mortgage bonds and \$7300 debentures.

The bond conversion was worked out as follows:

	Total issued.	Converted.	Outstanding.
First mortgage	\$ 6,000,000	\$ 5,926,000	\$74,000
Debentures	4,500,000	4,492,700	7,300
Total	\$10,500,000	\$10,418,700	\$81,300

By the time the next dividend becomes payable there appears to be every likelihood that practically all fixed charges ahead of the stock will have been eliminated through complete conversion of the two issues of bonds.

Rambler-Cariboo, B. C.

In addition to paying the remainder of the bills payable account of a year ago of \$10,000, the Rambler-Cariboo Mines, Ltd., B. C., disbursed \$52,500 in dividends and has cash in the bank amounting to \$16,000. Ores unsettled for amount to \$75,000. The following shows receipts and disbursements for the fiscal year ending April 30, 1916:

Receipts:—	
Balance forward	\$ 5,324.89
Ore in transit from previous year.....	\$33,801.26
Ore, lead	89,567.95
Ore, zinc	18,188.66
Transfer fees	\$ 141.50
Sale of compressor	748.50
Sale of wagons	200.00
Surprise mine, for milling ore.....	1,030.00
Total	\$155,964.41
Disbursements:—	
Bills payable	\$10,000.00
Dividends, B 1, 2, and 3.....	52,500.00
Ore production	\$27,294.07
Development	13,384.70
General mine expenses	9,486.11
General expenses	9,401.87
Milling	17,339.65
Mill Equipment	\$ 354.00
Machinery and plant	14.06
Stores purchased	740.15
Less:—	1,108.21
Special discounts	\$ 71.77
Profit on mine boarding house	987.95
Cash on hand	\$139,455.49
Total	\$155,964.41

U. S. Smelting.

Of the \$5,072,840 earnings after all charge-offs reported by United States Smelting Co. for the 5 months ended May 30, it is understood that less than \$1,000,000 were derived from Mexico. In other words, less than 20% of the current year's earnings have come from across the border.

In the 1915 results Mexico accounted for about 21% of the net earnings. It is therefore fair to say that Mexico for some time has been contributing only about 20% of the Smelting profits and in recent weeks even less.

The unimportant part which Mexico has been playing in the record-breaking earnings can be gathered from the production figures. For the first 5 months of this year the output of silver was only 2,500,000 ozs., or at the annual rate of 6,000,000 ozs., whereas normal production is 50% in excess of this figure.

Although operations in Mexico have practically ceased

and all of the American employees are supposedly at Vera Cruz or en route to the States, conditions are such that should quiet be restored or law and order forced through American invasion or intervention production can be rapidly resumed. Prior to the last year or two it was the Smelting Co. custom to keep the reserves of ore actually blocked out at about 1½ years' full production rate. With the work done on the Real Del Monte strike, however, ore reserves have been blocked out for a long time to come.

Buffalo Mines, Ltd., Ontario.

The following report has been issued by the Buffalo Mines Co. for the fiscal year ending April 30, 1916:

Earnings—	
Gross income from mining operations.....	\$524,973.46
Transportation and treatment	85,928.76
Other income	712.20
Total income	\$439,756.90
Expenses—	
Mining	89,490.88
Milling	64,294.00
Cyaniding	16,872.35
Ray lease—operating	10,741.12
Shops	3,178.45
Stable	2,248.91
Repairs and renewal.....	2,520.80
Boarding house	1,164.58
Surface prospecting	371.89
Depreciation	24,427.15
Administration and Financing Charge—	
Insurance	8,744.14
Taxes	5,322.41
Legal and traveling.....	2,470.53
Light and heat.....	3,072.30
Salaries and miscellaneous.....	16,146.79
Superintendence and office expenses.....	5,342.39
Interest	9,797.28
Total expenses	\$266,205.97
Net income	\$231,344.24
Surplus April 30, 1916.....	\$610,888.80

The following is the condensed balance sheet:

Assets—	
Cash and accounts receivable.....	\$ 16,985.78
Ore and bullion.....	605,310.97
Stores and supplies.....	61,948.72
Plant, tools and equipment.....	138,054.57
Mines Water Co.....	6,305.40
Mining rights	907,092.86
Prepayments	5,297.55
Total	\$1,738,995.85
Liabilities—	
Notes and accounts payable.....	\$ 108,351.25
Reserve for transportation and treatment of ore precipitates on hand, etc.....	19,755.80
Capital and surplus.....	1,610,888.80
Total	\$1,738,995.85

Standard, B. C.

The operating statement of the Standard Silver Lead Mining Co. for the year 1915 is as follows.

Income—	
Preliminary settlements, 8364 tons of lead ore and concentrates	\$686,288
Final settlements	9,416
Zinc sales	60,188
Impres	725
Total ore sales.....	\$756,618
Less zinc penalty on lead product.....	4,465
Income from ore sales.....	752,153
Other income	47,320
Total income	\$799,473
Disbursements—	
Operating expenses	\$201,459
Other disbursements	70,400
Home office expenses.....	17,783
Dividends paid	250,000
Transferred to surplus.....	260,430
Total disbursements	\$799,473

Consolidated Coppermines Co.

The gross income of \$356,318 was realized by Consolidated Coppermines during its fiscal year ended April 30. Production was 1,616,592 lbs. of copper, 556 ozs. of gold and 1445 ozs. of silver.

Development work was resumed last February and in the ensuing 60 days there were added to reserves 466,540 tons of developed ore averaging 1.68% copper.

It is estimated that all properties controlled by Consolidated Coppermines now have developed and partly developed 25,867,850 tons of ore averaging 1.141% copper.

The financial statement of the Consolidated Coppermines Co. shows a deficit on April 30 last of \$180,784, an increase during the year of \$64,197. Giroux, the operating subsidiary, showed net profits for the year 1915 of \$63,584.

Miscellaneous Company Notes.

Total earnings of the Tonopah Extension Mining Co. for the first 4 months of 1916 amounted to \$287,632, derived from the production of 6753.31 ozs. of gold and 710,704 ozs. of silver.

Tonopah-Belmont's results for May show: Dry tons milled, 12,824; ounces gold bullion produced, 2363.75; ounces silver bullion, 226,987; net profit for May, \$126,263.

The report of the Tonopah Mining Co. for May shows as follows: Dry tons milled, 9239; average value per ton, \$13.30; ounces gold and silver bullion shipped, 125,000; value of bullion, \$107,100; net profit for May, \$26,330.

Operations of the McIntyre Porcupine Mines, Ltd., for the quarter ended March 31, 1916, are given as follows: Tons milled, 27,248; value per ton, \$7.74; gross value, \$210,840; recovery, \$201,110; operating cost, \$104,982, or \$3.85 per ton; operating profit, \$97,128.

By agreement of counsel the petition in the Massachusetts Supreme Court of A. S. Bigelow for a review of the Old Dominion case on the ground of newly discovered evidence has been dismissed. No financial consideration of any kind is involved in the settlement of this last phase of the long drawn out litigation.

D. C. Jackling is quoted as follows: "Butte & Superior has mined 1,250,000 tons of ore during past 5 years from the upper levels, and yet there is today more than double the amount of ore in sight on these levels that was calculated as fully developed when we took the property." He states further that the company can produce its product for 4 cts. a pound and can earn \$12 a share on 6-ct. spelter.

May was an unusually good month for the Utah-Apex Co., earnings reaching up to the high level of \$152,000. The company's financial position is steadily improving, and after the payment of the July 1 dividend of 25 cts. per share—which calls for \$132,000—there will be over \$500,000 in cash on deposit in Boston banks. On the basis of April and May net the company earned at the rate of \$1,800,000 per annum, the equivalent of \$3.50 per share on 522,000 shares outstanding—or 80% on selling price of 4%.

Sales of the National Lead Co. so far this year have been more than satisfactory. What is probably the largest business ever recorded by the company has been done in all products except white lead, which has been unfavorably influenced by the backward season. It is expected, however, that the demand for this product will pick up as summer progresses and will reach, if not exceed, normal proportions. The United States Cartridge Co., in which the National Lead Co. holds an important stock interest, is running to capacity, employing between 8000 and 9000 hands, against 400 in the early part of 1914.

Managing Director D. C. Jackling of the Utah Copper Co. has gone over the plans for the new leaching plant and he announces that the construction work will be well on its way within a few weeks. The capacity will be 2500 tons daily and it will treat solely the ore that forms in the oxides and carbonates. The sulphide product will continue to be treated by the old process of concentration, there having been installed at the plant a number of the Janney machines, which makes a higher recovery than formerly under the vanner table process. Sulphuric acid will be employed in the leaching plant and this product will be made by the Garfield Smelting Co., which has a copper smelting plant of 6000 tons daily capacity near the Utah Copper mills. It is estimated that there are more than 40,000,000 tons of this oxide and carbonate ore-bearing rock to be treated and a high-grade copper recovery will be made from this product. The new plant will be operating within the year.



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*Illustrated.

Anaconda Copper Co.'s Wonderful Earning Powers.

A prediction a few years ago that a mining company would show net profits in a single year of \$45,000,000 would have been laughed to scorn. Yet today this is possible for the Anaconda Copper Co. Figuring on the basis of present production of approximately 30,000,000 lbs. of copper a month; produced at a cost of 10 cts. a pound and sold at an average of 24 cts. per pound, there results a total net profit of close to the amount mentioned above.

In addition to the above Anaconda derives substantial profits from spelter and the income from smelting and refining Inspiration and Miami concentrates.

The company's 25-ton electrolytic zinc plant is running at capacity; in fact, it is now producing at the rate of 24½ tons per day. This plant when completed will cost a tidy sum, but its product has been sold well into 1917 at a profit of \$4,000,000.

Anaconda's big construction campaign, with the exception of the work necessary to increase the zinc plant to 100 tons daily capacity, is now 100% complete. The company is prepared to make the record of a life-time—low costs, high recoveries and an output 40,000,000 lbs. per annum larger by reason of flotation—without any increase in the tonnage of ore treated.

Mining Towns Better as a Result of Prohibition.

At the recent national conference on charities and correction at Indianapolis many practical points were presented covering the results of extended studies as to the attitude of mining companies, railroads, public service corporations, etc. From returns received from employers of 750,000 people alcohol is forbidden in their plants and in many instances its use is considered in the promotion and retention of employees.

This attitude on the part of employers brings before every man the necessity of total abstinence.

Reports received by Mining & Engineering World from many mining towns where alcoholic liquors are not for sale indicate that total abstinence on the part of mine workers has resulted in their becoming better workmen, better husbands and fathers, and ready for work on Monday mornings following pay days.

Other results mentioned are to the effect that many miners who were always behind at the company stores, when the bar rooms drew a large part of their wages, now have balances due them each month, many having savings accounts. Furthermore, their wives and children are comfortably clothed, which was too often not the case when they were spending their earnings for drink.

Altogether, labor conditions have been greatly improved in those mining towns and there has been no falling off in the number of laborers by reason of prohibition.

A British Columbian Mineral Boom. Dollar Financing of Metal Exports.

Not since the early boom days of British Columbia has that mining section experienced such a demand for copper, lead and zinc as that now operative because of the war. The boom in mining has been most remarkable during the past year. The shipment of silver-lead from British Columbia mines to the Trail smelter alone for the year ending April 30, 1916, aggregated 14,586 tons; while 1415 tons were shipped over the Canadian Pacific railway to American smelters, in addition to 2660 tons of zinc ore and concentrates.

The mining industry in British Columbia now gives employment to 18,000 workmen, supporting approximately one-third of the population of the province. The industry is capable of great expansion, not only in the production of metals and coal, but in the utilization of these mineral resources in the industrial life of the people.

The copper production of the province is nearing an aggregate of 100,000,000 lbs. per annum. The refining of copper in this province would save \$2,000,000 in transportation of blister copper to eastern refineries and in the refining charges.

There is under construction at Trail, a spelter plant which, when completed, will produce 50 to 75 tons of spelter a day, thus supplying the second metal requisite for the development of brass founding industries, galvanizing works, manufacture of paints, electrical supplies and instruments.

A Factor in Plant Design.

An ore-dressing or metallurgical plant may be likened to the human body. It consists of a number of different departments, each of which, like the organs of the body, has some special and necessary function to perform. When anything goes wrong in one department the effect is felt in the impaired efficiency of the plant as a whole. Unless all departments are planned and managed so that they work in harmony, the best possible results and the highest efficiency cannot be attained.

It is important, therefore, that the designing and equipment of such plants be under the direction of one man who thoroughly understands the technical requirements involved, not only of each individual department of the plant, but of the plant as a whole.

Many a plant is not giving the results expected of it because the designer had but an incomplete knowledge of the work which was to be accomplished by the completed plant. It is not sufficient that the designer of a plant have a knowledge of the theoretical principles involved, but he must also have a practical knowledge of the difficulties that are to be met and overcome, that the results of his work will be a plant that is adapted to the ores to be handled, and to other conditions under which it is to operate.

Due to the unsettled conditions in exchange, American producers of copper and spelter have been unwilling to assume the risks of fluctuation and have lately adopted the suggestion made about a year ago by Leopold Frederick, of the American Smelting & Refining Co., that they require the purchaser to open 90 days' sight credits in dollars with New York bankers.

This recommendation, according to *Financial America*, was at first not very favorably received, but recently it is learned dollar credits amounting to many millions have been opened for the accounts of French and Italian concerns with a prominent trust company and several international banking houses. Most of the London banks, so far, have been unwilling to open such credits in New York, but should they do so, Mr. Frederick believes that they would facilitate materially the task of the English government of steadying the sterling rate in New York.

Prior to the adoption of Mr. Frederick's plan payments for metals exported to Europe have been effected by the sellers drawing in pounds, francs, or lire on the purchasers and selling their bills in the New York market.

Without doubt the evolution of engineering skill and proficiency owes much to the remarkable advancement of mining science and mining development. And along these lines the wonderful production of mining machinery, the progress in electrical invention, the perfection of gas engines and all the allied interests of construction and development have kept engineering skill on edge. The theoretical engineer has no place in this practical age. He must work his theories into profitable practice, and it is well that he is put to his wits' end frequently to keep abreast with or a little in advance of the tremendous business energy in all lines, of which mining is a powerful lever.

That American mining companies are in the forefront in sharing profits with their employes is proved by the repeated voluntary increases in wages that have been made during the period of prosperity that has been enjoyed by the companies. The latest along these lines is from the Calumet & Hecla Mining Co. and its subsidiaries, employing some 11,000 men in mines, mills and smelters, which announces that the 10% bonus will be continued and an additional premium of 25 cts. a day from July 1 to Dec. 31, 1916. An additional disbursement of \$426,500 will be made in January, 1917.

The inquiry for copper for prompt and last quarter delivery continues small but steady and the tone of the market is quoted firm. Most of the large producers still are sold up so far ahead that they cannot accept orders for nearby delivery and the result is that many small consumers who want copper now are endeavoring to cover in the resale market.

PERSONAL.

R. D. Agassiz, president of the Calumet & Hecla Co., is at Calumet, Mich.

Frank A. Love has been appointed manager of the Elkhart mine, Chloride, Ariz.

P. S. Haury, mill superintendent of the Seoul Mining Co., Korea, is in San Francisco, Cal.

L. S. Cates, general manager of the Ray Con. Co., Ray, Ariz., has recently been in Boston and New York.

L. A. Friedman, general manager of the Rochester Mines Co., Rochester, Nev., has recently been in Salt Lake City, Utah.

M. A. Rowan is now in charge of the coal mining department of the Chicago & Eastern Illinois Railroad Co., at Nokomis, Ill.

M. P. Kirk, of Kirk & Leavell, Salt Lake City, Utah, has returned from a trip to New York, Chicago, and other eastern cities.

H. K. Burch, chief engineer of the Inspiration Copper Co., Miami, Ariz., has left for a trip including the larger eastern cities.

J. T. Miliken, mining engineer, Denver, Colo., has been examining properties in the Coeur d'Alene district, Idaho, and is now in Spokane, Wash.

S. Nakagawa, mining engineer of the Imperial Bureau of Mines, Tokio, Japan, is now in Cripple Creek, Colo., studying mining methods.

H. F. Fay, president of the Old Colony, Contact, and Union Land companies, is at Houghton, Mich., on business connected with these companies.

W. E. Thorne will remain with the Lenskoie Co., Siberia, as geologist in charge of the sampling and selection of the company's dredging ground.

J. Dana Sperr, mining engineer with the Tom Reed Gold Mines Co., Oatman, Ariz., has resigned and will return to Houghton, Mich., for the present.

Hugh L. Wright, formerly with the Arizona Copper Co., Clifton, Ariz., is now with the American Smelting & Refining Co., Spokane, Wash., on the engineering staff.

John D. Ryan, president of the Anaconda Copper Co., is with his family spending a few weeks with their relatives at their old home in the Michigan copper country.

G. A. Guess, in charge of metallurgy, University of Toronto, Toronto, Ont., has been engaged by the Vermont Copper Co., to reopen the old smelter at South Stafford, Vt.

F. M. Sylvester, former general manager of the Granby Con. Co., Vancouver, B. C., has recently been elected managing director and will hereafter make his headquarters in New York.

Sumner S. Smith, federal mine inspector, Juneau, Alaska, is now inspecting the Willow Creek district north of Knik and will inspect the Moose Creek coal fields on his return to Juneau.

W. A. Paine, president of the Copper Range and Lake and director of other companies in the Lake Superior district, is with his son and assistant, F. Ward Paine, inspecting these properties.

Douglas S. Buchanan of Houghton, Mich., clerk of the New Arcadian and New Baltic companies, has gone with the naval reserves to the training ship at Mackinac. He has been succeeded by Fred Cross.

C. A. Foster, formerly mayor of Hailebury, Ontario, and a very well known mine owner and promoter, has become a lieutenant in the Canadian army. There are three other graduates of the Michigan College of Mines who are lieutenants in the British forces: Harold Whittingham in the artillery, R. H. Anderson in the aviation corps, and V. H. Lavery. Clinton Ball and L. B. Schwaderer, who about 6 months ago went from the Michigan College of Mines to the Transvaal as mining engineers, have joined the engineering corps and are at the training camp at Pooghsroom on their way to German East Africa.

OBITUARY.

Michael J. Drum, a well-known miner operating in the Goldfield district and other Nevada sections, died recently at Bonnie Clare, Nev. He was born in Ireland 75 years ago and came to this country at an early age. He was a veteran of the Civil war and after the war he entered the newspaper business in Chicago. Later he was sheriff of Fremont county, Colorado, going to Goldfield, Nev., after leaving that office. At the time of his death he owned the Oriental mine at Gold Mountain, Nev.

SCHOOLS AND SOCIETIES.

Massachusetts Institute of Technology.—A class of seven under the direction of Prof. C. E. Locke is visiting the mines and mills in the Lake Superior copper district.

NEW PUBLICATIONS.

Geology and Underground Water of Luna County, New Mexico. By N. H. Darton. Washington, D. C., U. S. Geol. Surv. Bulletin 618; pp. 188; illustrated.

For the greater part the bulletin treats on the separate descriptions of the formation occurring in the different geological eras. The rocks and general nature of the formation classified under the different eras are described and followed by a review of the structural geology of the area being covered. Though some pages are given to the mineral resources of the district, those confined to the water resources are here given more importance. The area included is known as the Deming quadrangle.

Distribution of Energy in the Visible Spectrum of an Acetylene Flame. By W. W. Coblentz and W. B. Emerson. Washington, D. C., U. S. Bureau of Standards. Scientific Paper 279; pp 10; illustrated. For sale by Mining World, 15c.

It is important from a practical standpoint to know the quality of acetylene light—that is, the relative proportion of the different colors in the visible spectrum of the acetylene flame. It is also important to know the luminous efficiency—that is, the ratio of light to heat in an acetylene flame. The publication enclosed gives the numerical results of a research on the measurement of the energy distribution in the visible spectrum from the acetylene flame—data of value in the scientific study of light sources.

Some Manganese Mines in Virginia and Maryland. By D. F. Hewett. Washington, D. C., U. S. Geol. Surv. Bulletin 640-C; pp. 35; illustrated.

On account of their proximity to the steel centers of the east these two states have always played a prominent part in the production of manganese. This paper was compiled as a result of many brief visits into the districts during 1913, 1914 and 1915. For the greater part it describes separately the various manganese properties visited. In addition to describing the occurrence of the ores it is brought out that there are four different types of deposits, one of which has not previously been recognized. These four types give the

same problems of exploitation, but the persistency with depth seems to vary with each.

Tests of Reinforced Concrete Flat Slab Structures. By A. N. Talbot and Willis A. Slater. Urbana, Ill., Engg. Experiment Station. Bulletin 84; pp. 128; illustrated.

Complete and detailed tests made on five different buildings are described separately. Each was made for determining different phenomena and in each minute details of the test and results obtained are given, with a brief discussion on the same. For example, test IV is on the Schulze Baking Co. building. The structure is described and followed by a description of the tests and their results, with much of the information tabulated or plotted in a curve.

TRADE PUBLICATIONS.

Pulmotors. The Draeger Oxygen Apparatus Co., Pittsburgh, Pa. Folder; pp. 4; illustrated.

An announcement of the new type B pulmotor is here made and a complete general description is given of its operation and construction. For making the latter more clear sectional drawings of the apparatus have been reproduced and illustrations given showing the pulmotor in practical use. In a substantial carrying case the new type weighs 12 lbs. complete.

Automatic Measuring Devices. Ogle Construction Co., Chicago. Pamphlet; pp. 4; illustrated.

It is the intention of the manufacturers to have this measuring device replace the scales of different types now being used in checking up materials used. An illustration of the device and some places where it has been installed are given. They claim to be able to install the device, which is placed at the mouth of the chute, by doing nothing more than slightly raising the side baffles of the chute and in no way altering the present bin construction.

Flexible Couplings. J. R. Shays, Jr., 47 West 34th street, New York. Folder; pp. 6; illustrated.

Sectional drawings of the coupling are shown and a table gives details of the different sizes and prices of the same. In this connection directions are given for selecting the proper coupling from the table. The couplings are made in bores from $\frac{3}{4}$ to $7\frac{1}{2}$ ins., the maximum R.P.M. for which are 3600 to 1000. Different sized line-shafts may be connected, it is stated. The casing of the coupling is constructed so as to be rigid and may therefore be used as a line-pulley for the belt transmission of power.

Supplies and Data for Reinforced Concrete. Corrugated Bar Co., Buffalo, N. Y. Booklet; pp. 96; illustrated.

It will be found of use not only as a reference regarding the company's products, but further for specifications, data and construction details connected with reinforced concrete work. Many tables and drawings are shown which will be of interest to the construction man or designer. It has been brought out in the introduction that no attempt has been made in compiling the booklet to dwell in detail on all of the company's products, but simply to give clear and brief data which is absolutely essential.

Pulverizing Mills. Lehigh Car, Wheel & Axle Works, Cata-sauqua, Pa. Catalog No. 70; pp. 61; illustrated.

The mills herein considered are of two different types. The sweep-discharge type is made in 33-in. and 42-in. sizes and the fan-discharge type is made in 33-in., 42-in. and 57-in. sizes. A list of materials are given for which the mill will be found suitable to crush. The sweep-discharge type is then described and specifications are given in which it is stated that the mill will handle from 2 to 4 tons of material per hour. Separate sectional views are given of both sizes and in this connection the different parts are numbered and listed on the opposite page. A similar form is given to the description of the fan-discharge type. The concluding pages are given to practical installations, using both direct electric

drive and line shafts. The preliminary preparation of materials is treated separately.

Wooden Piping. G. R. Wood's Sons Co., Sheffield, Pa. Catalog; pp. 16; illustrated.

This catalog gives details, prices, description of wooden pipe and the methods used for its manufacture. It is stated that the pipes are bored with a special bit from solid pieces of white pine timber. The average length is 14 ft., while the pipe varies from 8 ft. to 16 ft. Pipes are listed from 2 to 6 ins. internal diameter, and all are connected with a taper joint and mortise. It is stated that sulphur and acid fumes will not corrode it, nor will fluids be tainted. It is also brought out that the pipe is less liable to freeze and burst.

Concrete Mixers. Archer Iron Works, Chicago. Catalog No. 25; pp. 16; illustrated.

In this catalog the Archer No. 1 mixer is described in detail as regards its construction, what it will do and why the mixer is capable of performing its work as stated. It is of the small type and is intended to handle from 35 to 70 tons per day of 10 hours. The catalog gives as its features: End discharge; it can be backed to the form and place the concrete direct without haulage; the engine is mounted on top of the all-steel frame out of the way; the machine can be moved by one man in a similar way to any 2-wheeled vehicle; it is entirely gear-driven, with no chains.

PATENTS RELATING TO MINING.

Air Compressor. Michael Reisner, Cincinnati, Ohio, assignor, by mesne assignments, to Worthington Pump and Machinery Corporation, New York, N. Y. (1,185,942; filed March 4, 1915.)

Process of Treatment of Anode Slimes and Similar Materials. Francis C. Ryan, Hammond, Ind., assignor of one-half to United States Metals Refining Co., Chrome, N. J. (1,185,005; filed Feb. 24, 1914.)

Air Compressor. Samuel D. Black, Baltimore, and Alonzo G. Decker, Orangeville, Md. (1,187,031; filed June 4, 1915.)

Vacuum Ore Separator. Harry H. Baer, Orrville, Ohio. (1,186,874; filed Jan. 18, 1916.)

Double-Acting Grinding Pan-Mill and Amalgamator. Charles Davey Tregoning, Grass Valley, Cal. (1,186,709; filed Oct. 28, 1915.)

Concentrating Table. Howard A. McClelland, Allensworth, Cal., assignor of three-fourths to H. H. Tucker, Los Angeles, Cal. (1,186,811; filed Sept. 28, 1915.)

Coal-Sampling Machine. Lewis Lazell Beeken, Pittsburgh, Pa. (1,186,646; filed July 6, 1915.)

Dredging Bucket. Gordon R. Rowan, Oak Ridge, Mich., assignor of one-half to Roberts P. Hudson and Albert B. Davidson, Sault Ste. Marie, Mich. (1,186,684; filed Sept. 9, 1914.)

Gold-Saving Apparatus. Ernest H. Gagnon, Billings, Mont. (1,186,304; filed Nov. 23, 1915.)

Gas-Analyzing Apparatus. Henry Leland Lowe, Pittsburgh, Pa. (1,186,014; filed Feb. 27, 1911.)

Crushing Machine. Axel G. J. Rapp, Chicago, Ill., assignor to Link-Belt Co., Chicago, Ill. (1,185,937; filed March 29, 1915.)

Process of Treating Ores. Royal S. Handy, Kellogg, Idaho. (1,185,902; filed Oct. 28, 1914.)

Tunneling Machine. Carl W. Hodgson, Denver, Colo. (1,185,797; original application filed Nov. 5, 1909; divided and this application filed Dec. 3, 1912; renewed Oct. 23, 1915.)

Process of Treating Metal and Mineral-Bearing Materials. John L. Malm, Denver, Colo. (1,185,817; filed Feb. 21, 1911.)

Support for Coal and Rock Drills. Nils D. Levin, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co., Columbus, Ohio. (1,185,809; filed July 28, 1914.)

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Knik.

The Willow Creek Mines Co. has been formed to operate in the Willow Creek district north of this city. In the forming of this company Messrs. Doherty and Thompson were the principal parties. The holdings include the lease on the Gold Bullion mine, one of the largest producers in the district. Five additional stamps are to be installed this season. The camp will soon be reached by the government railroad from Anchorage, and freight will only have to be hauled 12 miles, instead of 35 miles as at present. The operators will use Anchorage as their base of supplies as soon as the road is completed to Moose creek, which is expected to be some time this month. The additional developments undertaken this year will be considerable.

Fairbanks.

Cleveland & Howell of Woodfortune are again to take out a big season. Their first cleanup, made recently, amounted to \$68,000, according to advices from the lower river.

According to Commissioner Vinal "Boob and Mastodon creek districts are progressing. Cooper, the center, is located at the mouth of Mastodon creek, on the Tolstoi river, $2\frac{1}{2}$ miles from discovery, Boob creek. Steps are now being taken to have Cooper incorporated as a town of second class. I am of the opinion that Cooper will be the center of activity in this section for the reason that it is near and convenient to already found pay. Horse and power boats can reach Cooper also. I think it is about 25 miles to Ditna river by water, where large boats can land supplies. The country has been indiscriminately staked. At this writing Boob creek shows up the best, although Mastodon and its tributaries look good. Recently a discovery was made on Wilson creek that promises to turn out well. A great deal of prospecting is now under way along the creek channels, but I believe that the pay will be found more on the benches than along the channels. Up to the present little has been done except staking claims. They are hauling supplies from Ophir, Ruby and Iditarod. On Boob creek pay that will run fully \$3 per foot has been found. On Mastodon creek 5 miles from Boob prospects that practically amounts to pay have been found in two holes. On Wilson creek, a left limit tributary of Mastodon creek, good prospects have been found. Ten miles from Boob creek, on Madison creek, good prospects have been found, and on Meier and Esperant creeks, tributaries of Madison creek, good prospects have been found." He further states that undue reports have been made and that considerable work is still necessary to bring the camp in as a good producer.

ARIZONA.

Tucson.

The United States Smelting, Refining & Mining Exploration Co. has started churn-drill exploration work in Tortilla mountains, 15 miles northeast of Redrock and 45 miles north of Tucson, under direction of F. B. Weeks, who recently opened an office for the company in Tucson. This work is in the schist area, where there are surface showings of copper carbonates. This is known as the Durham group, on which the company has a bond.

The Roadside group, embracing 500 acres in Rorkrue range, 37 miles west of Tucson, is being developed for an

eastern capitalist, under direction of Courtenay DeKalb, E. M. The first shaft sunk showed a disseminated deposit of chalcocite, 65 ft. thick, assaying 2% copper and 5 ozs. silver. Below this was an oxidized zone, containing copper oxides and native copper. The main 2-compartment shaft being sunk is expected to open a second zone of enrichment at permanent water level. One feature of the deposit is the existence of cinnabar and antimony in places.

The Cobriza Mines Development Co., Johnson, and New York, controlled by the Goodrich-Lockhart Syndicate, has a bond to purchase the defunct custom smelting plant at Benson, the property comprising a 150-ton blast furnace, blower, boilers, sampling plant, engines and a 60-acre site; also a silver-lead slag dump of 100,000 tons, resulting from former smelting operations, and reputed to carry silver and gold of value of \$2.50 to \$5 per ton.

Jerome.

The surface improvements at the property of the United Verde Extension Co. are practically completed and are aiding materially the work of getting out ore. A new compressor has been installed, a change room with shower baths has been erected and a blacksmith shop, carpenter shop and warehouse built. The lower workings carry 60 ft. of carbonate ore that averages 40% copper and 205 ft. of ore, including the carbonate, that averages 20% copper.

The United Verde is outputting an average of 5,000,000 lbs. of copper per month and will soon be outputting 8,000,000—the figures quoted representing the returns on ore shipped from the mine to the smelter at Clarkdale.

Following the discovery of a body of high-grade copper sulphide in the workings of the Lone Pine Verde Copper Co., a plant of machinery has been ordered. The property adjoins the Copper Chief in the lower Verde contact.

Mining operations at the property of the Dundee-Arizona Copper Co. are being furthered by a 25-hp. hoist and an 8 by 8 Sullivan compressor, recently installed. Shaft sinking has been resumed at a depth of 200 ft., the objective being the 1000. Scotch mining men are financing the enterprise.

The mill at the Copper Chief mine, located about 4 miles south of Jerome, is treating 125 tons of gold-silver ore daily. Worked originally as a gold proposition, the mine is now producing a good grade copper ore in its lower levels. The latter is going forward to smelter at the rate of 30 tons per day.

Prescott.

A deposit of high grade copper ore of promising possibilities has been encountered at a depth of 400 ft. in the workings of the Black Rock Co. in the southern part of Yavapai county. The management has decided to sink the shaft to a depth of 800 ft. and at that level to again cross-cut the ore. While this work is progressing further development will be prosecuted in ore on the 400 level.

George W. Long and James L. McIver, together with W. K. Ridenour, are turning their attention to mining properties in Yavapai county with a view to extensive investments therein. Their first venture outside of the Oatman field was made the last week in June, when they purchased a large block of stock of the Tiptop Con. Mining Co., whose holdings are located in the southern part of Yavapai county, in the vicinity of the Agua Fria river. Under the terms of the agreement with the Tiptop directorate mining operations are at once to begin on an extensive scale, with a view to getting out a large tonnage of the tungsten-silver ores that have been opened to a depth of 800 ft. To that end the main working shaft is immediately to be unwatered below the 400 or tunnel level. All ores mined are to be treated at

the company's mill. The high-grade tungsten and silver concentrates will then be shipped to Pittsburgh, Pa.

Mining conditions in the McCabe section continue to improve. A. W. Davis, general manager of the Great Southern Co.'s property, has opened an ore body that is causing considerable attention. At the Lady Alday, Smith Bros. have increased the working force, have sunk the main shaft to 160 ft. and have equipped it with efficient machinery. The ore showing is above average for that section.

Three carloads of high-grade gold ore were sent to smelter in June from the Davis mine on Slate creek. Two lessees on the property are shipping ore regularly. Including the output of the Dunkirk, the Slate creek section is outputting better than 500 tons of ore per month.

A camp has been established at the Magnolia property, located about 2 miles east of Prescott, and a force of miners is now engaged in tunnel operations. The property is adjacent to the holdings of the Bullwhacker and carries the extension of that ore body. C. R. Wallace is the owner.

The concrete walls and foundations for the flotation plant of the Stoddard Milling Co., located on the Agua Fria river, have been completed. Ten carloads of machinery for the plant have arrived at Mayer and as many more are on the way. The plant will have a capacity of 100 tons and will be utilized for the reduction of ores mined by the Copper Queen Gold and the Stoddard Mines companies. Eighty men are on the payroll, 25 of whom are millwrights.

Four thousand dollars' worth of gold bullion and a carload of high-grade concentrates is the monthly output from the Tiger Gold property in the Bradshaw mountains. Within a short time this is to be exceeded. The property, including the dump tonnage, is under lease to Bradshaw, Riggs, Cowan, Marks and Shea, all of whom are former operators of mines in the mining districts of Nevada.

Oatman.

Developments in the Ivanhoe property are the center of interest. At a distance of 395 ft. from the shaft, and after cutting through an intrusive dike of quartz-porphry, the main vein which was the objective was entered. It has been penetrated a distance of 27 ft. beyond the foot wall, with no hanging wall in sight. The vein filling is quartz, with some calcite and adularia, considerably stained by limonite and highly oxidized. The vein matter shows free gold. This work is being done at 500 ft. depth. The property is about 2½ miles northwest of Tom Reed, and at a surface elevation and estimated geological elevation of some 250 ft. less than the Tom Reed.

Steady work continues in the Arizona Tom Reed, both in shaft sinking and in lateral work on the 400 level from the Pioneer shaft. It is estimated that the strike of the ore shoots being developed in the Pioneer carry them into the adjoining property. Keith & Keith of Boston control the Pioneer. On the 400 level the east drift is yielding some vein matter which is speckled with coarse gold, and this is being sacked as developed.

In the Big Jim property 15 men are at work, and drifts are being run in both directions in the vein on both the 400 and the 485 levels. The faces of the four drifts are said to be in ore averaging \$35, \$150, \$30 and \$100. The first two figures are for the drifts on the 400 level, which have been carried in further than the drifts on the deeper level.

In the Fessenden property the south crosscut on the 500 level has been carried out 210 ft. and has already cut two veins showing about 3 ft. each of low-grade ore. Stringers of quartz are now showing in the face of the cut and the operators believe they are near their main vein.

The Black Range is steadily drifting in ore on the 300 level. Values, however, are spotted, going to above \$30 for a few feet, and then dropping very low. Through E. McNeal & Co., a syndicate of Chicago capitalists are said to have secured control of this property and plan extensive development.

In the United Northern shaft 330 ft. calcite stringers giving big pan values in gold are showing, and for some little distance these stringers have been increasing in number and strength. The shaft will be continued to 500 ft.

The Iowa Mining Co., in the southern section, has

decided to use two drills in sinking operations. The plant consists of a 25-hp. hoist and a 350-ft. compressor driven by a 50-hp. engine. Officials of the company state that the company is already financed to carry out the development plans of Engineer Carl O. Lindberg.

The North Star shaft is 400 ft. deep and the formation is so changing that the management believes the shaft is dropping onto a blind lead. Quartz coming from the bottom of the shaft yields good gold pannings.

New York capital is to back the Oatman-Federal Mining Co., according to an official statement by the company, which states that a block of 400,000 shares of the treasury stock has been sold.

The Goldroad mine sent a bar of bullion valued at \$17,000 to the mint this week, this representing last week's cleanup.

John B. Cockrum, attorney for the New York Central lines, is president of the Oatman Empire Mining Co., with headquarters in Indianapolis, which company has just been organized to operate the Empire group. Pending the delivery of machinery, which has been ordered, work of sinking the shaft has been started.

Drifting operations on the 300 level of the Carter continue in a full face of ore which is said to be averaging between \$20 and \$30, with the higher values predominating.

In the Boundary Cone, drifting operations on the 750 level have not as yet reached the zone, where the downward continuation of the ore shoots opened on the 550 level are to be expected. The formation is satisfactory.

The Lucky Boy has completed its station on the 350 level, is overhauling its machinery equipment and within a couple of days will start driving a crosscut toward one of its veins, which is estimated to be about 75 ft. distant.

The Gold Ore continues to ship 30 tons per day to the Gold Road mill, the extraction being better than \$20. Development of new ore continues steadily.

The Gold Dust continues to block out mill-grade ore on the 2nd level, and on the 5th level lateral work is being done to find the downward extension of this ore shoot.

Although a number of companies which entered the Oatman district and commenced operations on a "shoe-string" are in financial straits, and some of these operators are sending out pessimistic reports, optimism among those who entered the field prepared to withstand a long development siege is higher than ever. Mining activity, backed by ample funds, is greater than at any previous time.

CALIFORNIA.

Keeler.

The Jumbo mine, south of Keeler, has been taken under bond and lease by the Darwin Development Co. Sixty tons of lead-silver ore are being shipped monthly, much of this being high grade. Extensive developments are proceeding at several points and reserves of shipping ore are being steadily augmented.

The Montezuma property in the Fish Springs section, owned by Louis Joseph of Big Pine, and John Mitchell, is on the eve of heavy production. Orders have been placed for motor trucks, and a large tonnage of high-grade ore is in the bins. Twelve men are blocking out ore.

Trainloads of ore are leaving Keeler daily and the railroad company is experiencing difficulty in handling the heavy tonnage. The heaviest shippers are the Cerro Gordo, Jumbo, Santa Rosa, Anton, Lucky Jim, Custer and Ygnacio. A number of smaller companies and numerous lessees are making occasional shipments of silver-lead and zinc ores.

The Estelle Co. has driven its tunnel under Buena Vista mountain a distance of 6850 ft. and expects to reach the objective ore bodies in about 500 ft. The bore, designated as the Troeger tunnel, is 7 ft. sq. Five distinct veins have been intersected, the ledges carrying silver, lead, copper, gold and zinc. A little further on it is expected the western extensions of the Union, Jefferson, Enterprise and Santa Maria veins will be encountered, at an approximate vertical

depth of 3000 ft. A drift will then be driven to the Ygnacio ledge. The holdings of the company embrace 500 acres. Preparations are being made to replace the steam power plant with an electrical unit. Roy C. Troeger is superintendent.

Kennett.

The Mammoth Copper Co. has decided on the immediate building of an electrolytic zinc plant at Kennett, to cost in the neighborhood of \$350,000. It will employ the electrolytic process developed by the Bully Hill Co. at Winthrop, after a series of experiments extending over several years. Metallurgists of the Mammoth Co. have thoroughly investigated the process and are convinced of its merits along commercial lines. As soon as the plant is in commission all the zinc produced by the Mammoth mines will be treated at this point and shipments to Kansas smelters discontinued. The plant will also treat the dust from the bag-house, which already contains 25,000 tons of material running high in zinc, with some silver, gold and copper.

It is reported here that the Bully Hill Co. will erect a large electrolytic plant near Winthrop to treat its own ores, and may also handle the output of the Afterthought mine near Ingot. The Bully Hill mine has been developed to a vertical depth of 1000 ft. and contains large reserves of copper-zinc ore. It is said the Afterthought owners would welcome the opportunity to ship to the proposed plant, provided satisfactory arrangements were made.

Coulterville.

New machinery has been installed at the McAlpine mine and drifting from the 500 level has begun to intersect a rich shoot which yielded large quantities of ore in the upper workings. In the older sections of the property some developments are advancing with satisfactory results. W. A. Irwin is superintendent.

Colfax.

With the aid of a deep-sea diving outfit H. M. Estee is recovering gold from the North fork of the American river near here. The sand and gravel at the bottom of the deep stream contains considerable gold, particularly in the deep depressions, but attempts to win the metal by ordinary means have been fruitless. Other miners are watching the work with keen interest and it is probable this form of mining will become popular in the Colfax district.

Grass Valley.

The Pacific Western Commercial Co. is building a 900-ft. tramway from the Golden Gate mine and mill to the local railway line, and is preparing to crush chrome and tungsten ores, which will be shipped to the 30-ton Golden Gate mill. It is reported the mill will be remodeled for production of tungsten concentrates. It is also likely that work will be resumed in the Golden Gate mine, which produced good ore years ago.

The cyanide plant at the Golden Center mine has been practically completed and enlargement of the main plant is proceeding rapidly. Work in the deep levels from the new vertical shaft continues to uncover quartz of good milling grade. The company is installing hoisting and pumping equipment at the Allison Ranch mine and expects to have the property in shape for mining before the end of the summer.

Eureka.

The Humboldt Copper Co. is exploring its extensive acreage with diamond drills. Immense tonnages of low-grade material were discovered last fall and the present work is going on with a view to intersecting ore of better grade. O. H. Hershey is consulting engineer.

A thorough examination of the 74 claims of the Horse Mountain Copper Co. is being made by engineers representing Eureka stockholders and Charles Willis Ward, New York, who is heavily interested. It is planned to extensively prospect the more promising sections with diamond drills.

Redding.

High-grade copper ore has been discovered 14 miles west of Gibson in the Trinity mountains. The deposit has been proven for a length of 400 ft. and width of 300 ft. and is said to sample over 20%. Three carloads are ready for shipment, and developments are proceeding steadily to de-

termine the extent of the deposit. The property was discovered a few weeks ago and is owned by Dr. Ernest Dozier of Redding and Dr. J. P. Sandholdt and associates of Kennett.

Sutter Creek.

It is reported that all the ground between the Keystone and Golden Eagle properties, including the South Keystone and South Spring Hill mines, has been taken under option by a syndicate of Seattle capitalists. The group includes several noted mines, with large bodies of ore in their workings. Most of the properties have long lain idle.

Under the direction of Supt. Jose much new work is about to start at the Central Eureka. From the 3200 level a winze will be sunk to 3300 ft. with a view to picking up the vein which yielded well above the 3000. A series of drifts will be driven to intersect new ledges believed to exist in both the hanging and foot walls.

COLORADO.

Cripple Creek.

The Cripple Creek Gold Mining Co. has succeeded in putting its Koyneho shaft down 440 ft. There has been opened what is believed the southern extension of the Strong vein dipping into the shaft. The vein fills the bottom of the shaft. The quartz is identical in appearance with the Strong ore. No lateral work on the vein, however, will be attempted at this time. Sinking is to be continued, and with a depth of 500 ft. attained, connection by lateral will be made with the Jefferson shaft workings, under agreement entered into between the Koyneho manager and M. B. Burke of the Jefferson Mining Co. This connection will ensure ventilation for both properties, and the additional exit will make conditions safer.

A new 1600-ft. air line has been constructed to the mines of the Albert Beacon Gold Mining Co. and hand drilling has been replaced with machine drills under the direction of General Manager Frank Vetter. A short extension has also been carried to the Henry von Phul lease on the property. In addition the compressor plant at the Iland tunnel is to be connected up on the Eureka claim of the Prince Albert group. This lease has a rich ore shoot under development from a winze sunk below the tunnel level, and with power drills would make a material increase in production.

The Reid and Worcester mills, recently constructed and placed in commission at the Dante and Rubie mines, are running steadily, and while no cleanup will be made for another week, tests of the concentrates show both to be successfully treating low grade ores. The Blue Flag, Neville, Wild Horse and Isabella mills still remain inactive, but two or more of these plans will be running again very shortly, it is rumored.

A second shipment has been loaded out from the Shoo Fly property. Recent exposures have been richer, and rusty gold is visible on the face and cleavages of the quartz. Panned, a long string of coarse colors results in each panning. Grab samples taken back of the machine are running from 1 to 5 ozs. From the ore in sight bi-weekly shipments can be made and 2 cars will be loaded out during the present week.

At the Hondo property, an ore body, having the appearance of permanency, has been entered at the 500 level in Sitting Bull shaft. Grab samples taken across a 4½-ft. face of the vein, give returns of \$19 a ton. Streak assays—the vein is seamed with narrow but rich streaks of ore—run high. The vein, on which this shoot has been entered, is shown on the maps as the extension of the Harrison vein of the Golden Cycle system. The course of the vein is identical with the Harrison-Cycle lode, striking northwest, while the vein matter is colored with fluorite and carries both native gold and calaverite and occasionally a little pyrite and galena. The ore is now going into the bins and a shipment will shortly be made.

El Paso Con. Gold Mining Co. has liquidated its indebtedness. On Jan. 1, 1916, it was reported at \$29,000. To date the company has paid about \$2,000,000 in dividends

from a production of \$9,000,000. The company now has 15 sets of lessees active and producing and the June production, based on the output to date, will be about 75 to 80 cars, or approximately 2100 tons, with an average value of 1 oz. gold. The company will receive a good sum in royalties from this ore, lessees having mined the bulk. It is continuing exploitation work in the deeper levels, and at this time has 3 machine drills in operation on dead work.

Leadville.

The News gives a review of this district as being more active now than in some time past. The United States Smelting, Refining & Mining Co. has practically unwatered the properties on Friar Hill which it intends to work, and within a short time sinking will be started to open up the ore bodies at greater depth. At Kokomo and Robinson many of the old mines that have not been worked in years are being opened up. In the old days this part of Colorado saw many properties flourish for a few years and then practically pass away. When the price of the white metal went below \$1 in the early eighties these properties ceased work. At these old mines are mills, smelters and dumps. At Breckenridge the Dunkin mine is shipping gold ore that goes to the mint at Denver just as it is taken from the grounds. Besides that the company is shipping a good lead-silver product. The Tonopah Placers Co., a subsidiary of the Tonopah Mining Co., is taking out \$5000 a day from the placer ground about Breckenridge and there are still thousands of acres of placer ground to be treated. One of the four dredges in operation is handling \$2000 in gold a day at a cost of approximately \$120 a day. Drilling operations are also adding to the territory the company already has. The Rilla Mining Co. is now well equipped with drills, and other machinery for rapid development. Running through the property from east to west is the Witch Hazel vein, which has produced considerable ore in other properties. To the north of this is mountain of gneiss. From the base of this mountain a tunnel is being driven to get depth on the vein. In the gneiss rich, narrow streaks of ore are being found in the cross fissures to the Witch Hazel. T. R. Griffith, manager of the property, who has been in the district for many years, feels confident that when the tunnel reaches the vein, large ore bodies will be found in or near the Witch Hazel fissure. The latest development at this property is that the main tunnel, which is now in 1200 ft., is showing softer in the face and considerable water is coming in. It is expected that the fissure will be encountered within 100 ft. Another more recent development is the opening of a porphyry ore body for a distance of 1000 ft. and 18 ft. wide which carries from \$3.00 to \$4.20 and as high as \$8 a ton in gold and silver and an average of 60% copper. In this body there are 250,000 tons of ore which it is believed will make net returns of better than \$1.50 a ton. The old Governor mine, which has not been active for years, has within past few days started work. The property has been tied up in litigation and a settlement has just been effected. There is a large dump on the ground carrying \$10 a ton. During the time that mine was tied up in the courts much of the ore from the dump was hauled away and made into wagon roads.

IDAHO.

Wallace.

At a meeting of the shareholders of the Nipsic Mining Co., June 24, the sale of the company's property to the Consolidated Interstate-Callahan Mining Co. for \$111,200 was unanimously confirmed. The sale had previously been negotiated, subject to ratification by the shareholders, at a meeting of directors, held June 16, the directors in question being J. W. and Edward Pohlman, M. Freeland, E. V. Sandell, W. G. Boland and J. F. Dealy of Spokane and Norman Ebbley of Wallace. At the shareholders' meeting J. V. and Edward Pohlman voted 1,210,253 shares of the Nipsic's issued capital stock of 1,344,851 shares, or approximately 90%. "After taking care of the outstanding obligations the net returns to the shareholders will be between 7 and 8 cts. a share," said J. V. Pohlman, president of the Nipsic. "We

bought nearly all of our holdings, or more than 1,000,000 shares of Nipsic stock, in the open market at prices between 6 and 7 cts. The Nipsic property consists of a group of seven claims lying northwest of the Hercules and north of the Interstate-Callahan group, which it partially adjoins. The Silver State group lies between it and the main body of the Interstate-Callahan holdings.

Fritz Marschante of Spokane has bid in for \$10,100 at receiver's sale the claims constituting the old Oro Fino group prior to its consolidation with the Bear Top property as the Bear Top-Oro Fino Co. The sale was conducted at the mine by Allen G. Kennedy, receiver, and will have to be confirmed by the district court of Shoshone county to become effective.

Stock of the Con. Interstate-Callahan Mining Co. was listed on the New York stock exchange June 29. It will be necessary for shareholders to send their stock to the company's transfer agent, the Title Guarantee & Trust Co., No. 176 Broadway, New York, for transfer into engraved certificates approved by the exchange before any trading in the issue will be permitted. New certificates will be returned at once.

The listing of the company on the New York exchange marks another chapter in the career of the corporation, and also creates a broader market for one of the sterling Coeur d'Alene stocks. Less than 3 years ago the shares were inactive at from \$3.75 to \$5, but in recent weeks the price has advanced to from \$27.50 to \$29, and the demand, both locally and in the east, has been insistent. Regardless of the increase in price, however, but little of the issue has been lured into the open, the majority of the holders preferring to retain their holdings as a permanent investment.

Kellogg.

The Constitution Mining & Milling Co., of which Judge George Turner of Spokane is president, has decided to build a mill on its property, the Constitution group, near here. The plant will be of 100 tons daily capacity and will cost between \$30,000 and \$35,000. The Constitution ore is a complex lead-silver-zinc, and for the last 3 months the management has been making exhaustive tests to determine the best treatment. A mill-site has been selected about 1000 ft. from the main workings, at a point where adequate water can be secured from Pine creek and a small tributary stream.

Hailey.

The Federal Mining & Smelting Co., which recently acquired the North Star-Triumph mines, has begun the erection of a 300-ton concentrator at the property, according to Frederick Burbidge, general manager for the Federal Co. The plant will be equipped with a flotation system and electric separator, and is being designed and fitted especially for treatment of the North Star-Triumph ores. Burbidge states also that the mill at the Federal Co.'s Morning mine at Mullan is being enlarged, and that as soon as the additional equipment is ready for service the output of the mine will be increased.

LAKE SUPERIOR.

COPPER.

Houghton.

Franklin has finished lining the collar of the Allopez conglomerate shaft No. 2 with reinforced concrete and will in a very short time put up the steel head frame. Later on a shaft rock house will be erected. This southern side of the shaft is all in good ground with many long stretches of spectacular disclosures; the 32nd level is now over 1100 ft. from the crosscut leading from the shaft, which is, of course, on the Pewabic amygdaloid 500 ft. west of the conglomerate. Within less than 300 ft. of this conglomerate No. 2 shaft, and the 27th level are only a few feet behind with several other levels half way or more along in the same direction. Only a very small portion of the tonnage is coming from the amygdaloid, it having slowly but steadily decreased, so that the additional amount on this account coming from the conglomerate with the constant if slow increase

of the total tonnage, and the fact that all of the rock from the conglomerate is from this good ground on the southern side, the yield is showing a constant improvement. The tonnage has increased as often as the drifts are sufficiently opened for new stopes. Besides the increase here there will soon be another with a similar steady rise, from No. 2 and with these increases will come lower costs.

Cherokee has its hoist in position and is advancing so well with its buildings that in about 10 days it will commence mining operations, which will be to sink the exploration shaft, which is down about 16 ft., farther on the lode. The shaft is located where the lode was trenced with a disclosure of a width of 46 ft. and very heavy copper over the greater part of it.

New Arcadian has a width of 700 ft. on both its drifts on the 900 level with an average somewhat better than that of the other openings. This is very positive evidence in favor of the continuation of the mineralization both on the length and depth of the lode; it is also the greatest length of drifts made on any level so far.

Michigan is still continuing its wonderful showing on the Butler lode, the best disclosures so far being now made. The richest display is being made on the west side of the shaft, where the lode was cut into about 8 ft. from the drift carried along the course of two stringers in a fissure or "crossing" that has shown a width of 14 ft. and which is being opened by drifts as it is richer than the surrounding vein. This territory has been very greatly broken up and the fissures resulting have no uniform course as is usually the case. The amount of stamp copper is very small. Supt. S. A. Brady, who has been at this mine for a long period, and has made a long study of the lodes of this region, says the disclosure of copper is very remarkable for its richness and its occurrence in these veins.

LaSalle is shipping to the Franklin mill nearly 500 tons daily, and could ship more if there were greater milling capacity to be had. The best ground is at No. 2, the southern shaft, which has been recently sunk to the 9th level, and which has been good beginning with the 12th level. No. 1 is bottomed at the 20th level, but is only unwatered to the 15th and is only being stoped as far down as the 13th level. The rock here is hard and the stamp shoes only last about 3 days, while at the Centennial they last 5, and at the Allouez 7. The amygdaloid here is almost as hard as the Calumet conglomerate, where the stamps last only about 2 days. There is a chance of finding as good ground at depth and laterally at No. 1 as at No. 2. The electric pump located at No. 2 drains both shafts from the 12th level is a great success both as to efficiency and as a cost saver.

Centennial has extended some of its drifts out under the South Kearsarge and Wolverine to the North Kearsarge line, and at this point is about the distance of one-half the greatest width of the Wolverine from its east corner. The average of the ground passed through is very good. This part of mine will be taken out from No. 1 Centennial when in 2 to 3 years South Kearsarge will have exhausted its paying rock. The shipments remain at about the same figure as for some time past, about 550 tons.

Calumet & Hecla has continued the 10% premium on monthly earnings, now being paid, until Jan. 1, and will also pay to each person in its employ Dec. 31, 25 cts. per day between July 1 and that date. This payment will be made in January, 1917. These provisions apply to the Ahmeek, Tamarack, Calumet & Hecla, Allouez, Centennial, White Pine, Isle Royale, Osceola, LaSalle and Superior, and will embrace about 11,000 employes.

Osceola will have about 112,000 tons for June as compared with 114,000 for May, the former having 26 working days and the latter 27, the difference being partly due to the scarcity of men. The two South Kearsarge shafts will last about the same time, for, though No. 2, the Southern, has the lesser amount of good ground, its shaft pillars will be taken, while those of No. 1 will be retained so that the shaft can be used for hoisting the northwestern side of Centennial. The greater part of the present tonnage of South Kearsarge is coming from the footwall, which was discovered to have a greater extent of copper a few years

ago, though there is considerable of the rich streak of the hanging wall being also mined. North Kearsarge has just begun with a small tonnage by the resumption of mining at No. 3 to gradually supply the declining tonnage of South Kearsarge. Old Osceola is in the ground that has been found to be much richer than the rest of the mine, on the 38th to the 43d levels inclusive, these having been carried the farthest to the south; and the ground will be undoubtedly found to be equally rich, when the lower levels are sufficiently extended. As there is yet on the southern side of the mine quite a large area to be mined, this means much in the way of "sweetening" the yield, as has been done during the greater part of the past year. The mining costs for this good area have been much reduced by the introduction of the compressed air and rope haulage on the 42nd and 45th levels.

Winona is hoisting from King Philip shaft No. 1 a small amount of rock which will be increased as men can be obtained.

Ahmeek is having constructed by the Westinghouse Mfg. Co. turbine of 1000 kw. to run the lights, rockhouse machinery, pumping to its reservoir for the boilers at Nos. 3 and 4, etc., which will afford a much more convenient and a cheaper power. The Worden-Allen Steel Co. has begun to erect the steel shaft rockhouse.

Quincy is getting about 150 tons a day from No. 7 shaft from rock left in the main branch of the Pewabic, or Quincy, lode, and will, when that is exhausted, which will take some time, begin to open up the west branch that has shown such good values at No. 2.

Tamarack is, at shaft No. 3, in about 2600 ft. on the 20th level, which is on the subsidiary shaft begun from the 18th level, towards No. 5, having only about 400 ft. more to go, and the rock is averaging almost as good as when first opened by the sinking of the shaft at this level. It is richer on the 22nd level where a drift has pushed quite a distance both ways, and also on the 23d where a loading station is being cut out, than at any place on the subsidiary shaft. This betterment of the yield with depth is quite marked. The temporary injunction asked for by G. A. Hyams to restrain sale of Tamarack stock because Calumet & Hecla had voted their own stock in the vote of the company for the sale, was denied by Judge Sessions at Grand Rapids, June 27, on condition that if sale be made to the Calumet & Hecla Co. no distribution shall be made to Tamarack stockholders for 15 days after sale, and notice thereof to plaintiff and that of moneys received, the Tamarack shall keep in its possession within the jurisdiction of the court and subject to its order \$100 for each share owned by the plaintiff or other stockholders who may within said 15 days intervene, such moneys to be retained to secure payment of any decree hereafter made in favor of plaintiff and intervenors. An appeal was made by Hyams June 28.

IRON.

Iron River.

Sinking at the Spies mine here will be continued. It is being operated by the Cleveland-Cliffs Co., and will not be in condition to ship until the 1917 season. The original intention was to start in on ore at the 130-ft. level where a drift 150 ft. had been extended, but now they are going down 450 ft., opening the mine at several levels before starting stoping.

Ishpeming.

The Holmes shaft was down 475 ft. July 1, it having been sent down at better than 100 ft. per month since the work began. The shaft is to go to the 1200 level. During the week a pair of 10-ft. hoisting drums were received, with 7-ft. faces. Other machinery as well as structural steel is being received, and the buildings are in course of construction.

The Cleveland-Cliffs Iron Co. has let a contract to the Hoose & Person Construction Co. for shipping the stockpile ground and grade for the railroad tracks at the new Holmes mine. Permanent tracks will be put in, connecting with the different railroads, both on the north and south sides, so that the ore trains can be handled to the best of

advantage. The stripping is extensive, and the company expects to keep their force busy there for 2 months. In places the cut into the embankment will be 20 to 30 ft. Many boulders, too large to be handled by the steam shovel, are being encountered, but these will be blasted and dumped into the foundation being made for the stock-pile grounds. Forty men are now being employed on this work.

Republic.

An excessive amount of water is being encountered at the Republic mine. There is plenty of water power, however, for the hydroelectric plant. Formerly the water was pumped during the night shift, but now it requires steady pumping throughout the day, this being due to the excessive rains of the last few weeks. The single trestle stands are working out satisfactorily and they were particularly useful during the time the L. S. & I. was out of commission and not handling ore, in permitting stocking at the shaft. As the trestle supports were still in place the ore was dumped onto the pile, which would not have been done had the old two-legged stands been in use, as they would have been removed in the steam shovel work of loading onto the cars.

MISSOURI-KANSAS.

Joplin, Mo.

The lower prices paid for zinc ores the last month resulted in a further reduction in the wage schedule of 25 cts. a day, and while it caused considerable dissatisfaction, most of the miners acceded with good grace. Those dissatisfied were principally shovelers, who departed for the harvest fields and left a number of the mines rather short handed for this class of labor. The general results are reductions in output, a feature in line with the present needs and desires of the majority of the operators of the field.

In fact, this week sees a general threat of shutdown in the sheet ground field, where the cost of production is always high, and where the low-grade ore makes a small margin of profit. Driven by low ore prices very near the profit extinction mark, and then having to face higher prices for dynamite, has forced a crisis among that class of mines whose mining costs are high, and whose profit margin is small. Many of this class of mines will not be operating after this month unless the price of ore goes up again, or else the price of supplies and labor go down very greatly.

Never in the history of the Joplin district has there been the amount of surplus stocks of ore now existing in the ore bins of the district. It is conservatively estimated that at least 25,000 tons of zinc concentrates are now in the field ready for shipment, and with a constantly receding market, it has been growing every week. Any shut downs or curtailment of output is looked upon with favor by those who are desirous of seeing a maintenance of the ore market levels that have been enjoyed for many months.

The final organization proceedings were perfected last week for the Interstate Mine Operators' Association, to embrace zinc and lead mine operators of Missouri, Kansas, Oklahoma and Arkansas. The officers selected so far are the president, P. D. Butler, and Henry Connolley, secretary. A directorate and executive committee is now being selected, which will practically control and direct the organization. The work of the new organization will be toward the better marketing of the ores, better buying of their supplies, and organized action with regard to all community problems affecting the mining industry. The membership is strictly limited to those whose interests are mining as opposed to smelting, and no other members will be tolerated. It is said the organization will start out with a membership of about 300 operators.

The mid-year showing in output is a remarkable one from both tonnage and value. In tonnage there has been a very large increase in the zinc output as compared with 1915, and the valuation has nearly doubled that of the same period last year. The total is approximately \$20,000,000 for all ores as against slightly over \$10,000,000 the first half of 1915. The high-price period of the months of March, April and May, together with the large shipments made at that

time, very materially aided in increasing of both shipment and value.

That the mining companies of the Joplin district will aid in the national preparedness movement is made manifest in the announcement by some of the larger concerns that any of their employees called out by the militia will have their jobs held until their return, and during their absence will have paid to their dependents a salary of \$50 per month. The first of the concerns to make the announcement was the Kenefick Zinc Corporation, which has been followed by others. The calling out of the Missouri militia resulted in calling out of the Joplin district four different companies, one from Webb City, one from Joplin, one from Carthage and one from Sarcoux, while the one at Pierce City also took some of the workmen from the field. Over 600 men were drawn from the district and took its toll from the mine employes, a toll that was felt severely in some quarters.

Miami, Okla.

The United States Smelting Co. is rapidly developing its new lease in the Cardin camp north of Miami. It acquired by purchase from B. H. M. Marbury a prospected piece of ground lying between the Blue Goose and Beaver mines, consisting of 40 acres; 18 drill holes were down, showing the ore deposit, and the purchase price was stated to be \$125,000. The company is now sinking two shafts and is at the same time moving its mill from the old Ravenswood mine at Reeds and getting it ready for erection on the new lease. There are approximately 18 cars of machinery already shipped to the new site and more are to follow. The foundations are in for the air compressors and the boiler plant is being bricked in. Everything will be ready by the time shaft sinking is completed. T. J. Rightly is the local superintendent of the company.

MONTANA.

Butte.

The North Butte Mining Co. has advanced the quarterly dividend from 50 to 75 cts. per share. This puts the company on a basis of \$3 per share per year as against \$2 formerly. The last payment of 50 cts. was paid April 26. The dividend of 75 cts. will be paid about July 26. The requirements for dividend purposes on the 430,000 outstanding shares will be \$322,500. The company is making on the present basis of production and price of copper from \$6 to \$8 per share above all expenses. The stock is selling at the lowest point for many months—\$21.50 to \$22—and the new dividend rate of \$3 would be about 14% on the investment.

The Tuolumne is now shipping 50 tons of ore daily. In order to secure better air on the lower levels, a raise is being driven from the 2600 to the 2400 levels. When this work is completed a winze will be sunk from the 2600 level and if developments are favorable, then a shaft will probably be sunk to the 2800 level. The 2600 level is the same as the 2800 of the North Butte, and so it means, if Tuolumne's management should decide to sink deeper, that the new lower levels would open up the Jesse vein at a lower depth than has yet been done in the district.

At the Butte-Main Range property the Tuolumne management, in accordance with its contract, is retimbering the 700 ft. of shaft preparatory to developing the property. The Tuolumne will start its development work of the Colusa Leonard Extension in the near future. The contract between the Tuolumne and Colusa Leonard Extension companies will be ratified at a stockholders' meeting in Phoenix. In the meantime necessary material is being hauled to the Colusa Leonard ground.

Alfred G. White, mine economist for the U. S. Bureau of Mines, is in Butte to begin a survey of the production and consumption of coal, oil and electrical supply throughout the state for future calculation by the commercial interests of the country and the government. The work in Montana is part of a compilation of these products throughout the western states which Mr. White has been engaged in for the last 3 years. He is studying the distribution of coal from the

different fields, the extent of such distribution and the manner of consumption. In studying the coal fields he will endeavor to find out the tonnage used by the railroads, the amount sent out of the state and the number of tons consumed for domestic and commercial purposes. The statistics collected will be grouped according to fields, then states and totals for the western part of the country. His study of oil and electrical development will be very largely relative, and from the point of view of their ability to displace fuel where power, heat and light are generated or to supplement the coal supply.

Two stations—65x20 ft. each—have been cut out at the 1600 level of the Butte & London, and crosscutting will be pushed. As recently announced the two crosscuts will be run north and south to open some 20 veins striking easterly from the Anaconda hill. The crosscuts will be 1250 ft. each in length, which will extend them to the property's end lines, as called for in the contract. Considerable interest is evinced in the development of this property. Under present plans the work of crosscutting will require about a year.

The Anaconda Copper Mining Co. at a recent meeting of the directors decided to increase its regular quarterly dividend from \$1.50 to \$2 a share. It has been predicted that the Anaconda will earn \$15,000,000 this year and while the company still has some debts to meet it is believed this can be done even though the dividend is increased.

In June 1 the East Butte Co. had \$1,900,000 in cash on hand and with the earnings for June added had a surplus of about \$1,200,000 on July 1. This is the best financial condition of the country in its history. The production of copper is now in excess of 1,500,000 lbs. per month, and as long as copper keeps around the level of 27 and 28 cts. the company will continue to add to its surplus about \$200,000 a month. There is nearly \$3 per share in cash in the treasury and the company is making about \$6 per year per share.

NEVADA.

Tonopah.

A new ore body, 5 ft. wide, has been encountered on the 1260 level of the Tonopah Extension. It was found between the O. K. and North Merger veins while extending crosscut 403 and is of excellent grade. It is being developed and promises to closely resemble the O. K. ledge, which is a connecting vein between the Murray and North Merger ore bodies. Retimbering of the Victor shaft is being rapidly completed and a heavy tonnage will soon be drawn from the deepest workings. The mill is now treating 2200 tons of ore per week.

The Belmont mill is crushing about 3000 tons of ore weekly, and developments on all the main levels continue gratifying.

The output of the Tonopah district has increased to over 9000 tons per week. The Rescue Eula has increased its production to 210 tons weekly, and the yield of the Halifax now exceeds 158 tons per week. Tonopah Mining is producing 2000 tons; West End, 708 tons; Jim Butler, 750 tons; North Star, 43 tons. Lessees are shipping 25 to 200 tons per week, most of this coming from blocks on the Midway and Montana.

Hawthorne.

The Mineral County Gold Mining & Cyaniding Co. has been formed, with J. H. Miller, president and general manager; P. H. O'Neil, vice-president; J. E. Adams, secretary-treasurer. The Harvey-Taylor group of 5 gold claims in the Bell district has been acquired and will be worked. Considerable ore is exposed. The property is equipped with a cyanide plant.

The Nevada Garfield, a property with a productive record of fully \$3,000,000 in silver, has been taken under option by H. B. Lind of Goldfield and T. K. Stallo of New York. The dumps are estimated to contain ore to the value of \$2,000,000, and large quantities of low-grade material is exposed underground. The property is being placed in shape for a thorough sampling and satisfactory reports by

the examining engineers will result in the acquisition of the group by a strongly-financed New York corporation.

Rye Patch.

B. A. Goldsworthy and associates have bonded and optioned the Redemption mine from J. O. Blackburn for a price of \$25,000. The property adjoins the old Rye Patch mine, and contains some good-grade ore. Sinking on a 2-ft. vein of excellent ore is proceeding and the best-grade product will be shipped. Later on a mill may be erected.

Golconda.

Ore ranging from \$45 to \$300 in lead, gold and silver is being shipped to Utah smelters from the Honolulu mine, 12 miles south of the Golconda. The shoot is 18 ins. wide and consists entirely of a hard carbonate. The mine comprises 6 claims, adjoining the Golconda, a once famous producer. J. A. Gomes and associates of Golconda are the owners.

Mina.

The Blue Light Mining Co. is arranging to install a leaching plant of a capacity of 100 tons. Shipments have been discontinued and all ore in future will be treated at the company's plant. It is stated a good tonnage of excellent grade copper ore is blocked out. F. M. Baker of Carson City is manager.

Goldfield.

Work has been resumed at the Lone Star with Emory Arnold in charge. Drifting from the -225 level of the Nelligan shaft is proceeding with two shifts to open the extension of the Patrick vein. Arrangements have been made to install an electric hoist and a large compressor. Control of the company was recently gained by New York capitalists.

Connections have been established between the Merger and Jumbo Extension mines and prospecting of the shale-latite contact by the Merger Co. is being pressed. Most of the work thus far has been in shale with the contact tapped by a few raises. Exploration of the true contact is now advancing. This work will determine whether or not the rich Jumbo Extension vein passes into Merger ground.

NEW MEXICO.

Mogollon.

Mogollon Mines Co.'s cleanup for last 2 weeks produced 14 bars gold and silver bullion and 8 tons high-grade concentrates. Ore treated the past week was 875 tons. The new 3-compartment shaft is now 40 ft. below the 700 level and is being sunk at rate of 2 ft. a day; it is in commission for regular hoisting from the 500 level. This property is under the management of S. J. Kidder.

Socorro Mining & Milling Co. is constructing a conveyor to dispose of tailings by elevating and fluming onto a comparatively flat area near the mill and avoid discharging into creek, which has caused more or less inconvenience to ranchers in the lower valleys in past years. The plant treats 230 tons of ore daily.

The Oaks Co. has encountered pay ore from north drift of raise in south tunnel on Eberle mine and is shipping to custom mill. Ore body No. 1 in Clifton mine has been proven to continue to the north by a new crosscut into foot wall of adit tunnel.

Surveys and measurements by Earl C. Cleaveland the past 2 years on West Fork creek have demonstrated the availability of a minimum of 1000 to 1500 hp. during the dry seasons. For its magnitude this is probably the most feasible of the unappropriated water rights within a radius of 35 miles, and if developed will supply the greater part of local power requirements. The mines for a number of years have used crude oil, freighted about 90 miles by wagon, as a source of power, at a cost of around \$150 per horsepower-year. The rising price of crude is turning their attention to the possibilities of water power development which will generate current at a fraction of the present cost by internal combustion engines. It is understood the operators will contract for power at \$100 per horsepower-year with any outside interests undertaking the installation.

NEW YORK.

Gouverneur.

The Northern Ore Co. has increased the capacity of its concentrator at Edwards to 200 tons of ore per day. A car a day of high-grade concentrates are going out. The company has just opened its new hotel, the Northern Inn, to the public.

The Lux Development Co. of Syracuse has resumed development work on the Horace Webb farm, where several test pits were sunk last summer. A steam hoist has been installed.

The Grenville Reduction Co. has been organized by Gouverneur business men for the purpose of erecting a custom concentrator, for which there is a large demand. Charles McCarty, ex-postmaster, is president; John J. Sullivan, president of the Chamber of Commerce, is vice-president, and Arthur W. Orvis, a prominent attorney, secretary and treasurer. The other directors are Mial H. Pierce, W. S. Lee, Jerome Payne and Dr. G. H. Summerfelt. The company is capitalized at \$100,000. In addition to a concentrator a zinc white plant may be installed.

The Pre-Cambrian Exploration Co. has filed incorporation papers. The company is capitalized at \$50,000 and has taken an option on the Eugene Davis property, 1 mile from Talleville, on which a vein carrying high-grade milling zinc ore on the surface was recently discovered. The vein has been stripped and shows a width of 57 ft. Selected samples assay 25% zinc and the ore is practically free from pyrites. The company organized by the election of B. J. Hatmaker, mining engineer, president; E. C. Jordan, chemist, vice-president, and A. W. Orvis, secretary and treasurer.

OREGON.

Champion.

The Champion Con. Mining Co., capitalized for 3,000,000 shares at 10 cts. each, has been organized by Olaus Jeldness of Spokane and associates to take over and operate three groups of claims in the Bohemia district, at a reported price of \$500,000. Mr. Jeldness is president, J. S. Lewis, vice-president and treasurer; C. V. Bobb, managing director, and H. C. Mahon, Portland, secretary. "The properties acquired by the Champion Co. have been examined by Jeldness and myself," said Bobb, "having been favorably passed on previously by several engineers, including W. W. Elmer, R. H. Spencer, W. H. Adams and James P. Kimbell, late director of the United States mint. They consist of 49 claims formerly embraced in the holdings of the Helena, Music and Champion companies covering 800 acres and three parallel ledges for more than a mile along their strike. They form a compact group, located at Champion, 35 miles from Cottage Grove, on the line of the Southern Pacific railroad in Lane county. The mines were discovered in 1858 and the district was named in 1863. The Champion is more extensively developed than either of its neighbors and contains 2000 ft. of crosscuts and drifts. All three groups are stope, so far as they have been developed, to the 300 level, where the ore changed in character from free milling to refractory. Considerable virgin ground is left above the 300 level. The gross production of the three mines to date is estimated to have been \$2,200,000, of which one-half was taken out by the Champion. All three ledges average about 3 ft. in width and show strongly in the bottom of all drifts. Champion ore, according to old mill records, averaged about \$80 in gold. We are drifting east now on the 300 level in new ground in a body of ore that averages \$50. By driving a crosscut 40 ft. in the Music mine we expect to open a large reserve of \$40 ore above the 300 level. The property is equipped with machinery valued at \$200,000, all of which is in first-class condition. We propose to increase the capacity of the 30-stamp mill and concentrator by the addition of 20 stamps and a flotation mill, with which we shall be able to treat economically the ore the old-time miners found too

refractory to handle. Among the machinery equipment is a hydro-electric power plant developing 800-hp. and a saw-mill. The company's holdings include 60,000,000 ft. of Oregon fir. Two ore resources which we expect to be the base of large production are a shoot of ore 25 ft. wide, developed for 400 ft. in the Excelsior vein of the Champion showing average values of \$3 to \$4 a ton; and an unexplored porphyry dike 150 ft. wide from which numerous samples taken by Jeldness and myself ranged from \$1.60 to \$3.50 in gold."

SOUTH DAKOTA.

Lead.

Articles of incorporation have been filed by the Johnson Fuel Co. of Fairfax. The corporation is capitalized at \$2,000,000. The company has holdings of 10,000 acres on which there are large deposits of low-grade lignite coal, and will install machinery to briquet the material. Tests made in the Fernholtz briquetting machines give very favorable results and the product can be mined, briquetted and sold for less than \$4 per ton. It is expected that a six unit plant having a daily capacity of 440 tons briquets will be installed this year.

The Custer Peake Copper Co. is installing a new boiler, compressor and pumps, and as soon as they are put into commission the 250-ft. shaft will be unwatered, and the active development of the copper deposits will follow. This property has been idle for a number of years.

The Wasp No. 2 will return to the mining and treatment of gold ores within a very short time. Operations were suspended some months ago when the large amount of water in the workings made the work impractical. Tungsten ores are being mined and concentrated, and since the closing down of the gold mill about 50 tons of high-grade material has been recovered. The recent installation of a jig to eliminate hand sorting has proved a great success, both in costs and in the grade of material produced.

The Homestake has completed the tungsten concentrator and is now treating the lower grade ore. A good product is obtained and regular shipments of concentrates and high-grade mine ore are made.

Terry.

The aerial tram at the Two Johns property has been put into operation, and the ore from the mine is now delivered to the railroad, a distance of 4000 ft. The mine is under lease to W. A. Hines and associates and the ore is shipped to the Mogul mill for treatment.

C. B. Harris has begun work on the War Eagle property and is taking out lead-silver ore for shipment to a smelter. The first car is ready and regular shipments will follow.

Deadwood.

The U. S. Gypsum Co., whose plaster mill was destroyed by fire last fall, has for some time been busy prospecting the gypsum deposits near Piedmont, and it is expected that a new plant will be erected at this place.

Water has interfered with the shaft work at the Homelode property, near Silver City, awaiting the arrival of a second pump. This has been placed in operation and the shaft has gained a depth of 75 ft. It is the intention of the company to continue to 100 ft. and then do considerable lateral work.

UTAH.

Delta.

The King Silver-Copper Mining Co. has been incorporated with a capital of \$100,000, divided into 1,000,000 shares of 10 cts. par value. The officers of the company are: Geo. E. Banks, president; Wm. F. Curtis, vice-president; Geo. Day, secretary-treasurer; Bert F. Johnson, general manager; H. P. King, superintendent of mines; Wm. C. Curtis, assistant superintendent of mines. It has 14 claims, a shaft down about 165 ft. near the south end of the property and

a tunnel in about 350 ft. near the north end. There are many prospect holes down 15 to 20 ft. in different parts of the claims. The principal values are in silver, copper and lead, with some gold. Recent samples gave the following returns in values: \$245.66, \$27.10, \$51.62, \$15.10, \$60.71 and \$94.86. These were samples taken from the dumps, among which they sent two sacks of 286 lbs. and received the values of \$51.62. The south end of the property seems to be the richer, where the croppings show a vein of copper and silver ore about 15 ins. wide. The north end has a vein about 6 ft. wide of silver and lead ore that assayed \$60.71.

Bingham.

A loading record has recently been made by the Utah Copper Co. which in 24 hours loaded 41,800 tons of ore. June will show a new record, both in production for the company and amount of ore handled. The month will show an average of 34,000 tons of ore a day, while the best previous record was around 30,000 tons a day. The best previous record made by the property was 16,000,000 lbs. for a month, while the production for June is expected to be over this. Although no figures have been given out it is probable that the production will be better than 17,000,000 lbs. After going into the details of the future D. C. Jackling, vice-president, sanctioned plans that call for the increasing of the present Arthur and Magna plants to a point where they will ultimately handle 50,000 tons of ore a day. This increase in capacity will be gradual, as it has been in the past. Besides the present methods of handling of ore it is understood that other methods of treatment will be installed that will greatly increase the efficiency of the plants. The work on the leaching plant will start in a few days now.

Alta.

The strike of an 18-in. vein on the Michigan-Utah property has been followed continuously for 50 ft. The ore occurs in a fissure in the limestone and varies in width from 15 ins. to 3 ft. The Grizzly fissure, in which the ore occurs, strikes east and west. It is being followed to the east. Within 60 ft. it should intersect, according to the surveys, the Lavinia vein, famous for its ore production in the upper workings. The Grizzly fissure strikes northwest and the Lavinia strikes southwest. When the point of intersection is reached it will be about 300 ft. below the stopes on the Lavinia vein. Severely five feet lower both fissures intersect the quartzite-limestone contact, striking northwest and dipping northeast. With the ore showing in the Grizzly, the management is of the opinion that a large ore body will be developed when the winze is sunk along the ore body to the contact.

According to Superintendent Blake of the Wasatch Mines Co., the drainage tunnel has been started. The company intends to get under the deposits shown in the old workings. It is estimated that it will require 6000 ft. of development to get to the objective point in Wasatch ground, and the management believes that this work can be accomplished within 8 months. A careful study of the geology of the country has been made and it is the opinion that the drainage of the shaft down to the new tunnel level will be accomplished after the tunnel has been driven 2500 ft. from its portals. The new workings will open the Wasatch mines to an additional depth of approximately 350 ft. below the present lowest workings and there will also be an opportunity to mine below the tunnel level afforded, as with small pumps it is believed that the drainage can be successfully accomplished to a considerable depth. The water will only have to be raised to the tunnel level and this adit will carry off all the flow from the upper water courses. It will drain a lot of territory besides that being operated by the Wasatch Mines Co. By extending it beyond the Wasatch shaft it will drain and develop a lot of territory under the townsite and beyond into the heart of Alta.

Eureka.

At the Red Wing property work has been progressing. The ground is south and adjoining the well-known Scranton property and undoubtedly traversed by the same ore-bearing veins. The tunnel, by which the ground is being developed, is now in about 85 ft. and it is estimated that only a few feet of drifting will be necessary to carry it to the vein in

which commercial ore should be found. For some distance the work has been carried on in a heavily mineralized lime formation and the showing could hardly be more promising.

At the Lehi-Tintic new machinery has been purchased. The equipment consists of a 4-drill air compressor, drills, motor, etc. Connections will be made with the Utah Power Co., in order that electricity may be used in the operation of the compressor. The power company's line has already been extended to the Selma property in North Tintic and the cost of extending it to the Lehi-Tintic will not be large, besides there is a chance for the company to secure the Eureka King property in the same section. It is to be equipped with electricity for the operation of both hoist and drills. Work is being handled through two tunnels and already a large amount of good prospecting has been done. With the machine drills this work can be pushed forward more rapidly and commercial ore is expected within the next few hundred feet, as two or three important veins are to be cut at splendid depth in this distance.

WASHINGTON.

Spokane.

The increase in miners' wages in the Coeur d'Alene district is prompting workmen in the mines of other regions to demand better pay, and the employees of the different companies operating in Republic have petitioned for an advance of 50 cts. a shift. The prevailing schedule is \$3.50. To consider the demands of the miners the mine owners have formed an association, of which S. H. Richardson, general manager of the Knoch Hill Co., is chairman, and D. M. Drumheller, Jr., general manager of the West Hill Co. and receiver for the San Poil Co., is secretary. Republic mines are employing more men now than for several years, from 125 to 150 being on the payroll. Production also has been increased because of reduction of the freight and treatment rate to the Northport and Trail smelters, but regardless of this the most of the companies are operating on a small margin of profit, owing to the low grade of ore being shipped.

The old Germania mine, near Springdale, regarded as a promising tungsten property, has been sold to a recently organized German company, said to have been financed by the Krupp interests, according to N. V. Steinmark, one of the stockholders in the Germania Co., who has been living in California for the last several years. Steinmark states that Captain Wilhelm von Scheck, former president of the corporation, who left Spokane to join his regiment at the outbreak of the European war, has been relieved from military duty and now is in Belgium, en route to Spokane to assume the management of the mine for the new owners. The Germania mine and the Roselle, adjoining, both formerly controlled by the Germania Co., are extensively developed, more than \$500,000 having been expended in running undergrounds, erecting and equipping a 200-ton mill and establishing a camp, but before shipments were begun the property became involved in litigation and never was operated. The mill was dismantled several months ago, but the buildings and the workings have been kept in excellent condition, a force of watchmen and caretakers having been maintained during the years of idleness. Several months ago an English firm, represented by Fletcher T. Hamshaw of Seattle, endeavored to purchase the holdings, but there were so many persons who claimed to have title, and the promise of litigation was so evident, that Hamshaw finally abandoned the effort. "Several parties, including one I represented, have been negotiating for months with the different parties claiming to have the disposition of the mine, for its sale or lease," said W. V. Garrett, mining broker and tungsten ore buyer. "The title appeared to be badly involved. The original discovery was the Roselle, located by George Newman, and the ore bodies afterward developed were all on that claim. The Germania property was located all round it and the Roselle was jumped by agents of the Germania. They could not make their title stick, however, and finally leased and bonded the property, the Roselle stock

being put in escrow in a Spokane bank. When the Germania got into financial difficulties, was closed down and attached, the title to the Roselle remained clear and the German bondholders of the Germania, to protect themselves, exercised the option on the Roselle stock and took over the control, at least, of that property."

WISCONSIN-ILLINOIS.

Highland.

Saxe-Lampe Mining Co. is rushing to completion a 100-ton concentrator for complex zinc ore deposits recently developed. For the New Jersey Zinc Co. a remodeled plant is in running order on the Red Jacket mine at Centerville. Another new mill is being built for zinc deposits on the Kennedy farm.

Montfort.

The O. P. David mine is shipping regularly, making 2 to 4 cars blende weekly. This is the only zinc ore producer in an area of miles.

Linden.

A big tonnage of low-grade concentrates are being held here by operators. The Mineral Point Mining Co., incorporators Priestly, Smith & Fawkes, have a new mine fully developed on the Wickes allotment, and a 100-ton power and concentrating plant is now being supplied. Another new plant is nearing completion for the Spring Hill Mining Co. Big strikes with drill ahead of the main working face of the Gilman mine insures a heavy producer for sometime to come. Operations were started last week on the Weigle-Jacobs mine. The Silver Dollar has been taken over by local interests who are equipping. Ross Bros., Optimo No. 2, and Optimo No. 3, Glanville, Stoner, Gilman, Hinkle and others, are all producing. The Linden Zinc Co. has been running at minimum capacity pending alterations and repairs. Several cars of high-grade ore have been carried in bin for some time, indicating that offerings of recent date have not been satisfactory. The company has restricted its buying of low-grade ore, and stock on hand is low.

Mineral Point.

The New Jersey Zinc Co. has increased its sulphuric acid capacity to 25 tons. Prices of oxide zinc quotable by the New Jersey Zinc Co. have been reduced, notification going into effect July 1. Much low-grade calcined blende ores from the west, and Canadian carbonate zinc ore, is being received at the oxide works of the Mineral Point Zinc Co. The Mineral Point Public Service Co. is extending its service to Richland Center, 53 miles north. Mulhain Mining Co. has developed a strong blende producer. Shipments of high-grade zinc ore from the two refining plants—the Mineral Point Zinc Co. for June aggregated 67 cars, 5,100,000 lbs. The National Separators at Cuba was next with 50 cars of 60% blende, 4,080,000 lbs. Wisconsin Zinc Roasters at New Diggings and Galena, 45 cars, 3,755,000 lbs. Total direct to smelter for June exceed 20,000,000 lbs.

Cuba.

National Zinc Ore Separating Co. has been discarding coal firing and a new gas producer is now in operating order which will materially raise the efficiency of the plant. J. H. Garrett & Co., 35 S. Dearborn street, Chicago, have a producer in going shape with equipment on the Anthony mine, and now two new producers are planned with equipment on the Dall lease. Utt-Thorne Mining Co. is producing heavily and Geo. L. Jarrett, of Platteville, mining and constructing engineer, is behind a project to develop three new producers in this camp.

Miffin.

Shipments last week were heavier, but low-grade ores again suffered through lack of demand. Shippers were the Peacock, B. M. & B. Mining Co., Lucky Six, Biddick, Cokers, Rundell and Senator. The Rundell operated for the Vinegar Hill Co. extensions of the range have carried into the Yewdall lease, and a new shaft is down in ore and a new 100-ton milling plant is being constructed. Another

new 200-ton concentrator is assuming operation on the Big Tom for the M. & A. Mining Co. of Platteville. A new mine is being developed on the Hugh R. Livingston allotment. Cleveland Mining Co. of Hazel Green is engaged in completing a small plant and developing a new producer on the O. K. leasehold formerly owned by Linden parties. Recent drilling operations in the west quarter of the district show that the main range, a big east and west, is now defined for a distance of 8 miles. It is the longest east and west range in the Wisconsin field.

Platteville.

Ore deliveries for June, including the 24th, show about 40,000,000 lbs. of zinc ore handled, the production falling for the month considerably under this amount, due partly to bad weather. Sales of lead ore 650,000 lbs.; pyrites all from National plant at Cuba to General Chemical Co., 2,266,600 lbs. Millions of pounds of fine pyrites, by-product of zinc ore refineries in this field, are being carried over. One large operator protected by contract claims the cause is found in the increased capacity for making spot acid and a demand for high-grade sulphur from Louisiana mines and high-grade sulphur ores carrying greater acid values. No relief from the present situation is in sight in this field. Prices for the month of June on blende show the range to have held steadily on a base of \$75 down to \$70 on zinc values ranging as low as 42% zinc. Many new mines are being developed and outfitted in this district which is in better shape for zinc mining on a large scale than ever before in its history.

Benton.

In matter of crude zinc ore production, this district eclipsed all its nearest competitors by 4 to 1, shipping 18,000,000 lbs. of concentrates during June up to the 24th. Leasing of unexplored lands took on added impetus during the month and more drilling machines were in actual operation than ever before. The Wisconsin Zinc Co. and Vinegar Hill Co. operated 35 machines at different points in the field. The Frontier Co. was busy with 12 outfits, and small leasing companies all over the district were going with one or two machines each. The lowered prices on ore caused some agitation over the wage scale. The lack of demand for low-grade ore has inspired in many of the independent operators a desire to install zinc ore separators in connection with the mine outfit. One such is going in at Shullsburg. The Cuba Campbell Separator is again running under new management and two new roasting and separating plants are planned for Hazel Green.

WYOMING.

Rock Springs.

E. E. Leshar, of the Geological Survey, states that the production of coal in Wyoming in 1915 was 6,554,028 short tons, an increase of 78,735 tons, or more than 1%, as compared with 1914. The greatest increase was in the Rock Springs field, Sweetwater county, and amounted to more than 122,000 tons. Hot Springs and Converse counties also had increases but all other counties recorded small decreases. The total value of the coal for the state decreased nearly 5%, from \$10,033,747 in 1914 to \$9,555,804 in 1915. The increase in the Rock Springs field is attributed to a strong demand for coal by both the railroads and the domestic and steam coal users during the last half of the year, and to the fact that there were no labor troubles or lack of railroad cars. Normally a considerable quantity of Wyoming coal from the Sheridan field reaches market in northern Montana, Idaho, and Washington (in and about Spokane), but Canadian coal now admitted duty free is reported to have partly replaced it, and to that cause the decreased production in Sheridan county is partly due. Abundance of water in the Black Hills for the hydro-electric plants cut off a part of the market for Wyoming coal. The number of men employed in the coal mines of Wyoming decreased from 8117 in 1914 to 7214 in 1915, but the average number of days worked increased from 192 to 201.

CANADA.

BRITISH COLUMBIA.

Silverton.

Damage to the power plant of the Standard Silver-Lead Mining Co., caused by the recent freshets in the region, has been repaired, and operations have been resumed at capacity in both the mine and the mill.

Kaslo.

Charles F. Caldwell, manager of the Jackson Basin Zinc Mines Co., is in Spokane arranging for the complete organization of that corporation. Caldwell has bonds on the Sunset Bell, U. S., Echo, Alameda and one or two other groups of properties which are being put into the Jackson Basin Co. for about \$250,000. He is associated with Volney D. Williamson, A. L. White, W. Y. Williams and other Spokane men. The corporation will have 2,000,000 shares. Ample funds for development will be provided.

Trail.

The new sulphuric acid plant of Con. Mining & Smelting Co. is finished and General Manager R. H. Stewart states that it will go into operation this week. The new structure is a steel and brick building 50 by 150 ft., and is entirely lined with lead. The plant will produce immediately about 10 tons of acid a day. Half of the output will be used by the company in its lead and zinc refineries and the other half will be sold in the market. A large part of the sulphur which formerly escaped into the air and damaged vegetation in the district will be saved and utilized in the new plant.

Nelson.

The Nelson, Slocan and Eastern British Columbia Mining Men's Club has been organized here with a large membership. The purpose is to give aid to all legitimate mining enterprises in those districts and to add social features to the work of the mining men. Officers chosen are as follows: Hon. L. A. Campbell, Minister of Mines, Victoria, honorary president; Frank C. Bailey, secretary of the Spokane Mining Men's Club, and Sidney Norman, Spokane, honorary vice-presidents; S. S. Fowler, mining engineer of the Blue Bell mines, Riondel, honorary vice-president; J. J. Malone, mayor of Nelson, president; Bruce White of the Noonday mine, Sandon, representing the West Kootenai district, vice-president; George Stark, Invermore, representing East Kootenai district, vice-president; Duncan McIntosh, Greenwood, representing Boundary district, vice-president. Fred A. Starkey, Nelson, president of Associated Boards of Trade of Eastern British Columbia, secretary; E. W. Widdowson, Nelson, provincial assayer, treasurer. The directors are C. F. Caldwell, Utica mines, Kaslo; W. P. Pool, Reno mines, Sheep creek; Dr. Willson, Kootenai Gold mines, Granite; A. G. Larson, Lucky Jim mine, Spokane and Nelson; J. A. Gilker, merchant, Nelson.

Coleman.

The McGillivray Creek Coal & Coke Co. will pay on July 20 a dividend of 1 ct. a share, or \$24,391. This will increase the total to \$73,173, two dividends of 1 ct. each having been paid in 1915. The following officers were elected at the recent meeting: President, Henry L. Simons, Glencoe, Minn.; vice-president, James A. Nowell, St. Paul, Minn.; secretary-treasurer, W. E. Cullen, Jr., Spokane; directors in addition to the above, Fitzhugh Burns, St. Paul, and Lorne A. Campbell, Rosslund. George Kellock of Coleman is colliery manager, and R. S. McKibben, also of Coleman, assistant to the president. The directors' report showed that 158,550 tons of coal had been mined and marketed during the year. The payroll aggregated \$203,118, an average of 241 men having been employed for 206 days. Coal developed was stated at 686,761 tons, and net profit for the year's operations, \$80,262. The conservative way in which the company is managed was instanced by the charge of \$1 for development for the year, it being the company's custom each year to write off the entire cost of development by

charging it against production. The ore reserve of nearly 700,000 tons consequently stands the company nothing.

Vancouver.

An analysis of ore lately discovered in the Omineca district shows values of nearly \$200. The property is situated on Rocher de Boule mountain and adjoins that of the same name, but the claims carrying this ore are the northerly portion of the company's property, and not on the strike of the Rocher de Boule veins. Alexander Sharp, M. E. of Vancouver, completed an examination and report on the property 4 weeks ago and the analysis was made from a sample brought from the mine by him. It exceeds the average of gold values of his samples, which was \$73.28. Sharp reports that the vein is a fissure in granite and that he found a continuous surface pay shoot over some 1200 ft. in length; the fissure being from 3 to 4 ft. in width, and the clean ore from 12 to 36 ins. in width and the difference in elevations over this distance, 800 ft. A. Erskine Smith has formed a company to develop and mine the ore under the name of the New Hazelton Gold-Cobalt Mines, Ltd.

ONTARIO.

Cobalt.

According to the Buffalo Mines, Ltd., report the total production for the year ending April 30, 1916, including sales of silver, silver on hand and unsettled for at the smelter, amounted to 705,055 ozs. There is broken, ready for extraction, about 8000 tons of ore in the stopes, 5000 tons of unbroken ore, and 5000 tons of ore dumps on surface, averaging about 18 ozs., 300,000 tons of tailings from the concentrator containing 1,600,000 ozs. of silver, 7000 tons of residue from treatment of high-grade ore, containing in addition to silver values, cobalt, nickel and arsenic. The gross earnings from mining operations for the year were \$524,973.46. Total expenses of operation and administrative and financing charges were \$266,205.97. After providing for various other charges and adjustments the total surplus at the end of April stands at \$610,888.80. During the year the mill treated 37,152 tons of milling ore, and 1000 tons of sand and slime tailings, or a total of 38,152 was treated. Of this, 30,079 tons were treated by wet concentration, averaging 19 ozs. of silver per ton, with a recovery of 431,512 ozs., and 8073 tons were treated by combination concentration and oil flotation averaging 25.46 ozs. of silver per ton, with a recovery of 197,601 ozs. During the year the cyanide plant treated 6340 tons of slime from the concentrator, averaging 10.54 ozs. of silver per ton, of which 55,161 ozs. were recovered. Total recovery by mill and cyanide was 684,274 ozs. The amalgamation plant and refinery treated during the year 13,465 lbs. of high-grade ore, direct from the mine, 285,554 lbs. of jig concentrates, 718,240 lbs. of table concentrates, and 1952 lbs. of metalics from the low grade mill and 6662 lbs. of precipitates from the cyanide plant, or a total of 612,020 ozs. of silver treated, a portion of which was on hand at the beginning of the year and accounted for in last year's production. The total production of bullion from this plant was 775,253 fine ozs., and 4070 ozs. scrap, etc., on hand, making a total of 779,323 fine ozs. recovered with residue still to be treated.

It is strongly rumored that Beacon Con. will install a flotation plant to treat tailings from its mill. Experiments being conducted for the purpose of making a recovery of silver from mill tailings, which in the past have been considered valueless, have been successful. The main shaft is down 1630 ft. and at the present a station is being cut at the 1600 level. The intention is to drive a cross-cut both east and west of the shaft, which by reason of the dip of the diabase intrusion it is thought that exploration work can be carried on both above and below the contact. The May statement of the company showed: Bullion in storage, 186,433.19 ozs., ore at smelters, 39,350.03 tons; ore hagged at mine, 68,700 ozs.; cash on hand, \$92,483.68. Work on the upper levels of the property, a large proportion of which is unexplored, is progressing favorably and on the 530 level a shoot of high-grade ore, about 4 ins. in width, was encountered. The latter has been proven for a distance of about 20 ft.

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(6) Number of pages. Illustrated articles are indicated by an asterisk (*).

(7) The price.

I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Fearnside, W. G.—*Some Effects of Earth Movement on the Coal Measures of the Sheffield District*. [A paper read before the Midland Inst. on Mining, Civil and Mechanical Eng.].—I. & C. Tr. Rev. June 2 1916; p 630; pp 2*; Coll'y Guard. June 2; p 1039; pp 1½*; June 9; p 1088; pp 2*; 70c.

Freeman, O. W.—*Gold Mining in the Judith Mountains, Montana*. [Briefs are given on some of the plants and mines. The geology and genesis of the ores and formation containing them is given with a general topographic description of the country].—M. & S. P. June 10 1916; p 863; pp 2½*; 20c.

Hewett, D. F.—*Some Manganese Mines in Virginia and Maryland*. [Most of the important mines are described separately. Four types of deposits are described as regards their geology and genesis].—U. S. G. S. Bull. 640-C; pp 35*.

Howard, L. O.—*Ozokerite in Utah*. [A brief review of the deposits is made and a description of the methods of refining the raw product are given. Some of the deposits and operating properties are described].—M. & S. P. June 17 1916; p 907; pp 4½*; 20c.

Marstrander, R.—*The Mineral Resources of Uruguay, South America* [The country has been exploited but little. Iron-manganese ore is of greatest importance, though gold and copper are found and there is possibility for lead, silver, coal and petroleum].—Mg. Mag. June 1916; p 315; pp 6*; 50c.

Miller, W. G.—*Silver Deposits of the Cobalt District*. [Abst. from a report by the author, who is provincial geologist of Ontario. Considerable history of the camp is given and excellent views showing the nature of the formation are reproduced].—Canadian Mg. Jnl. June 15 1916; p 291; pp 7*; 35c.

Nicholls, H. E.—*The Nature of Nigerian Tin Deposits*. [Discusses the mode of occurrence of cassiterite and does not

agree with the theory that the deposits are secondary. Gives examples of the alluvial deposits coming from the weathered granites and lodes].—Mg. Mag. June 1916; p 321; pp 3*; 50c.

Petre, R. W.—*Manganese in South Carolina*. [A detailed geological description].—E. & M. J. June 10 1916; p 1019; pp 1¼*; 25c.

Shelley, J. W.—*Graphite in Madagascar*. [Takes up geology, prospecting, mining, costs, labor conditions, production, law and a general description of the country and conditions to be found there].—Mg. Mag. June 1916; p 324; pp 7*; 50c.

Singewald, J. T., Jr.; Miller, B. L.—*The Cerro de Pasco District, Peru*. [On the history of the camp which was originally a silver camp. The geology of the large copper deposits is given the greater preference].—E. & M. J. June 10 1916; p 1015; pp 4*; 25c.

Ore Genesis

Hewett, D. F.—*Some Manganese Mines in Virginia and Maryland*. [Most of the important mines are described separately. Four types of deposits are described as regards their geology and genesis].—U. S. G. S. Bull. 640-C; pp 35*.

Nicholls, H. E.—*The Nature of Nigerian Tin Deposits*. [Discusses the mode of occurrence of cassiterite and does not agree with the theory that the deposits are secondary. Gives examples of the alluvial deposits coming from the weathered granites and lodes].—Mg. Mag. June 1916; p 321; pp 3*; 50c.

Mineralogy and Petrography

Miller, W. G.—*Silver Deposits of the Cobalt District*. [Abst. from a report by the author, who is provincial geologist of Ontario. Considerable history of the camp is given and excellent views showing the nature of the formation are reproduced].—Canadian Mg. Jnl. June 15 1916; p 291; pp 7*; 35c.

II. ORES AND METALS

(I) METALS AND ORES

Copper

Ball, L. C.—*Notes on a Short Tour in the Gladstone District, Queensland*. [Gold,

copper, coal and molybdenum properties were visited and are briefly described].—Queen Govt. Mg. Jnl. May 15 1916; p 213; pp 1½*; 35c.

Hixon, H. W.—*Electrothermic Zinc Smelting in Puebla, Mexico*. [A description of the operation of the Teziutlan Copper Co.'s plant is given. The ores run 4% copper and 10% zinc. The zinc is obtained as dust for cyanidation work].—E. & M. J. June 17 1916; p 1080; pp 1¼; 25c.

Magnus, B.—*The Sintering of Flotation Concentrates*. [Deals with the operation at Mount Morgan, Queensland, Australia. The ores contained about 2% copper and 7 dwt. gold. Dwight-Lloyd sintering machines were used].—E. & M. J. June 10 1916; p 1032; pp ¾*; 25c.

Marstrander, R.—*The Mineral Resources of Uruguay, South America*. [The country has been exploited but little. Iron-manganese ore is of greatest importance, though gold and copper are found and there is possibility for lead, silver, coal and petroleum].—Mg. Mag. June 1916; p 315; pp 6*; 50c.

McDonald, P. B.—*Mining at the Nevada Consolidated, Nevada*. [Items of financial interest from many other copper companies are spoken of. The deposit is described from a mining standpoint. The methods of timbering, haulage, drilling, etc., are described].—M. & S. P. June 10 1916; p 858; pp 4*; 20c.

Probert, F. H.—*Surficial Indications of Copper*. [Discusses and describes in detail the chemistry of the oxidized zone].—M. & S. P. June 17 1916; p 893; pp 6¼*; 20c.

Samuel, J. M.—*Methods of Measuring Dust Losses at Copper Queen Works, Arizona*. [Abst. of a paper to be read before the Arizona section of the A. I. M. E. Detailed description of methods employed for determining the losses carried as dust in the waste furnace gases].—E. & M. J. June 17 1916; p 1061; pp 2¾*; 25c.

Scott, W. A.—*Mill Equipment of the Engels Copper Mining Co., California*. [Mineral Separation Co.'s flotation cells are used. Crushing and classifying are described and the mill handles about 500 tons].—Mg. World June 24 1916; p 1165; pp 2*; 10c.

Scott, W. A.—*Milling and Smelting at Humboldt, Arizona*. [The plant of the

Consolidated Arizona Smelting Co. is reviewed, including its crushing, concentration, flotation and smelting equipment and operations].—Mg. World June 17 1916; p 1133; pp 1¼*; 10c.

Scott, D. B.—*Stopping Hard Ore at Miami, Arizona*. [Abst. from a paper read before the A. I. M. E.].—M. & S. P. June 24 1916; p 943; pp 4*; 20c.

Singewald, J. T., Jr.; Miller, B. L.—*The Cerro de Pasco District, Peru*. [On the history of the camp, which was originally a silver camp. The geology of the large copper deposits is given the greater preference].—E. & M. J. June 10 1916; p 1015; pp 4*; 25c.

—*The King Process of Refining Copper*. [Extracts from U. S. patent. Hydrocarbon oil under pressure is introduced below the copper-bath's surface. It is shown being used in a tilting furnace].—Mg. World June 24 1916; p 1173; pp 2*; 10c.

Gold Fields and Mining

Alderson, M. W.—*Mining Possibilities in Colombia, S. A.* [A description of the alluvial deposits is given, with details of operation at several properties. In discussing the good points and faults items of financial interest, production figures and costs are brought out].—Mg. World June 24 1916; p 1169; pp 3*; 10c.

Ball, L. C.—*Notes on a Short Tour in the Gladstone District, Queensland*. [Gold, copper, coal and molybdenum properties were visited and are briefly described].—Queen. Govt. Mg. Jnl. May 15 1916; p 213; pp 1½*; 35c.

Dudley, Boyd, Jr.—*The Distribution of Silver Between Metallic Lead and Litharge Containing Slag*. [Formulae which may be used for correction of this loss are given and a complete review of investigations made to determine what amount of silver is in the lead and what part in the litharge slag, is given].—Met. & Chem. Engg. June 15 1916; p 695; pp 6*; 30c.

Freeman, O. W.—*Gold Mining in the Judith Mountains, Montana*. [Briefs are given on some of the plants and mines. The geology and genesis of the ores and formation containing them is given with a general topographic description of the country].—M. & S. P. June 10 1916; p 863; pp 2½*; 20c.

Lee, C. F.—*Some Hydraulic Mining Problems*. [Abst. of a paper read before the A. I. M. E. Costs, difficulties and details of operation in the Atlin district, B. C., are given. Detailed data and information regarding sluicing are included].—Mg. World June 24 1916; p 1181; pp 1*; 10c.

Magnus, B.—*The Sintering of Flotation Concentrates*. [Deals with the operation at Mount Morgan, Queensland, Australia. The ores contained about 2% copper and 7 dw. gold. Dwight-Lloyd sintering machines were used].—E. & M. J. June 10 1916; p 1032; pp ¾*; 25c.

Marstrander, R.—*The Mineral Resources of Uruguay, South America*. [The country has been exploited but little. Iron-manganese ore is of greatest importance, though gold and copper are found and there is possibility for lead, silver, coal and petroleum].—Mg. Mag. June 1916; p 315; pp 6*; 50c.

Mostowitsch, W.—*Extraction of Gold and Silver from Matte by Lead*. [Abst. translation from the Jnl. of the Russian Metallurgical Soc. For the greater part the text is on the results of experimental work].—Met. & Chem. Engg. June 15 1916; p 705; pp 2¾*; 30c.

Rickard, T. A.—*The Re-Opening of Old Mines Along Mother Lode, California*. [Gives details on the history of present and historical companies. Figures on their production and methods of operation are given].—M. & S. P. June 24 1916; p 935; pp 5*; 20c.

Rye, C. M.—*Gold Mining in the Philippines*. [Water power and combustion engines are used considerably. The descriptions are general, but separate in describing the operations of companies. Both amalgamation and cyanidation are employed].—M. & S. P. June 17 1916; p 900; pp 2½*; 20c.

Thomas, C. A.—*Lübecker Excavator in the Klondike, Alaska*. [This dredge is to be tried by the Northwest Corp. It is a chain-bucket excavator heretofore used in digging brown coal in Germany. A special design has been made to act as a gold dredge here].—E. & M. J. June 17 1916; p 1037; pp 2¾*; 25c.

—*Rhodesia Chamber of Mines, Report of the Executive Committee*. [In tabulated form the gold production for the different companies and districts, is given].—Rhodesia Chamber of Mines; Mar. 1916; pp 5; 35c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

Landgrebe, K. L.—*Handling the Blast Furnace Charge*. [A paper read before the Amer. Iron & Steel Inst. Gives detailed information on the charging top used at the furnaces of the Tennessee Coal, Iron & Railroad Co.].—I. Tr. Rev. June 22 1916; p 1376; pp 6*; 25c.

Marstrander, R.—*The Mineral Resources of Uruguay, South America*. [The country has been exploited but little. Iron-manganese ore is of greatest importance, though gold and copper are found and there is possibility for lead, silver, coal and petroleum].—Mg. Mag. June 1916; p 315; pp 6*; 50c.

—*Iron Ore Production in 1915*. An advance report of the U. S. G. S. reviewing the situation by districts separately].—Chem. Engg. June 1916; p 233; pp 1½; 35c.

Iron and Steel

Jeffries, Z.; Kline, A. H.; Zimmer, E. B.—*Determining Grain Size in Metals*. [The authors have evolved a new method for determining the number of grains in a given sample. The properties of iron and steel depend considerably on this].—I. Tr. Rev. June 15 1916; p 1317; pp 3¾*; 25c.

Moore, H. F.—*The Web Strength of I-Beams and Girders*. [Gives formulas derived and used besides a general description and discussion of the results of the tests].—Jnl. West. Soc. of Eng. Mar. 1916; p 209; pp 23*; 60c.

Oxley, A. E.—*The Transformation of Pure Iron*. [Deals with the theory and practical metallography of the molecular constitution of iron].—Trans. of Faraday Soc. April 1916; p 129; pp 5½; 60c.

Thompson, F. C.—*The Allotropy of Iron*. [Treats on the properties and chemical composition of iron at various temperatures. The results of some tests and discussion are given].—Trans. of Faraday Soc. April 1916; p 134; pp 6½*; 60c.

—*Vacuum Melted Pure Iron*. [By this practice open-hearth metal is purified and the magnetic powers greatly increased].—Iron Age June 8 1916; p 1382; pp 1½*; 30c.

Iron and Steel: Foundry and Furnace Practice

Diehl, A. N.—*The Economical Use of Blast Furnace Gas*. [A paper read before the American Iron & Steel Inst.].—Iron Age June 8 1916; p 1384; pp 5*; 30c.

Landgrebe, K. L.—*Handling the Blast Furnace Charge*. [A paper read before the Amer. Iron & Steel Inst. Gives detailed information on the charging top used at the furnaces of the Tennessee Coal, Iron & Railroad Co.].—I. Tr. Rev. June 22 1916; p 1376; pp 6*; 25c.

—*Two-Ton Open-Hearth Furnace Successfully Operated*. [The furnace has a record of five heats daily and a long run without relining].—Foundry May 1916; p 169; pp 4½*; 25c.

Lead

Engelder, O. G.—*Mining in Sardinia*. [A general account of the lead-zinc mines, their operation, production, etc. Labor wages, etc., are spoken of, and in this connection the law in regard to hiring and expelling employes is brought out].—M. & S. P. June 19 1916; p 862; pp 1; 20c.

Parmalle, J. G.—*Flotation Process at the Standard Mill, Silverton, B. C.* [The ores are zinc-lead containing much leaf silver. The Wyman pneumatic flotation machine is shown and described in detail. Assays of the concentrates are given with details of mill operation and flow sheet].—Mg. World June 17 1916; p 1121; pp 2*; 10c.

—*Missouri's Mine Output in 1915*. [Abst. of an advance report of the U. S. G. S. Production figures are given and a review of the mine and smelter conditions and operations is made].—Mg. World June 17 1916; p 1128; pp ¾; 10c.

Manganese

Hewett, D. F.—*Some Manganese Mines in Virginia and Maryland*. [Most of the important mines are described separately. Four types of deposits are described as regards their geology and genesis].—U. S. G. S. Bull. 640-C; pp 35*.

Marstrander, R.—*The Mineral Resources of Uruguay, South America*. [The country has been exploited but little. Iron-manganese ore is of greatest importance, though gold and copper are found and there is possibility for lead, silver, coal and petroleum].—Mg. Mag. June 1916; p 315; pp 6*; 50c.

Petre, R. W.—*Manganese in South Carolina*. [A detailed geological description of the same].—E. & M. J. June 10 1916; p 1019; pp 1¼*; 25c.

Molybdenum

Ball, L. C.—*Notes on a Short Tour in the Gladstone District, Queensland*. [Gold, copper, coal and molybdenum properties were visited and are briefly described].—Queen. Govt. Mg. Jnl. May 15 1916; p 213; pp 1½*; 35c.

Nickel

McLeish, John.—*Annual Report on the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—Canada Dept. of Mines, Mines Branch, No. 384; pp 362.

Platinum

Burgess, G. K.; Waltenberg, R. G.—*Further Experiments on the Volatilization of Platinum*. [Tests were made at 700, 1,000 and 1,200. Also with hydrochloric and hydrofluoric acids].—U. S. Bur. of Stand. Sci. Paper 280; pp 9; 15c.

Silver

Cole, A. A.—*Concentration of Cabalt Silver Ores by Oil Flotation*. [Extract of a report to the T. & N. O. Ry. commission. A reprint is shown of the Buffalo Mines Ltd. flotation plant flow sheet].—*Canadian Mg. Jnl.* June 15 1916; p 301; pp 1; 35c.

Dudley, Boyd, Jr.—*The Distribution of Silver Between Metallic Lead and Litharge Containing Slag*. [Formulae which may be used for correction of this loss are given and a complete review of investigations made to determine what amount of silver is in the lead and what part in the litharge slag, is given].—*Met. & Chem. Engg.* June 15 1916; p 695; pp 6*; 30c.

Mathers, F. C.; Kuebler, J. R.—*Addition Agents in the Electric Deposition of Silver from Silver Nitrate Solutions*. [A paper read before the American Electrochem. Soc.].—*Chem. Eng.* June 1916; p 243; pp 4½; 35c.

Miller, W. G.—*Silver Deposits of the Cobalt District*. [Abst. from a report by the author, who is provincial geologist of Ontario. Considerable history of the camp is given and excellent views showing the nature of the formation are reproduced].—*Canadian Mg. Jnl.* June 15 1916; p 291; pp 7*; 35c.

Mostowitsch, W.—*Extraction of Gold and Silver from Matte by Lead*. [Abst. translation from the *Jnl.* of the Russian Metallurgical Soc. For the greater part the text is on the results of experimental work].—*Met. & Chem. Engg.* June 15 1916; p 705; pp 2¾*; 30c.

Parmalee, J. G.—*Flotation Process at the Standard Mill, Silverton, B. C.* [The ores are zinc-lead containing much leaf silver. The Wyman pneumatic flotation machine is shown and described in detail. Assays of the concentrates are given, with details of mill operation and flow sheet].—*Mg. World* June 17 1916; p 1121; pp 3*; 10c.

Singewald, J. T., Jr.; Miller, B. L.—*The Cerro de Pasco District, Peru*. [On the history of the camp, which was originally a silver camp. The geology of the large copper deposits is given the greater preference].—*E. & M. J.* June 10 1916; p 1015; pp 4*; 25c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Nicholls, H. E.—*The Nature of Nigerian Tin Deposits*. [Discusses the mode of occurrence of cassiterite and does not agree with the theory that the deposits are secondary. Gives examples of the alluvial deposits coming from the weathered granites and lodes].—*Mg. Mag.* June 1916; p 231; pp 3*; 50c.

Zinc

De Lumen, M.—*The Roasting of Blende*. [The effect of constituents of blende on sulphur elimination and roasting process. The Hasenclever, Delplace, Hegler, McDougal and Spirlet furnaces are described. Comments on the gases for sulphuric acid manufacture in England, Belgium and Germany].—*E. & M. J.* June 10 1916; p 1021; pp 3¾; 25c.

Engelder, O. G.—*Mining in Sardinia*. [A general account of the lead-zinc mines, their operation, production, etc. Labor, wages, etc., are spoken of and in this connection the law in regard to hiring and expelling employes is brought out].—*M. & S. P.* June 10 1916; p 802; pp 1; 20c.

Hixon, H. W.—*Electrothermic Zinc*

Smelting in Puebla, Mexico. [A description of their operation of the Teziutlan Copper Co.'s plant is given. The ores run 4% copper and 10% zinc. The zinc is obtained as dust for cyanidation work].—*E. & M. J.* June 17 1916; p 1080; pp 1¼; 25c.

Parmalee, J. G.—*Flotation Process at the Standard Mill, Silverton, B. C.* [The ores are zinc-lead containing much leaf silver. The Wyman pneumatic flotation machine is shown and described in detail. Assays of the concentrates are given, with details of mill operation and flow sheet].—*Mg. World* June 17 1916; p 1121; pp 3*; 10c.

—*Missouri's Mine Output in 1915*. (Abst. of an advance report of the U. S. G. S. Production figures are given and a review of the mine and smelter conditions and operations is made).—*Mg. World* June 17 1916; p 1128; pp ¾; 10c.

(II) NON-METALS**(A) FUELS****Coal Fields and Mining**

Ball, L. C.—*Notes on a Short Tour in the Gladstone District, Queensland*. [Gold, copper, coal and molybdenum properties were visited and are briefly described].—*Queen. Govt. Mg. Jnl.* May 15 1916; p 213; pp 1½*; 35c.

Fearnside, W. G.—*Some Effects of Earth Movement on the Coal Measures of the Sheffield District*. [A paper read before the Midland Inst. of Mining, Civil and Mechanical Eng.].—*I. & C. Tr. Rev.* June 2 1916; p 630; pp 2*; 35c; *Coll'y Guard.* June 2; p 1039; pp 1½*; June 9; p 1088; pp 2*; 70c.

Marstrander, R.—*The Mineral Resources of Uruguay, South America*. [The country has been exploited but little. Iron-manganese ore is of greatest importance, though gold and copper are found and there is possibility for lead, silver, coal and petroleum].—*Mg. Mag.* June 1916; p 315; pp 6*; 50c.

Steelman, J.—*The Wire Rope and the Coal Mine*. [A general detailed discussion on the proper kinds of rope for different uses, such as hoisting, haulage, zuying, aerial tramways, etc.].—*Coal Age* June 24 1916; p 1082; pp 5½*; 20c.

Winmill, T. F.—*The Absorption of Oxygen by Coal*. [A paper read before the Inst. of Mining Eng. The effect of size and percentage of oxygen in the air on the rate and quantity of oxygen absorbed by the coal is brought out].—*I. & C. Tr. Rev.* June 9 1916; p 660; pp 3; 35c.

Winmill, T. F.—*The Estimation of Moisture in Coal*. [A paper read before the Inst. of Mining Eng.].—*I. & C. Tr. Rev.* June 9 1916; p 671; pp 1*; 35c.

Coke

Gosrow, R. C.—*Coke as a Reducing Agent in the Electric Smelting Furnace*. [Details of operation for this practice is given with discussion on the advantages and disadvantages].—*Met. & Chem. Engg.* June 15 1916; p 691; pp 3; 30c.

—*New Coke Ovens at Port Clarence Works*. [In detail gives the plant arrangement and operation of Bell Bros., Ltd., plant at Middlebrough, England].—*I. & C. Tr. Rev.* May 26 1916; p 606; pp 2*; 35c.

Natural Gas

McLeish, John.—*Annual Report on the Mineral Production of Canada, 1914*. [Each mineral is reported on separately. The imports, exports, production and condition of the trade are given].—*Can-*

ada Dept. of Mines, Mines Branch, No. 384; pp 362.

Petroleum

Marstrander, R.—*The Mineral Resources of Uruguay, South America*. [The country has been exploited but little. Iron-manganese ore is of greatest importance, though gold and copper are found and there is possibility for lead, silver, coal and petroleum].—*Mg. Mag.* June 1916; p 315; pp 6*; 50c.

(B) STRUCTURALS AND CERAMICS**Concrete**

Del Mar, Algernon.—*Concrete Foundation for Mining Installations*. [Gives details of the concrete work and shows drawings of many forms with discussion on this form of foundation].—*Mg. World* June 17 1916; p 1129; pp 2*; 10c.

Drucker, M. A.—*Diagrams for the Design of Reinforced Concrete T Beams*.—*Engg. & Cont.* June 28 1916; p 579; pp 1½*; 20c.

Talbot, A. N.; Slater, W. A.—*Tests of Reinforced Concrete Slab Structures*. [Practical tests which have been made on five different large buildings of concrete. Most minute descriptions are given].—*Univ. of Ill. Bull.* 84; pp 128*.

Wig, R. J.; Williams, G. M.; Gates, E. R.—*Strength and Other Properties of Concrete as Affected by Materials and Methods of Preparation*. [Many tests are given, the most important being a long series of tests on concrete mixtures].—*U. S. Bur. of Stand. Tech. Paper* 58; pp 172*; 45c.

Lime

Hough, N. G.—*Field Work of the Hydrated Lime Bureau*. [An account of field investigation of various sorts made by this bureau].—*National Lime Mfg. Assn.* April 1916; pp 7; 35c.

(C) OTHER NON-METALS**Acids**

Martin, G.; Foucar, J. L.—*Sulphuric Acid and Sulphur Products*. [Describes modern plants, their methods and other common methods of manufacturing sulphur products. Statistics are given].—*Crosby, Lockwood & Son, London; book*; pp 100*; 72.

Feldspar

Watts, A. S.—*The Feldspars of the New England and North Appalachian States*. [Contains description of the geology and separate descriptions of the quarries. Tests for the feldspar are given, as are methods of quarrying, pumping, crushing, concentration, etc.].—*U. S. Bur. of Mines Bull.* 92; pp 181*; 35c.

Fluorspar

Burchard, E. F.—*Fluorspar in 1915*. [The report shows that the production has materially increased and the imports decreased to nearly a negligible quantity].—*Min. Res. of U. S.* II:6; pp 9.

Fullers Earth

Middleton, J.—*Fuller's Earth in 1915*. [Treats on the occurrence, uses, production, the industry by states].—*Min. Res. of U. S.* II:3; pp 4.

Gems

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*. [Prospecting, sampling, dredging, washing and dressing, water supply and transportation in the diamond fields of this area are reviewed].—*S. Afr. Mg. Jnl.* May 6 1916; p 133; pp 1; 35c.

Graphite

Shelley, J. W.—*Graphite in Madagascar*. [Takes up geology, prospecting, mining, costs, labor conditions, production, law and a general description of the country and conditions to be found there].—Mg. Mag. June 1916; p 324; pp 7*; 50c.

Mica

—*Mica Mining*. [A general review of the mica mining and marketing industry. Production, sorting and concentration of the raw material is briefly treated on and a chart is given showing the final subdivision of 1,000 lbs. of the raw material and what total amount will be obtained for different grades of the same].—M. & S. P. June 10 1916; p 866; pp 1; 20c.

Paint

Howard, L. O.—*Ozokerite in Utah*. [A brief review of the deposits is made and a description of the methods of refining the raw product are given. Some of the deposits and operating properties are described].—M. & S. P. June 17 1916; p 907; pp 4½*; 20c.

Pyrites

Winmill, T. F.—*The Atmospheric Oxidation of Iron Pyrites*. [A paper read before the Inst. of Mines, Eng.].—I. & C. Tr. Rev. June 9 1916; p 664; pp 1; 35c.

Sulphur

Martin, G.; Foucar, J. L.—*Sulphuric Acid and Sulphur Products*. [Describes modern plants, their methods and other common methods of manufacturing sulphur products. Statistics are given].—Crosby, Lockwood & Son, London; book; pp 100*; \$2.

III. TECHNOLOGY

MINES AND MINING

Prospecting

Probert, F. H.—*Surficial Indications of Copper*. [Discusses and describes in detail the chemistry of the oxidized zone].—M. & S. P. June 17 1916; p 893; pp 6¾*; 20c.

Shelley, J. W.—*Graphite in Madagascar*. [Takes up geology, prospecting, mining, costs, labor conditions, production, law and a general description of the country and conditions to be found there].—Mg. Mag. June 1916; p 324; pp 7*; 50c.

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*. [Prospecting, sampling, dredging, washing and dressing, water supply and transportation in the diamond fields of this area are reviewed].—S. Afr. Mg. Jnl. May 6 1916; p 133; pp 1; 35c.

Surveying and Drafting

Butcher, E. W. R.—*Standard Sub Turns*. [Treats on the standardizing of curves in sub-level haulage so that a supply of tracks may be had and thus eliminate the work of specially bending them].—E. & M. J. June 10 1916; p 1029; pp ¾*; 25c.

McCrystle, J. — *Underground Mine Roads*. [A list of set rules to be adhered to by the track layers and foremen. They have to do with details, distances, etc., to be noted by the trackmen and surveyors].—Coal Age June 10 1916; p 1000; pp 3¾*; 20c.

Drilling and Boring

Key, Cooper A.—*Dust Allaying in Rand Mines, South Africa*. [Gives de-

tailed results and methods used for allaying the dust caused from drilling and blasting].—E. & M. J. June 17 1916; p 1065; pp 2¾*; 25c.

McDonald, P. B.—*Mining at the Nevada Consolidated, Nevada*. [Items of financial interest from many other copper companies are spoken of. The deposit is described from a mining standpoint. The methods of timbering, haulage, drilling, etc., are described].—M. & S. P. June 10 1916; p 858; pp 4*; 20c.

Rehfuss, L. A.; Rehfuss, W. C.—*Portable Mining Equipment for Prospects*. [A description of gasoline motor units for work in various capacities at prospects].—E. & M. J. June 10 1916; p 1025; pp 2¾*; 25c.

—*Drill- and Tool-Sharpening Shop at the Copper Queen Mine, Arizona*. [The shop handles 1,200 pieces per day. Detailed costs and methods of operation are given which include a description of the equipment].—E. & M. J. June 24 1916; p 1099; pp 5¼*; 25c.

Explosives and Blasting

Fay, A. H.—*Coal Mine Fatalities in the United States in March, 1916*. [A list of permissible explosives, lamps and motors tested prior to May 1, 1916, is also given].—U. S. Bur. of Mines Monthly Statement; pp 22.

Key, Cooper A.—*Dust Allaying in Rand Mines, South Africa*. [Gives detailed results and methods used for allaying the dust caused from drilling and blasting].—E. & M. J. June 17 1916; p 1065; pp 2¾*; 25c.

McDonald, P. B.—*Mining at the Nevada Consolidated, Nevada*. [Items of financial interest from many other copper companies are spoken of. The deposit is described from a mining standpoint. The methods of timbering, haulage, drilling, etc., are described].—M. & S. P. June 10 1916; p 858; pp 4*; 20c.

Pumps and Pumping

Watts, A. S.—*The Feldspars of the New England and North Appalachian States*. [Contains description of the geology and separate descriptions of the quarries. Tests for the feldspar are given, as are methods of quarrying, pumping, crushing, concentration, etc.].—U. S. Bur. of Mines Bull. 92; pp 181*; 35c.

Lighting

Fay, A. H.—*Coal Mine Fatalities in the United States in March, 1916*. [A list of permissible explosives, lamps and motors tested prior to May 1, 1916, is also given].—U. S. Bur. of Mines Monthly Statement; pp 22.

Hardwick, F. W.—*The History of the Safety Lamp*. [A paper read before the Inst. of Mining, London].—Colly Guard. June 9 1916; p 1087; pp 1½; 35c.

Hoists and Hoisting

Bulkley, J. N.—*Application of Electrical Power to Rand Mining Work*. [Results with electric winding and comparison of the cost of steam and electricity are discussed].—S. Afr. Mg. Jnl. April 29 1916; p 112; pp 1; 35c.

Steelman, J.—*The Wire Rope and the Coal Mine*. [A general detailed discussion on the proper kinds of rope for different uses, such as hoisting, haulage, guying, aerial tramways, etc.].—Coal Age June 24 1916; p 1082; pp 5½*; 20c.

Dredging

Alderson, M. W.—*Mining Possibilities in Colombia, S. A.* [A description of the alluvial deposits is given with details of

operation at several properties. In discussing the good points and faults items of financial interest, production figures and costs are brought out].—Mg. World June 24 1916; p 1169; pp 3*; 10c.

Lee, C. F.—*Some Hydraulic Mining Problems*. [Abst. of a paper read before the A. I. M. E. Costs, difficulties and details of operation in the Atlin district, B. C., are given. Detailed data and information regarding sluicing are included].—Mg. World June 24 1916; p 1181; pp 1*; 10c.

Thomas, C. A.—*Lübecker Excavator in the Klondike, Alaska*. [This dredge is to be tried by the Northwest Corp. It is a chain-bucket excavator heretofore used in digging brown coal in Germany. A special design has been made to act as a good dredge here].—E. & M. J. June 17 1916; p 1057; pp 2¾*; 25c.

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*. [Prospecting, sampling, dredging, washing and dressing, water supply and transportation in the diamond fields of this area are reviewed].—S. Afr. Mg. Jnl. May 6 1916; p 133; pp 1; 35c.

Mine Sampling

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*. [Prospecting, sampling, dredging, washing and dressing, water supply and transportation in the diamond fields of this area are reviewed].—S. Afr. Mg. Jnl. May 6 1916; p 133; pp 1; 35c.

Power Shovels and Explosives

Hirschberg, C. A.—*Speed and Economy of the Deep Hole Drill Wagon*. [Details of results obtained and methods used are given, including some figures on costs of operation].—Comm. Air June 1916; p 8003; pp 5½*; 20c.

Thomas, C. A.—*Lübecker Excavator in the Klondike, Alaska*. [This dredge is to be tried by the Northwest Corp. It is a chain-bucket excavator heretofore used in digging brown coal in Germany. A special design has been made to act as a gold dredge here].—E. & M. J. June 17 1916; p 1057; pp 2¾*; 25c.

Transport

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*. [Prospecting, sampling, dredging, washing and dressing, water supply and transportation in the diamond fields of this area are reviewed].—S. Afr. Mg. Jnl. May 6 1916; p 133; pp 1; 35c.

Haulage and Conveying

Butcher, E. W. R.—*Standard Sub Turns*. [Treats on the standardizing of curves in sub-level haulage so that a supply of tracks may be had and thus eliminate the work of specially bending them].—E. & M. J. June 10 1916; p 1029; pp ¾*; 25c.

Liebermann, P. B.—*Comparative Friction Test of Two Types of Mine Cars*. [Abst. of a paper read before the A. I. M. E. Plane bore and roller bearings are the two types compared].—Mg. World June 24 1916; p 1175; pp 2½*; 10c.

McDonald, P. B.—*Mining at the Nevada Consolidated, Nevada*. [Items of financial interest from many other copper companies are spoken of. The deposit is described from a mining standpoint. The methods of timbering, haulage, drilling, etc., are described].—M. & S. P. June 10 1916; p 858; pp 4*; 20c.

Steelman, J.—*The Wire Rope and the Coal Mine*. [A general detailed discussion on the proper kinds of rope for dif-

ferent uses, such as hoisting, hauling, guying, aerial tramways, etc.].—*Coal Age* June 24 1916; p 1082; pp 5½*; 20c.

Safety

Hardwick, F. W.—*The History of the Safety Lamp*. [A paper read before the Inst. of Mining, London].—*Colly Guard*. June 9 1916; p 1087; pp 1½; 35c.

Sanitation

Burrell, G. A.; Oberfell, G. G.—*Effects of Atmospheres Deficient in Oxygen on Small Animals and on Men*. [Results of a number of different tests made on both animals and men].—U. S. Bur. of Mines Tech. Paper 122; pp 12; 15c.

Key, Cooper A.—*Dust Allaying in Rand Mines, South Africa*. [Gives detailed results and methods used for allaying the dust caused from drilling and blasting].—E. & M. J. June 17 1916; p 1065; pp 2¾*; 25c.

Labor and Management

Engelder, O. G.—*Mining in Sardinia*. [A general account of the lead-zinc mines, their operation, production, etc. Labor, wages, etc., are spoken of and in this connection the law in regard to hiring and expelling employees is brought out].—M. & S. P. June 10 1916; p 862; pp 1; 20c.

Production

Alderson, M. W.—*Mining Possibilities in Colombia, S. A.* [A description of the alluvial deposits is given, with details of operation at several properties. In discussing the good points and faults items of financial interest, production figures and costs are brought out].—Mg. World June 24 1916; p 1169; pp 3*; 10c.

Engelder, O. G.—*Mining in Sardinia*. [A general account of the lead-zinc mines, their operation, production, etc. Labor, wages, etc., are spoken of and in this connection the law in regard to hiring and expelling employees is brought out].—M. & S. P. June 10 1916; p 862; pp 1; 20c.

Freeman, O. W.—*Gold Mining in the Judith Mountains, Montana*. [Briefs are given on some of the plants and mines. The geology and genesis of the ores and formation containing them is given, with a general topographic description of the country].—M. & S. P. June 10 1916; p 863; pp 2½*; 20c.

Miller, W. G.—*Silver Deposits of the Cobalt District*. [Abst. from a report by the author, who is provincial geologist of Ontario. Considerable history of the camp is given and excellent views showing the nature of the formation are reproduced].—*Canadian Mg. Jnl.* June 15 1916; p 291; pp 7*; 35c.

Rickard, T. A.—*The Re-Opening of Old Mines Along Mother Lode, California*. [Gives details on the history of present and historical companies. Figures on their production and methods of operation are given].—M. & S. P. June 24 1916; p 935; pp 5*; 20c.

Shelley, J. W.—*Graphite in Madagascar*. [Takes up geology, prospecting, mining, costs, labor conditions, production, law and a general description of the country and conditions to be found there].—Mg. Mag. June 1916; p 321; pp 7*; 50c.

—*Iron Ore Production in 1915*. [An advance report of the U. S. G. S. reviewing the situation by districts separately].—*Chem. Engg.* June 1916; p 233; pp 1½; 35c.

—*Mica Mining*. [A general review of the mica mining and marketing

industry. Production, sorting and concentration of the raw material is briefly treated on and a chart is given showing the final subdivision of 1,000 lbs. of the raw material and what total amount will be obtained for different grades of the same].—M. & S. P. June 10 1916; p 866; pp 1; 20c.

—*Missouri's Mine Output in 1915*. [Abst. of an advance report of the U. S. G. S. Production figures are given and a review of the mine and smelter conditions and operations is made].—Mg. World June 17 1916; p 1128; pp ¾; 10c.

—*Rhodesia Chamber of Mines, Report of the Executive Committee*. [In tabulated form the gold production for the different companies and districts, is given].—Rhodesia Chamber of Mines; Mar. 1916; pp 5; 35c.

Mining Costs

Lee, C. F.—*Some Hydraulic Mining Problems*. [Abst. of a paper read before the A. I. M. E. Costs, difficulties and details of operation in the Atlin district, B. C., are given. Detailed data and information regarding sluicing are included].—Mg. World June 24 1916; p 1181; pp 1*; 10c.

—*Drill- and Tool-Sharpening Shop at the Copper Queen Mine, Arizona*. [The shop handles 1,200 pieces per day. Detailed costs and methods of operation are given, which include a description of the equipment].—E. & M. J. June 24 1916; p 1099; pp 5¼*; 25c.

Mining Miscellany

McDonald, P. B.—*Mining at the Nevada Consolidated, Nevada*. [Items of financial interest from many other copper companies are spoken of. The deposit is described from a mining standpoint. The methods of timbering, haulage, drilling, etc., are described].—M. & S. P. June 10 1916; p 858; pp 4*; 20c.

Scott, D. B.—*Stoping Hard Ore at Miami, Arizona*. [Abst. of a paper read before the A. I. M. E.].—M. & S. P. June 24 1916; p 943; pp 4*; 20c.

Tremoureaux, R. E.—*A New Dry-House*. [Costs and details of construction for this house constructed at the Champion mine, Nevada City, Cal., are given].—M. & S. P. June 17 1916; p 903; pp 2½*; 20c.

—*Mine Plant Water System*.—E. & M. J. June 17 1916; p 1073; pp 1; 25c.

MILL AND MILLING

Crushing, Grinding, Etc.

Scott, W. A.—*Mill Equipment of the Engels Copper Co., California*. [Mineral Separation Co.'s flotation cells are used. Crushing and classifying are described and the mill handles about 500 tons].—Mg. World June 24 1916; 1165; pp 2*; 10c.

Scott, W. A.—*Milling and Smelting at Humboldt, Arizona*. [The plant of the Consolidated Arizona Smelting Co. is reviewed, including its crushing, concentration, flotation and smelting equipment and operations].—Mg. World June 17 1916 p 1133; pp 1¼*; 10c.

Flotation

Cole, A. A.—*Concentration of Cobalt Silver Ores by Oil Flotation*. [Extract of a report to the T. & O. Ry. commission. A reprint is shown of the Buffalo Mines, Ltd., flotation plant flow sheet].—*Canadian Mg. Jnl.* June 15 1916; p 301; pp 1; 35c.

Magnus, B.—*The Sintering of Flotation Concentrates*. [Deals with the op-

eration at Mount Morgan, Queensland, Australia. The ores contained about 2% copper and 7 dwt. gold. Dwight-Lloyd sintering machines were used].—E. & M. J. June 10 1916; p 1032; pp ¾*; 25c.

McClave, James.—*Difficulties Encountered in Making Oil Flotation Tests*. [A general discussion on the practice of testing oils for use in flotation].—Mg. World June 17 1916; p 1135; pp ¾; 10c.

Parmalee, J. G.—*Flotation Process at the Standard Mill, Silverton, B. C.* [The ores are zinc-lead containing much leaf silver. The Wyman pneumatic flotation machine is shown and described in detail. Assays of the concentrates are given, with details of mill operation and flow sheet].—Mg. World June 17 1916; p 1121; pp 3*; 10c.

Scott, W. A.—*Mill Equipment of the Engels Copper Mining Co., California*. [Mineral Separation Co.'s flotation cells are used. Crushing and classifying are described and the mill handles about 500 tons].—Mg. World June 24 1916; p 1165; pp 2*; 10c.

Scott, W. A.—*Milling and Smelting at Humboldt, Arizona*. [The plant of the Consolidated Arizona Smelting Co. is reviewed, including its crushing, concentration, flotation and smelting equipment and operations].—Mg. World June 17 1916; p 1133; pp 1¼*; 10c.

Concentration: Sorting, Sizing, Washing

Free, E. E.—*Properties of Slime Cakes*. [Theories of plasticities are discussed. It is said to be due to gelatinous colloid films. There is no evidence of these in slimes. Factors tending to affect the colloidal properties of slimes are discussed].—E. & M. J. June 17 1916; p 1068; pp 2¼; 25c.

Howard, L. O.—*Ozokerite in Utah*. [A brief review of the deposits is made and a description of the methods of refining the raw product are given. Some of the deposits and operating properties are described].—M. & S. P. June 17 1916; p 907; pp 4½*; 20c.

Scott, W. A.—*Mill Equipment of the Engels Copper Mining Co., California*. [Mineral Separation Co.'s flotation cells are used. Crushing and classifying are described and the mill handles about 500 tons].—Mg. World June 24 1916; p 1165; pp 2*; 10c.

Scott, W. A.—*Milling and Smelting at Humboldt, Arizona*. [The plant of the Consolidated Arizona Smelting Co. is reviewed, including its crushing, concentration, flotation and smelting equipment and operations].—Mg. World June 17 1916; p 1133; pp 1¼*; 10c.

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*. [Prospecting, sampling, dredging, washing and dressing, water supply and transportation in the diamond fields of this area are reviewed].—S. Afr. Mg. Jnl. May 6 1916; p 133; pp 1; 35c.

—*Mica Mining*. [A general review of the mica mining and marketing industry. Production, sorting and concentration of the raw material is briefly treated on and a chart is given showing the final subdivision of 1000 lbs. of the raw material and what total amount will be obtained for different grades of the same].—M. & S. P. June 10 1916; p 866; pp 1; 20c.

Amalgamation

Eye, C. M.—*Gold Mining in the Philippines*. [Water power and combustion engines are used considerably. The de-

scriptions are general but separate in describing the operations of companies. Both amalgamation and cyanidation are employed].—M. & S. P. June 17 1916; p 900; pp 2½*; 20c.

Lee, C. F.—*Some Hydraulic Mining Problems*. [Abst. of a paper read before the A. I. M. E. Costs, difficulties and details of operation in the Atlin district, B. C., are given. Detailed data and information regarding sluicing are included].—Mg. World June 24 1916; p 1181; pp 1*; 10c.

Palmer, L. A.—*A New Dry Amalgamator*. [The machine consists of five amalgamated copper rolls with an amalgamating trough below each. It is being tried on slimes].—Met. & Chem. Engg. June 15 1916; p 715; pp 1*; 30c.

Cyaniding

Eye, C. M.—*Gold Mining in the Philippines*. [Water power and combustion engines are used considerably. The descriptions are general, but separate in describing the operations of companies. Both amalgamation and cyanidation are employed].—M. & S. P. June 17 1916; p 900; pp 2½*; 20c.

Free, E. E.—*Properties of Slime Cakes*. [Theories of plasticities are discussed. It is said to be due to gelatinous colloid films. There is no evidence of these in slimes. Factors tending to affect the colloidal properties of slimes are discussed].—E. & M. J. June 17 1916; p 1068; pp 2¼; June 24; p 1105; pp 3½; 50c.

McArthur, J. S.—*The Discovery of Cyanidation*. [On the experimental work and experience of the author and others in an attempt to find a hydro-metallurgical method for the extraction of gold. The account dates from about 1885].—M. & S. P. June 10 1916; p 851; pp 7*; 20c.

Briquetting

Leshner, C. E.—*Fuel Briquetting in 1915*. [Little difference was shown from 1914. The industry is still in its infancy].—Min. Res. of U. S. II:1; pp 6.

CHEMISTRY AND ASSAYING

Chemistry

De Lumen, M.—*The Roasting of Blende*. [The effect of constituents of blende on sulphur elimination and roasting process. The Hasenclever, Delplace, Hegler, McDougal and Spirlet furnaces are described. Comments on the gases for sulphuric acid manufacture in England, Belgium and Germany].—E. & M. J. June 10 1916; p 1021; pp 3¼; 25c.

Jamieson, G. S.—*On the Volumetric Determination of Tin Potassium Iodate*. [Gives the results of some analyses made and a complete chemical explanation of the method of procedure].—Jnl. Ind. & Chem. Engg. June 1915; p 500; pp 2; 60c.

Matheson, A. M.—*Notes on the Chemical Assay of Tin Ores*. [Shows the difference between fire and chemical assays on high pyritic tin ores and the impossibility of estimating mill losses by the vaning and fire assay].—Proc. Aus. Inst. M. E.; N. S. No. 21 1916; p 1; pp 7; 65c.

Probert, F. H.—*Surficial Indications of Copper*. [Discusses and describes in detail the chemistry of the oxidized zone].—M. & S. P. June 17 1916; p 893; pp 6¾*; 20c.

Ziegel, H.—*Brief Course in Metallurgical Analysis*. [Alternate pages are ruled for tabulating results of analysis. The book is intended for students who have had some previous analytical study].

—Chem. Pub. Co., Easton, Pa.; book; pp 72*; \$1.

Assaying

Dudley, Boyd, Jr.—*The Distribution of Silver Between Metallic Lead and Litharge Containing Slag*. [Formulae which may be used for correction of this loss are given and a complete review of investigations made to determine what amount of silver is in the lead and what part in the litharge slag, is given].—Met. & Chem. Engg. June 15 1916; p 695; pp 6*; 30c.

Analysis

Ziegel, H.—*Brief Course in Metallurgical Analysis*. [Alternate pages are ruled for tabulating results of analysis. The book is intended for students who have had some previous analytical study].—Chem. Pub. Co., Easton, Pa.; book; pp 72*; \$1.

METALLURGY

Electrochemistry

Watts, O. P.—*An Electric Arc Furnace for the Laboratory*. [A paper read before the Electrochemical and Metallurgical Inst. Describes its detailed construction, operation and tests made on].—Met. & Chem. Engg. June 15 1916; p 681; pp 2½*; 30c.

—*Tasmania and the Electro-Chemical Industry*.—Mg. Jnl. June 3 1916; p 1; pp 1½; 35c.

Electrometallurgy

Gosgrow, R. C.—*Coke as a Reducing Agent in the Electric Smelting Furnace*. [Details of operation for this practice is given, with discussion on the advantages and disadvantages].—Met. & Chem. Engg. June 15 1916; p 691; pp 3; 30c.

Hixon, H. W.—*Electrothermic Zinc Smelting in Puebla, Mexico*. [A description of the operation of the Teziutlan Copper Co.'s plant is given. The ores run 4% copper and 10% zinc. The zinc is obtained as dust for cyanidation work].—E. & M. J. June 17 1916; p 1080; pp 1¼; 25c.

Mathers, F. C.; Kuebler, J. R.—*Addition Agents in the Electro Deposition of Silver from Silver Nitrate Solutions*. [A paper read before the American Electrochem. Soc.].—Chem. Eng. June 1916; p 243; pp 4½; 35c.

Watts, O. P.—*An Electric Arc Furnace for the Laboratory*. [A paper read before the Electrochemical and Metallurgical Inst. Describes its detailed construction, operation and tests made on].—Met. & Chem. Engg. June 15 1916; p 681; pp 2½*; 30c.

Thermic Metallurgy

De Lumen, M.—*The Roasting of Blende*. [The effect of constituents of blende on sulphur elimination and roasting process. The Hasenclever, Delplace, Hegler, McDougal and Spirlet furnaces are described. Comments on the gases for sulphuric acid manufacture in England, Belgium and Germany].—E. & M. J. June 10 1916; p 1021; pp 3¼; 25c.

Hixon, H. W.—*Electrothermic Zinc Smelting in Puebla, Mexico*. [A description of the operation of the Teziutlan Copper Co.'s plant is given. The ores run 4% copper and 10% zinc. The zinc is obtained as dust for cyanidation work].—E. & M. J. June 17 1916; p 1080; pp 1¼; 25c.

Magnus, B.—*The Sintering of Flotation Concentrates*. [Deals with the operation at Mount Morgan, Queensland, Australia. The ores contained about 2%

copper and 7 dwt. gold. Dwight-Lloyd sintering machines were used].—E. & M. J. June 10 1916; p 1032; pp ¾*; 25c.

Mostowitsch, W.—*Extraction of Gold and Silver from Matte by Lead*. [Abst. translation from the Jnl. of the Russian Metallurgical Soc. For the greater part the text is on the results of experimental work].—Met. & Chem. Engg. June 15 1916; p 705; pp 2¾*; 30c.

Samuel, J. M.—*Methods of Measuring Dust Losses at Copper Queen Works, Arizona*. [Abst. of a paper to be read before the Ariz. section of the A. I. M. E. Detailed description of methods employed for determining the losses carried as dust in the waste furnace gases].—E. & M. J. June 17 1916; p 1061; pp 2¾*; 25c.

Scott, W. A.—*Milling and Smelting at Humboldt, Arizona*. [The plant of the Consolidated Arizona Smelting Co. is reviewed, including its crushing, concentration, flotation and smelting equipment and operations].—Mg. World June 17 1916; p 1133; pp 1¼*; 10c.

Thompson, F. C.—*The Allotropy of Iron*. [Treats on the properties and chemical composition of iron at various temperatures. The results of some tests and discussion are given].—Trans. of Faraday Soc. April 1916; p 134; pp 6½*; 60c.

—*The King Process of Refining Copper*. [Extracts from U. S. patent. Hydrocarbon oil under pressure is introduced below the copper-bath's surface. It is shown being used in a tilting furnace].—Mg. World June 24 1916; p 1173; pp 2*; 10c.

Metallurgy General

Ziegel, H.—*Brief Course in Metallurgical Analysis*. [Alternate pages are ruled for tabulating results of analysis. The book is intended for students who have had some previous analytical study].—Chem. Pub. Co., Easton, Pa.; book; pp 72*; \$1.

POWER AND MACHINERY

Electricity

Hatch, J. N.—*Power Station Buildings*. [Features for planning central electrical power plants. The subject is treated on in a broad way].—Jnl. West. Soc. Eng. Mar. 1916; p 266; pp 22*; 60c.

Hydro-Electric

Bennett, R.—*Out of Door Hydroelectric Plants*. [A paper read before the Amer. Inst. of Elect. Eng.].—Jnl. of Elect. Power & Gas June 24 1916; p 488; pp 3; 35c.

Dutcher, H. K.—*City of Kamloops Hydro-Electric Plant*. [A paper read before the Canadian Soc. of Civil Eng. Gives details on the plant's construction and equipment].—Canadian Eng. June 15 1916; p 639; pp 3½*; 35c.

Combustion Engines

Eye, C. M.—*Gold Mining in the Philippines*. [Water power and combustion engines are used considerably. The descriptions are general, but separate in describing the operations of companies. Both amalgamation and cyanidation are employed].—M. & S. P. June 17 1916; p 900; pp 2½*; 20c.

Rehfuß, L. A.; Rehfuß, W. C.—*Portable Mining Equipment for Prospects*. [A description of gasoline motor units for work in various capacities at prospects].—E. & M. J. June 10 1916; p 1025; pp 2¾*; 25c.

Steam and Steam Engines

Dorman, H. R.—*The Water Softener and Boiler Feed Water*. [In discussing the advantages of using a softener the heat losses due to boiler scale are plotted in a curve].—*Wis. Eng.* May 1916; p 388; pp 9*; 25c.

Hatch, J. N.—*Power Station Buildings*. [Features for planning central electrical power plants. The subject is treated on in a broad way].—*Jnl. Soc. Eng.* Mar. 1916; p 266; pp 22*; 60c.

IV. MISCELLANEOUS**Miscellaneous Costs**

Alderson, M. W.—*Mining Possibilities in Colombia, S. A.* [A description of the alluvial deposits is given with details of operation at several properties. In discussing the good points and faults items of financial interest, production figures and costs are brought out].—*Mg. World* June 24 1916; p 1169; pp 3*; 10c.

Shelley, J. W.—*Graphite in Madagascar*. [Takes up geology, prospecting, mining, costs, labor conditions, production, law and a general description of the country and conditions to be found there].—*Mg. Mag.* June 1916; p 324; pp 7*; 50c.

Tremoureux, R. E.—*A New Dry-House*. [Costs and details of construction for this house constructed at the Champion mine, Nevada City, Cal., are given].—*M. & S. P.* June 17 1916; p 903; pp 2½*; 20c.

—*Cost of Making Gasoline by the Rittman Process*.—*Mg. World* June 17 1916; p 1132; pp ½; 10c.

Testing

Burgess, G. K.; Waltenberg, R. G.—*Further Experiments on the Volatilization of Platinum*. [Tests were made at 700, 1,000 and 1,200. Also with hydrochloric and hydrofluoric acids].—*U. S. Bur. of Stand. Sci. Paper* 280; pp 9; 15c.

Dudley, Boyd, Jr.—*The Distribution of Silver Between Metallic Lead and Litharge Containing Slag*. [Formulæ which may be used for correction of this loss are given and a complete review of investigations made to determine what amount of silver is in the lead and what part in the litharge slag, is given].—*Met. & Chem. Engg.* June 15 1916; p 695; pp 6*; 30c.

Liebermann, P. B.—*Comparative Friction Test of Two Types of Mine Cars*. [Abst. of a paper read before the A. I. M. E. Plane bore and roller bearings are the two types compared].—*Mg. World* June 24 1916; p 1175; pp 2½*; 10c.

Mathers, F. C.; Kuebler, J. R.—*Addition Agents in the Electro Deposition of Silver from Silver Nitrate Solutions*. [A paper read before the American Electrochem. Soc.].—*Chem. Eng.* June 1916; p 243; pp 4½; 35c.

McClave, James.—*Difficulties Encountered in Making Oil Flotation Tests*. [A general discussion on the practice of testing oils for use in flotation].—*Mg. World* June 17 1916; p 1135; pp ¾; 10c.

Moore, H. F.—*The Web Strength of I-Beams and Girders*. [Gives formulas derived and used, besides a generous description and discussion of the results of the tests].—*Jnl. West. Soc. of Eng.* Mar. 1916; p 299; pp 23*; 60c.

Mostowitsch, W.—*Extraction of Gold*

and Silver from Matte by Lead. [Abst. translation from the Jnl. of the Russian Metallurgical Soc. For the greater part the text is on the results of experimental work].—*Met. & Chem. Engg.* June 15 1916; p 705; pp 2¾*; 30c.

Samuel, J. M.—*Methods of Measuring Dust Losses at Copper Queen Works, Arizona*. [Abst. of a paper to be read before the Arizona section of the A. I. M. E. Detailed description of methods employed for determining the losses carried as dust in the waste furnace gases].—*E. & M. J.* June 17 1916; p 1061; pp 2¾*; 25c.

Talbot, A. N.; Slater, W. A.—*Tests of Reinforced Concrete Slab Structures*. [Practical tests which have been made on five different large buildings of concrete. Most minute descriptions are given].—*Univ. of Ill. Bull.* 84; pp 128*.

Thompson, F. C.—*The Allotropy of Iron*. [Treats on the properties and chemical composition of iron at various temperatures. The results of some tests and discussion are given].—*Trans. of Faraday Soc.* April 1916; p 134; pp 6½*; 60c.

Watts, O. P.—*An Electric Arc Furnace for the Laboratory*. [A paper read before the Electrochemical and Metallurgical Inst. Describes its detailed construction, operation and tests made on].—*Met. & Chem. Engg.* June 15 1916; p 681; pp 2½*; 30c.

Wig, R. J.; Williams, G. M.; Gates, E. R.—*Strength and Other Properties of Concrete as Affected by Materials and Methods of Preparation*. [Many tests are given, the most important being a long series of tests on concrete mixtures].—*U. S. Bur. of Stand. Tech. Paper* 58; pp 172*; 45c.

Winmill, T. F.—*The Estimation of Moisture in Coal*. [A paper read before the Inst. of Mining Eng.].—*I. & C. Tr. Rev.* June 9 1916; p 671; pp 1*; 35c.

Metallography

Oxley, A. E.—*The Transformation of Pure Iron*. [Deals with the theory and practical metallography of the molecular constitution of iron].—*Trans. of Faraday Soc.* April 1916; p 129; pp 5½; 60c.

—*Vacuum Melted Pure Iron*. [By this practice open-hearth metal is purified and the magnetic powers greatly increased].—*Iron Age* June 8 1916; p 1382; pp 1½*; 30c.

Waste: Slag, Tailings, Fumes, Etc.

Diehl, A. N.—*The Economical Use of Blast Furnace Gas*. [A paper read before the American Iron & Steel Inst.].—*Iron Age* June 8 1916; p 1384; pp 5*; 30c.

Samuel, J. M.—*Methods of Measuring Dust Losses at Copper Queen Works, Arizona*. [Abst. of a paper to be read before the Arizona section of the A. I. M. E. Detailed description of methods employed for determining the losses carried as dust in the waste furnace gases].—*E. & M. J.* June 17 1916; p 1061; pp 2¾*; 25c.

Law, Legislation, Taxation

Engelder, O. G.—*Mining in Sardinia*. [A general account of the lead-zinc mines, their operation, production, etc. Labor wages, etc., are spoken of and in this connection the law in regard to hiring and expelling employees is brought out].—*M. & S. P.* June 10 1916; p 862; pp 1; 20c.

Shelley, J. W.—*Graphite in Madagascar*. [Takes up geology, prospecting, min-

ing, costs, labor conditions, production, law and a general description of the country and conditions to be found there].—*Mg. Mag.* June 1916; p 324; pp 7*; 50c.

—*Mexico's New Mining Law in Effect July 1*. [Treats on the taxation of the mines].—*Mg. World* June 24 1916; p 1167; pp 2; 10c.

History

Alderson, M. W.—*Mining Possibilities in Colombia, S. A.* [A description of the alluvial deposits is given with details of operation at several properties. In discussing the good points and fault items of financial interest, production figures and costs are brought out].—*Mg. World* June 24 1916; p 1169; pp 3*; 10c.

Hardwick, F. W.—*The History of the Safety Lamp*. [A paper read before the Inst. of Mining, London].—*Coll'y Guard.* June 9 1916; p 1087; pp 1½; 35c.

Rickard, T. A.—*The Re-Opening of Old Mines Along Mother Lode, California*. [Gives details on the history of present and historical companies. Figures on their production and method of operation are given].—*M. & S. P.* June 24 1916; p 935; pp 5*; 20c.

—*Mica Mining* [A general review of the mica mining and marketing industry. Production, sorting and concentration of the raw material is briefly treated on and a chart is given showing the final subdivision of 1000 lbs. of the raw material and what total amount will be obtained for different grades of the same].—*M. & S. P.* June 10 1916; p 866; pp 1; 20c.

General Miscellany

Freeman, O. W.—*Gold Mining in the Judith Mountains, Montana*. [Briefs are given on some of the plants and mines. The geology and genesis of the ores and formation containing them is given with a general topographic description of the country].—*M. & S. P.* June 10 1916; p 863; pp 2½*; 20c.

Gnick, Homer.—*Semi-Centennial Celebration of Calumet & Hecla Mining Co., Michigan*.—*Mg. World* June 24 1916; p 1179; pp 1¾; 10c.

Hutchinson, C. T.—*Fire Insurance on Mining Property*.—*M. & S. P.* June 24 1916; p 933; pp 2; 20c.

McArthur, J. S.—*The Discovery of Cyanidation*. [On the experimental work and experience of the author and others in an attempt to find a hydro-metallurgical method for the extraction of gold. The account dates from about 1885].—*M. & S. P.* June 10 1916; p 851; pp 7*; 20c.

Singewald, J. T., Jr.; Miller, B. L.—*The Cerro de Pasco District, Peru*. [On the history of the camp which was originally a silver camp. The geology of the large copper deposits is given the greater preference].—*E. & M. J.* June 10 1916; p 1015; pp 4*; 25c.

Societies

—*Central Association of Miners' Permanent Relief Societies*.—*I. & C. Tr. Rev.* June 2 1916; p 632; pp 1; 35c.

—*Institution of Mining Engineers, England*. [Annual general meeting at London on June 6 1916].—*I. & C. Tr. Rev.* June 9 1916; p 658; pp 2; 35c.

—*Midland Institute of Mining, Civil and Mechanical Engineers*. [Held at Doncaster, England, May 27, 1916].—*Coll'y Guard.* June 2 1916; p 1041; pp 1; 35c.

Ore and Metal Markets; Prices-Current

New York, July 6, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended July 5 were as follows:

		New York. Cents.	London. Pence.
June 29.....		65 1/2	31 7/16
30.....		65	31
July 1.....		65	31
2.....		65	31
3.....		65	31
4.....	Holiday		31
5.....		63 3/4	30 1/2

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York—1916			London Standard Oz. 1915.	
	High.	Low.	Avg.	High.	Avg.
January.....	57 1/2	55 1/2	56.775	48.890	26.875
February.....	57	56 1/2	56.755	48.477	27.000
March.....	60 1/2	56 1/2	57.935	49.926	27.080
April.....	73 1/2	60 1/2	64.415	50.034	31.375
May.....	77 1/2	68 1/2	73	49.915	34.182
June.....				49.072	21.577
July.....				47.619	22.950
August.....				47.178	22.750
September.....				48.65	23.600
October.....				49.385	23.923
November.....				51.713	24.640
December.....				55.038	26.232
Year.....				49.690	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Aside from a spasmodic foreign demand for copper the market has been colorless since our last report. The foreign business went almost entirely to second hands, while the producers' agencies had little in the way of orders. Prices, however, have been firmly held and from a close study of the situation it appears that any buying movement that would show signs of being fairly widespread would be quickly followed by higher prices for the red metal. The fact that prices have been maintained over a period of six weeks' inactivity proves, as has been pointed out, that the tremendous business done in the last movement will constitute a bulwark against price reaction. Inquiries for about 2,000 tons came from private buyers abroad. These were mostly for July, August and September shipments and brokers did a fairly good business in filling these orders with resale metal. The foreign buyers have apparently quickly responded to the cheap offerings by taking whatever copper is available at the lower prices. Resale copper in New York is well cleaned up, but a large consumer in Connecticut is still offering, while some metal is still available in the west. Electrolytic for July shipment sold at 26 1/2 cts., with sales of August done at 26 1/4 cts. and September at 26 cts. For prompt electrolytic resellers secured 26 3/4 @ 27 cts.

With the large producers there has been a slight disposition to entertain lower prices for the last four months of the year. One small producer has offered electrolytic for the last quarter at 26 cts. Any buyer seeking upward of 50,000-100,000 lbs. for these months would be forced to pay 27 1/2 cts. Thus, while producers are still quoting 29 1/2 cts. for September and 1/4 ct. for each month following, these prices are merely for small lots, as consumers have received offers on round lots at 1 @ 2 cts. under the outside figures. This by no means can be construed as a weakening in the copper situation. At all times large buyers can secure a preferential price. Casting copper is very easy in second hands, but producers are not offering beyond September. Second hands offered July at 24 1/2 cts. and August at 24 cts., with producers asking these prices respectively for August and September.

Exports during June have come fully up to expectations. The movement of copper abroad is beginning to co-ordinate with the heavy foreign buying and copper factors who thought they saw a "nigger in the woodpile" are now disposed to concede that foreign absorption in the last movement came close to 500,000,000 lbs. for delivery this year. At the present rate of output, 200,000,000 lbs. a month, this would take 2 1/2 months' production. Exports reported in June to-

taled 35,753 tons and with gulf and Pacific ports to be added the June movement may come close to 40,000 tons. From the figures now available exports in the first half of the year total 145,000 tons, being about 7000 tons greater than in the first half of 1915.

An upturn has developed in copper at London, but the advance had no special significance. Standard spot went up £5 in spot and £4 in futures last week, with American electrolytic £2 higher at £132.

Quotations for copper per pound at New York for the week ended July 5 were as follows:

		(For Third Quarter Delivery.)		
		Lake.	Electrolytic.	Casting.
June 29.....		27 @ 27 1/4	27 @ 27 1/4	24 @ 24 1/2
30.....		27 @ 27 1/4	27 @ 27 1/4	24 @ 24 1/2
July 1.....		27 @ 27 1/4	27 @ 27 1/4	24 @ 24 1/2
2.....		27 @ 27 1/4	27 @ 27 1/4	24 @ 24 1/2
3.....		27 @ 27 1/4	27 @ 27 1/4	24 @ 24 1/2
4.....			Holiday	
5.....		27 @ 27 1/4	27 @ 27 1/4	24 @ 24 1/2

Note:—These quotations are based on the average of prices asked by first and second hands.

Quotations for copper per ton at London for the week ending July 5 were as follows:

		Standard		Electrolytic.
		Spot.	Futures.	
June 29.....		£104 0 0	£100 0 0	£132 0 0
30.....		103 0 0	100 0 0	132 0 0
July 1.....		103 0 0	100 0 0	132 0 0
2.....		102 0 0	98 0 0	132 0 0
3.....		98 10 0	96 10 0	131 0 0
4.....		96 10 0	94 10 0	131 0 0
5.....				

MONTHLY AVERAGE PRICES OF COPPER.

Month	New York—Lake Superior. 1916			1915.
	High.	Low.	Average.	Average.
January.....	25.50	23.00	24.101	13.891
February.....	28.50	25.25	27.437	14.72
March.....	28.25	27.25	27.641	15.11
April.....	30.00	28.50	29.40	17.398
May.....	29.75	28.25	29.05	18.812
June.....				19.92
July.....				19.423
August.....				17.472
September.....				17.758
October.....				17.925
November.....				18.856
December.....				20.375
Year.....				17.647

Month.	New York—Electrolytic. 1916			1915.
	High.	Low.	Average.	Average.
January.....	25.50	23.00	24.101	13.707
February.....	28.50	25.25	27.462	14.572
March.....	28.25	27.25	27.410	14.96
April.....	30.50	28.25	29.65	17.057
May.....	29.75	28.00	28.967	18.601
June.....				19.173
July.....				19.08
August.....				17.222
September.....				17.705
October.....				17.859
November.....				18.826
December.....				20.348
Year.....				17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

Month.	New York—Casting Copper. 1916			London 1915.	
	High.	Low.	Avg.	Avg.	Avg.
January.....	24.25	22.00	23.065	88.008	60.760
February.....	27.00	24.12 1/2	26.031	102.760	63.392
March.....	27.75	25.50	26.210	106.185	66.235
April.....	28.00	26.75	27.70	103.681	77.461
May.....	27.75	26.00	26.692	104.794	77.360
June.....					82.350
July.....					74.807
August.....					67.850
September.....					68.660
October.....					72.577
November.....					77.400
December.....					80.400
Year.....					

Tin.—Deliveries of tin into consumption in June were record-breaking, amounting to 6398 tons. The feature of the

deliveries were the imports at Pacific ports, which amounted to 2198 tons, a showing which surprised many trade factors and indicated the extent to which prominent tin plate interests had been importing, as most of the tin arriving at Pacific ports is consigned to Pittsburgh consumers, although during the month it was noted that a considerable amount of Chinese tin was being offered by brokers. The market here was easier, with prices off 1 ct. as a result of the week's downward movement, although on the other side tin was firm, higher and active. The stocks and landing on June 30 totaled 3963 tons, an increase of over 1500 tons. This increase in stocks tended to make the spot market a draggy affair, but consumers are not fully covered on futures and importers are holding up prices as much as possible. Spot tin eased off to 39½ cts. at the close of June, while at the beginning of the month the price held at 45 cts., thus indicating the extent of the reaction. Straits tin for July delivery was offered at 39½ cts., with August held at 39 cts. and September to December at 39½@38¾ cts. The difference of only 1 ct. between spot and December tin shows the relative strength of futures and the weakness of spot. The market was practically closed on Monday, while Tuesday was Independence day.

Straits tin at London showed a net gain of £1 5s last week, advancing to £175. At Singapore tin advanced £3 15s to £178. Standard tin was also firm during the week, closing £2 higher in spot and £1 15s in futures.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ending July 5 were as follows:

	New York		London.		Singapore.
	Spot.	July.	Straits.	spot.	
June 29.....	39½c	39½c	£173 15 0		£176 10 0
30.....	39½c	39½c	175 0 0		178 0 0
July 1.....	39½c	39½c	175 0 0		178 0 0
3.....	39½c	39½c	173 5 0		177 0 0
4.....	Holiday		171 0 0		175 0 0
5.....	39½c	39½c	173 0 0		172 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	66.00	49.50	52.27½	44.38
May	52.00	46.75	49.86½	38.871
June				40.373
July				37.498
August				34.386
September				33.13
October				33.077
November				39.375
December				38.755
Year				38.664

Lead.—Demand for lead has been quite steady of late and prices in the outside market have been firmly held at levels nearer to those asked by the principal producer, and from present indications it would not surprise trade factors to hear of an advance by the A. S. & R. Co. early this month. Foreign and domestic buying took a large amount of metal out of the market. It is estimated that Russia and England took about 2000 tons last week for early shipment, while some rifle ammunition makers are understood to have quietly taken options on large blocks of lead to be exercised in the event of hostilities in Mexico. As has been pointed out war in Mexico would benefit the lead market on the basis of a greater consumption by small arm ammunition makers. Spot lead in the outside market held at 6.85 cts. New York and 6.70 cts. St. Louis, while the June average of the leading interest was 7 cts. New York and 6.92½ cts. St. Louis. Sales for August and September by independents at 6.80 cts. New York were noted. Lead at London eased off slowly last week, but dropped sharply at the opening of the current week. Closing last week at £28 15s for spot and £28 for futures, the market opened this week 15s off in spot and £1 5s lower in futures.

Quotations for lead per pound at New York and per ton at London for the week ending July 5 were as follows:

	New York		London.	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
June 29.....	6.85c	7.00c	£29 5 0	£28 5 0
30.....	6.85c	7.00c	28 15 0	28 0 0
July 1.....	6.85c	7.00c	28 15 0	28 0 0
3.....	6.85c	7.00c	28 5 0	27 0 0
4.....	Holiday		28 0 0	26 15 0
5.....	6.85c	7.00c	28 0 0	27 5 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.23½	7.34	4.235	33.209
June				5.875	25.750
July				5.738	25.611
August				4.750	22.160
September				4.627	22.953
October				4.612	23.932
November				5.152	26.240
December				5.346	28.884
Year				4.675	23.099

Lead Ore.—There seems to be little doing in the Missouri-Kansas-Oklahoma district as regards changes in the prices of lead ore. They remained as during the previous week, at \$75 and \$77.50 for 80% metallic lead content. Most of the mines have recuperated from the flood of last week and during the week ended July 1 they were producing normally. There were produced during the week 1,874,990 lbs. of concentrates and this brought the total for the year to date at 55,994,072 lbs., which quantities had respective values of \$71,379 and \$2,493,728.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June				63.60
July				59.00
August				47.50
September				48.25
October				51.80
November				63.00
December				71.375
Year				53.34

Zinc Ore.—Attributed to the fact that consumers are not up with their orders and therefore have a supply of spelter on hand, the market for ores in the Missouri-Kansas-Oklahoma district is still on the decline. During the past week prices dropped \$5 and the better grades brought \$85, with the less desirable ores bringing \$60. During the week ended July 1 12,581,430 lbs. of concentrates were produced and the total for the year to that date was 362,306,194 lbs. The respective prices were \$438,911 and \$17,281,280.

Calamine.—The ore continues to be in demand at the decreased figure of \$45@60. Production during the week ended July 1 was given as 65,550 lbs. of concentrates valued at \$1625, and the total for the year was 18,811,270 lbs., valued at \$700,033.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	120.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	88.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June				116.00
July				111.00
August				60.25
September				76.75
October				82.40
November				92.50
December				87.00
Year				102.95

Spelter.—The situation in spelter has developed no change for the better. On the contrary prices have made further recession, but with producers holding a good back log on orders taken when prices were high the declining movement is slow. Little demand has materialized, either from domestic or foreign buyers, and the inertia is furnishing galvanizers with an opportunity to consider securing concessions for future delivery. Galvanizers believe that with spelter below 10 cts. trade in their products could again be resumed. Spelter last week declined slightly over 1 ct., sellers offering spot at 11½ cts. New York and 10½ cts. St. Louis, with July delivery St. Louis quoted at 10½ cts., August at 10½ cts. and September at 10 cts. The London market continued to fall, spot dropping £5 to £61 and futures £3 to £53. At the opening of the current week the London market had a

violent break, spot dropping £10 to £51, with futures £8 lower, at £45. As the New York market was dormant, owing to the holiday period, the break at London exerted no repressive influence here, although it is certain that with the resumption of business Wednesday sellers will further readjust prices to lower levels.

Quotations for spelter per pound at New York and per ton at London for the week ending July 5 were as follows:

	New York.	London.	
	Spot.	Spot.	Futures.
June 29.....	11½c	£63 0 0	£53 0 0
30.....	11½c	61 0 0	53 0 0
July 1.....	11½c	61 0 0	53 0 0
3.....	11½c	51 0 0	45 0 0
4.....	Holiday	48 0 0	44 0 0
5.....	10½c	46 0 0	43 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	1916	1915	1916	1915	
January	High. 19.42½	Low. 17.30	Avg. 18.801	Avg. 6.519	89.840
February	21.17½	18.67½	20.094	8.866	97.840
March	20.50	16.60	18.40	10.125	100.720
April	19.37½	17.75	18.76	11.48	98.103
May	17.50	13.75	15.98	15.825	89.507
June				22.625	100.320
July				20.803	98.150
August				16.110	68.250
September				14.493	64.400
October				14.196	64.196
November				16.875	88.240
December				16.675	89.153
Year				13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—The market has held firm at the advanced price of \$80 a flask for spot virgin quicksilver, with some good business done at that price. Domestic consumers were the principal buyers, although a little foreign business came to the surface. The price has now held at \$80 for almost 10 days. There is little disposition to advance the quotation, which is now practically on a parity with the official price of £16 15s at London. Receipts are good and up to requirements of the trade. To a certain extent the known holdings of certain banking interests prevent a decided rise in prices, but speculators had their hands badly burned a short time ago and therefore outside interests are leaving the metal alone.

Antimony.—There appears to be no bottom to which prices for antimony will drop. Chinese and Japanese interests have indicated that they would accept 15 cts. duty paid for July delivery, although their quotation to smaller buyers is 17½ cts. The market is dull, weak, and heavy consumers can secure concessions without difficulty.

Zinc Sheets.—Following the recession in spelter prices on zinc sheets have been lowered, the principal maker now quoting \$18 per 100 lbs., f. o. b. Peru, Ill.

Nickel.—There has been no change of note in the situation. Demand continues fair, with prices as previously, 45@50 cts. for ordinary forms and 5 cts. additional for electrolytic.

Ferromanganese.—English makers brought down their price to \$175 seaboard for the fourth quarter, thus actively competing with domestic furnaces for business. Consumers, however, are showing a preference to domestic producers, owing to the new English restrictions. Users of English ferromanganese must sign an agreement not to export steel made therefrom except to allied countries. As this would seriously hamper trade to South America, consumers are either seeking English alloy already here on which the new restrictions are not applicable, or domestic ferro. Spot English unrestricted was offered at \$225 seaboard, with restricted held at \$200. Domestic furnaces are taking the bulk of the business. The fact that ferromanganese has been successfully produced by merchant furnaces in this country is an achievement that is beginning to stir the English makers who now fear the permanent loss of their trade.

Pig Iron.—Domestic demand for pig iron has been small and unimportant, but foreign business has furnished considerable activity. The export business is mainly for

bessemer iron, but lately inquiries for foundry grades have come from foreign countries. Domestic melters are not interested in covering last half requirements, having carried over a considerable amount of iron from the first half which they could not consume owing to labor shortages. Foundry iron has been offered by resellers at \$14 Birmingham and \$17.50 Buffalo for No. 2, with furnace prices \$1 higher. Bessemer is firm at \$21 valley, with basic held at \$18 valley. W. P. Snyder & Co. report the average price of bessemer in June to be \$21, a slight increase over May, with the basic average at \$18, a slight decrease from May.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	3.00	to	3.25
Muriatic, 20 deg.....	3.25	to	3.50
Nitric, 36 deg.....	.07½	to	.08
Nitric, 40 deg.....	.08½	to	.08¾
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured 183 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.71
Alum—Powdered, lb.....	.05½	to	.08
Ground, lbs.....	.041	to	.07½
Lump, lb.....	.04	to	.06½
Ammonia—			
Muriate, white grain, lb.....	.08¾	to	.08¾
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06½	to	.06¾
Red, lb.....	.55	to	.60
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.15	to	.16
Bismuth—Metallic, lb.....	3.11	to	3.20
Subnitrate.....	3 10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	5.25	to	5.75
Borax—100 lbs., car lots.....	7.50	to	8.00
Coke—Connellsville furnace.....	2.50	to	2.75
Foundry.....	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese—Spot.....	200.00	to	225.00
Last half.....	175.00	to	190.00
Ferrosilicon, 50%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glauber's Salts, bags.....	.60	to	.70
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
Lead—Granulated, lb.....	.15	to	.15¾
Brown sugar.....	.13¾	to	.14
White crystals.....	.15¾	to	.15¾
Broken, cakes.....	.14¾	to	.15
Powdered.....	.17	to	.17½
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13	to	.14
20 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 20 gr.....	.37½	to	.38
Wood grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.32¾	to	.33¾
Benzine, 59 to 62°, gal.....	.29	to	.29½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	80.00	to	\$4 00
Potash Fertilizer Salts—			
Kainit, mln. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.44	to	.45
Carbonate, cal. 96 to 98%.....	1.55	to	1.57
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.50	to	.58
Prussiate, yellow.....	1.25	to	1.30
Prussiate, red.....	4.25	to	4.50
Salt peter—Crude, lb.....	.15	to	.15½
Refined.....	.30	to	.31
Soda—Ash, 58% (43% basis), bbl.....	1.25	to	1.60
Strontia Nitrate, casks, lb.....	.48	to	.50
Sulphur—			
Crude, ton.....	28.50	to	29.00
Flowers, 100 lbs.....	2.50	to	2.70
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	17.25	to	17.75
Crystals, bbls., lb.....	.91	to	.32
Oxide, lb.....		to	.51
Zinc Chloride.....	.14	to	.20

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

Dividends on Issued Capitalization							Dividends on Issued Capitalization						
NAME OF COMPANY	Number Shares Issued	Par Val	Paid in 1918	Total to Date	Latest		NAME OF COMPANY	Number Shares Issued	Par Val	Paid in 1918	Total to Date	Latest	
					Date	Amt.						Date	Amt.
Acacia, g.	1,428,889	\$1		\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	480,916	\$1		\$98,916	Sept. '01	\$0.01
Adams, e. l. c.	80,000	10		778,000	Dec. 18, '09	.04	Golden Star, g.	400,000	5		120,000	Mar. 15, '10	.06
Ahmeek c.	200,000	25		4,650,000	Apr. 10, '16	3.00	Gold Com. Fra. g.	922,000	1		92,111	Oct. 15, '09	.10
Alaska Goldfield, g.	250,000	6		403,280	Jan. 10, '15	.35	Goldfield Con.	3,559,148	10		28,999,831	Oct. 31, '16	.10
Alaska Mexican, g.	180,000	6		3,507,381	Nov. 28, '15	.10	Good Hope, g. s.	500	100		941,250	Jan. '08	.25
Alaska Mines Sec.	600,000	6		30,000	Nov. 1, '06		Good Sp. Anchor, z. s.	550,000	1	35,000	1,192	June 1, '16	.02
Alaska Treadwell, g.	200,000	25	250,000	15,780,000	May 29, '16	.60	Grand Central, g.	600,000	1		17,200	May 10, '16	.02
Alaska United, g.	180,200	6	54,060	2,045,270	Feb. 28, '16	.30	Grand Gulch, c. s.	239,845	2.60	9,594	11,992	June 1, '16	.03
Allouez, c.	100,000	25	250,000	350,000	Apr. 10, '16	1.50	Granite, g.	430,000	1	17,200	17,200	May 10, '16	.02
Amalgamated, c.	1,538,829	100		103,444,983	Aug. 30, '15	3.77	Gwin, g.	100,000	10		481,500	Feb. '06	.25
Am. Sm. & R. com.	600,000	100	1,500,000	30,333,333	June 1, '16	1.50	Hazel, g.	900,000	1		1,114,000	Jan. 6, '16	.01
Am. Sm. & R. pf.	600,000	100	1,750,000	56,546,386	June 1, '16	1.75	Hecla, s. l.	1,000,000	0.25	650,000	4,405,000	June 20, '16	.16
Am. Sm. Sec. A. pf.	170,000	100	510,000	11,210,000	Apr. 1, '16	1.50	Hercules,	1,000,000	1	1,450,000	12,200,000	June 15, '16	.20
Am. Sm. Sec. B. pf.	393,120	25	750,000	16,200,000	Apr. 3, '16	1.25	Hidden Treasures, g.	30,000	10		457,452	Sept. '00	.10
Am. Zinc, L. & Sm.	2,331,250	60	2,414,000	5,522,522	June 10, '16	12.50	Holy Terror, g.	500,000	1		172,000	Jan. '00	.01
Anascondita, g.	25,000	100	6,993,750	171,251,771	May 20, '16	1.50	Homestead, g.	251,160	100	979,524	36,635,232	June 25, '16	.65
Annie Laurie, g.	200,000	100		439,661	Apr. 22, '05	.50	Hope Dev. i. s. z.	400,000	1	40,000	5,182,000	Dec. 23, '16	.01
Argonaut, g.	200,000	6	20,000	1,640,000	Mar. 27, '16	.10	Horn Silver, i. s. z.	400,000	1		300,000	June 30, '16	.05
Arizona, c.	100,000	25	629,550	10,120,434	Apr. 1, '18	.30	Imperial, c.	500,000	10		281,375	Apr. '01	.04
Atlantic, c.	100,000	25		990,000	Feb. 21, '05	.60	Independence Con. g.	2,500,000	1		1,449,859	May 1, '16	1.25
Bagdad-Chase, g. pf.	84,819	6		202,394	Jan. 1, '09	.10	Inspiration Con.	920,687	20	5,438,398	30,941,338	June 1, '16	2.00
Bald Butte, g.	250,000	1		1,354,648	Nov. 1, '07	.04	Inter'l Nickel, com.	1,673,384	25		5,614,824	May 1, '16	1.60
Baldwin, c.	100,000	25		7,960,000	Dec. 31, '13	2.00	Inter'l Nickel, pf.	89,126	100	267,378	4,100,000	May 2, '14	2.00
Barnes-King, g.	40,000	5	60,000	80,000	June 1, '16	.07	Inter'n Sm. & Ref.	100,000	100		3,952,415	June 30, '16	1.60
Beck Tunnel Con.	1,000,000	0.10		940,000	Nov. 15, '07	.02	Interstate Callahan	464,990	10	1,394,970	2,701,677	Dec. 31, '15	.00
Big Four Expl.	400,000	6	40,000	50,000	June 15, '16	.05	Iowa, g. s. l.	1,666,667	1		25,179	Jan. 15, '16	.50
Bingham-N. Haven	120,000	1		960,493	Dec. 20, '15	.05	Iowa Tiger, g. s.	500	100		1,555,000	Apr. 3, '16	.10
Board of Trade, z.	300,000	1		75,000	Jan. 15, '11	.20	Iron Blossom, i. s. g.	1,000,000	1	150,000	2,650,000	Apr. 15, '16	.10
Bonanza Dev.	300,000	1		1,425,000	Oct. 28, '11	.20	Iron Cap pf. d. c.	35,481	10		23,381	Dec. 31, '16	.17
Booth (Reorganized)	998,396	5	349,949	349,949	June 26, '16	.05	Iron Clad, g.	1,000,000	1		50,000	Nov. '06	.05
Boss, g.	408,860	1		40,850	Dec. 10, '14	.10	Iron Silver,	500,000	20		5,050,000	Dec. 31, '16	.10
Boston & Colo. Sm.	15,000	10		402,350	Oct. '02	.75	Isabella, g.	2,250,000	1		742,600	Mar. '01	.01
Bot. & Mont. Con.	100,000	25		63,225,000	May 15, '11	4.00	Isle Royale, c.	150,000	25		150,000	Mar. 31, '13	1.00
Breese, i. s.	200,000	25		230,000	Dec. 15, '13	.05	Jamison, g.	390,000	10		378,300	Jan. '01	.02
Brunswick Con. g.	300,000	1		203,315	Sept. 15, '15	.06	Jerry Johnson, g.	2,500,000	10		187,500	Nov. 5, '14	.00
Bullion-B. & Champ	100,000	10		2,768,400	July 11, '08	.10	Jim Butler,	1,718,020	1	171,802	343,604	Feb. 2, '16	.10
Bullwhacker, c.	450,000	1		10,000	July 1, '07	.01	Joplin Ore & Spelter	400,000	5	194,000	694,998	June 22, '16	.05
Bunker Hill Con. g.	200,000	1	30,000	851,000	June 4, '16	.02	Jumbo Ext. g.	1,550,000	1	60,000	1,555,000	Apr. 3, '16	.10
Bunker Hill & Sull.	327,000	10	827,500	17,590,500	June 4, '16	.40	Kendall, g.	800,000	5	60,000	1,555,000	Apr. 3, '16	.10
Butte Alex Scott,	250,000	10	844,662	1,054,193	Apr. 10, '16	10.50	Kenebeck Zinc,	200,000	100	7,000,000	12,000,000	June 30, '16	1.50
Butte-Ballila, c.	250,000	10		125,000	Aug. 1, '10	.25	Kennecott,	250,000	100		1,801,001	June '00	.05
Butte Coalition, c.	1,000,000	16		4,700,000	Dec. 1, '11	.25	Kennedy, g.	100,000	10		396,000	Aug. 2, '09	.12
Butte & Superior, z.	272,697	10	5,662,993	11,383,017	June 30, '16	10.75	King of Arizona, g.	200,000	1		157,500	Dec. 16, '12	.25
Caledonia, i. s. c.	1,606,000	1	469,900	1,351,631	June 15, '16	.03	Klar Piquet, z.	20,000	1		70,000	Apr. 1, '13	.00
Calumet & Ariz. c.	641,923	10	2,563,676	26,714,001	June 20, '16	2.00	Knob Hill, g.	1,000,000	1		1,200,500	Oct. '02	.01
Calumet & Hecla, c.	100,000	25	3,000,000	132,250,000	June 23, '16	15.00	La Fortuna, g.	250,000	1		102,600	May 10, '16	.02
Camp Bird, g.	1,750,000	25	113,584	10,243,964	Jan. 1, '18	.17	Lake View,	500,000	.05	56,250	180,000	Feb. 23, '03	.02
Cardiff, s. l.	500,000	1	125,000	250,000	June 1, '16	.25	Last Dollar, g.	1,500,000	1		1,762,795	Jan. 31, '16	.06
Carissa, g. s. c.	600,000	1		60,000	Dec. '06	.01	Liberty Bell, g.	133,551	6		331,179	June '06	.06
Cashier, g.	900,000	1		28,160	Apr. '04	.00	Lightner, g.	102,256	1		11,200	Dec. 31, '16	3.00
Centennial Eureka,	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Linden, z.	1,020	10		75,000	Apr. 22, '16	.05
Center Creek, i. z.	100,000	10	30,000	580,100	Apr. 1, '16	.25	Little Bell, s. l.	800,000	1	15,000	430,000	Jan. '08	.03
Central Eureka, g.	100,000	1		729,159	Mar. 5, '08	.05	Little Florence,	1,000,000	1		37,600	Oct. 23, '13	.26
Century, g. s. l.	1,000,000	1	41,000	392,067	Feb. 15, '16	.05	Lost Packer,	1,000,000	1		46,800	Apr. 23, '06	12.00
Champion, c.	100,000	25	3,720,000	13,720,000	June 7, '16	6.40	Lower Mammoth,	1,000,000	1		45,000	June 30, '16	.50
Chile Con.	892,960	1	88,175	439,212	May 15, '16	.06	MacNamara, g. s.	734,676	5.00	240,000	2,360,000	Apr. 20, '16	.05
Chino Copper c.	N. M.	5	3,044,930	9,742,925	June 30, '16	2.25	Mammoth, g. s. c.	400,000	10	40,000	30,248	Aug. 15, '11	.02
C. K. & N. g.	1,431,900	1		171,828	Nov. '04	.01	Manhattan-Big 4, g.	762,400	1		1,169,306	July 28, '14	.02
Cliff, g.	100,000	1		115,000	Feb. 5, '14	.06	Mary McKinney, g.	1,309,282	1	40,000	284,000	May 26, '16	.02
Cliff, s. l.	300,000	10		90,000	Jan. 1, '13	.10	May Day,	800,000	0.25	25,067	93,106	May 1, '16	.07
Clifton, g. s.	1,000	10		60,000	Dec. '03	.30	Mary Murphy, g. s. l. z.	370,000	5		171,360	June 1, '14	.76
Colo. G. Dredging,	200,000	10	100,000	425,000	Feb. 28, '16	1.00	Mexican, g. s. l.	201,600	3	2,064,563	7,454,442	May 15, '16	1.50
Colorado, s. l.	1,000,000	0.20		2,600,000	Mar. 15, '13	.03	Miami, c.	747,114	6		300,000	Jan. 23, '04	.20
Columbus Con. l. s. c.	283,540	5		212,623	Oct. 10, '07	.10	Modoc, g. s.	500,000	1		134,000	Oct. 20, '11	.01
Combination, g.	320,000	1		873,000	Dec. '06	.16	Mine La Motte, l.	300,000	10		27,500	Oct. 1, '16	.70
Comstock-Phoenix,	785,000	1		50,000	Nov. 10, '11	.05	Mogollon, g. s.	355,628	1		4,576,000	Feb. 1, '16	.00
Con. Mercur, c.	1,000,000	1		1,265,000	Mar. 25, '13	.03	Mohawk, c.	1,000,000	25	700,000	115,000	July 22, '08	.30
Consolidated, g.	2,5												

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest		
						Date	Am.							Date	Am.	
Petro, g. s.....	Utah..	500,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04		Success.....	Ida..	1,500,000	\$1	\$300,000	\$1,080,000	June 23, '16	\$0.03	
Pharmacist, g.....	Colo..	1,600,000	1	91,500	Feb. 1, '10	.00%		Superior & Pitts., c.	Ariz..	1,499,792	10	10,318,568	Dec. 21, '15	.38		
Phelps, Dodge & Co	U. S..	450,000	100	5,400,000	53,771,627	June 30, '16	8.00		Swansea, s. l.....	Utah..	100,000	6	334,500	Apr. 29, '07	.06	
Pioneer, g. s.....	Alaska	5,000,000	1	2,041,626	Oct. 7, '11	.03		Tamarack, c.....	Mich..	60,000	25	9,420,000	July 23, '07	4.00		
Pittsburg, l. z.....	Mo..	1,000,000	1	20,000	July 15, '07	.02		Tamarack-Custer..	Idaho.	2,000,000	1	80,000	June 1, '16	.02		
Pittsburg-Idaho, l.	Ida..	1,000,000	1	249,104	July 15, '13	.04		Tennessee, c.....	Tenn..	200,000	25	5,206,250	Apr. 15, '16	.75		
Pitts Silver Peak..	Nev..	2,790,000	1	840,600	Dec. 1, '14	.02		Tightner.....	Cal..	100	100	160,000	Jan. 3, '14	.....	
Platteville, l. z.....	Wis..	600	60	179,600	June 15, '07	10.00		Tomboy, g. s.....	Colo..	310,000	6	3,659,000	Dec. 31, '16	.24		
Plumas Eureka, g.	Cal..	150,625	10	2,831,294	Apr. 8, '01	.06		Tom Reed, g. s.....	Ariz..	909,555	1	2,555,334	Sept. 8, '15	.01		
Plymouth Con.....	Cal..	240,000	6	231,050	Apr. 10, '16	.24		Ton, Belmont, g.....	Nev..	1,500,000	1	375,008	Apr. 1, '16	.12%		
Portland, K.....	Colo..	3,000,000	1	180,000	10,357,080	Apr. 20, '16	.03		Ton, Extension, g. a.	Nev..	1,272,801	1	190,888	Apr. 1, '16	.10	
Prince Con, s. l.....	Nev..	1,000,000	2	75,000	200,000	Apr. 1, '16	.05		Tonopah, g. s.....	Nev..	1,000,000	1	300,000	Apr. 21, '16	.16	
Quartette, g. s.....	Nev..	100,100	10	376,000	July 31, '07	.20		Tonopah Midway, g.	Nev..	1,000,000	1	250,000	Jan. 1, '07	.05%		
Quicksilver, pf.....	Cal..	43,000	100	1,931,411	Apr. 8, '03	.60		Tremm.....	Cal..	200,000	2.50	234,000	Apr. 28, '15	.02		
Quip, g.....	Wash.	1,500,000	1	67,000	Feb. 1, '12	.01		Tri-Mountain, c.....	Mich..	100,000	25	1,100,000	Oct. 30, '12	3.00		
Quincy, c.....	Mich..	110,000	25	770,000	22,547,500	June 30, '16	4.00		Tuolumne, c.....	Mont.	800,000	1	496,626	Apr. 15, '13	.10	
Ray Con, c.....	Ariz..	1,571,279	10	1,571,279	6,144,406	June 30, '16	.50		Uncle Sam Con, s..	Utah..	600,000	1	470,000	Sept. 20, '11	.06	
Red Bird, g. s. c. l.	Mont.	300,000	6	72,000	Oct. 9, '14	.01		Union, g. s.....	Colo..	1,250,000	1	444,244	Jan. 27, '03	.02		
Red Metal, c.....	Mont.	100,000	10	1,200,000	Apr. 1, '07	4.00		Union Basin, z.....	Ariz..	835,350	1	167,070	Nov. 15, '15	.10		
Red Top, g.....	Nev..	1,000,000	1	128,175	Nov. 25, '07	.10		United, c. pf.....	Mont.	50,000	100	1,500,000	Apr. 15, '07	3.00		
Republic, g. s.....	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%		United, c. com.....	Mont.	450,000	100	6,125,000	Aug. 6, '07	.15		
Richmond, g. s. l.....	Nev..	54,000	1	4,453,797	Dec. 23, '00	.01		United, z. l. pf. pf.	Mo..	19,556	25	211,527	Oct. 15, '07	.75		
Rocco-Home, l. s.....	Nev..	300,000	1	152,500	Dec. 22, '05	.02		United Copper, c. s.	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01		
Rochester Ld. & L.	Mo..	4,900	100	190,846	July 1, '12	.60		United (Crip. Ck.)	Colo..	4,009,100	1	440,435	Jan. 1, '10	.04		
Round Mountain, g.	Nev..	889,018	1	363,964	Aug. 25, '13	.04		United Globe, c.....	Ariz..	23,000	100	3,335,000	June 30, '16	15.00		
Sacramento, g.....	Utah..	1,000,000	5	308,000	Oct. 22, '06	.00%		United Metals Sell.	U. S..	60,000	100	11,000,000	Sept. 23, '10	6.00		
St. Joseph, l.....	Mo..	1,464,798	10	10,972,631	June 20, '16	.25		United Verde, c.....	Ariz..	300,000	10	37,820,000	June 3, '16	1.60		
St. Mary's M. L.....	Mich..	160,000	25	6,240,000	June 28, '16	2.00		U. S. Red & R. com.	Colo..	69,188	100	414,078	Oct. 9, '03	1.00		
Schoenh'r-Wal'n.x.l	Mo..	10,000	10	90,000	Sept. 20, '11	.20		U. S. Red & R. pf.	Colo..	39,458	100	1,775,936	Oct. 1, '07	1.50		
Scratch Gravel.....	Cal..	1,000,000	1	20,000	Feb. 1, '16	.02		U. S. R. & M. com	USMx	351,115	60	614,451	Apr. 15, '16	1.00		
Seven Tr. Co. g. s.	Nev..	1,443,077	1	252,632	Apr. 1, '15	.02%		U. S. R. & M. pf.	USMx	486,350	60	859,112	Apr. 15, '16	.87%		
Shannon, c.....	Ariz..	300,000	10	750,000	Jan. 10, '07	.60		Utah, c.....	Utah..	1,624,490	10	8,934,695	June 30, '16	3.00		
Shattuck-Ariz., c.....	Ariz..	350,000	10	3,762,600	Apr. 20, '16	1.25		Utah, s. l. (Fish Spa)	Utah..	93,000	10	287,720	Oct. 21, '07	.02%		
Silver Hill, g. s.....	Nev..	108,000	1	88,200	June 24, '07	.06		Utah Apex, s. l.....	Utah..	528,200	5	132,050	198,075	Apr. 1, '16	.12%	
*Silver King Coaln	Utah..	1,250,000	5	13,959,885	Apr. 1, '16	.15		Utah Con, c.....	Utah..	300,000	5	9,600,000	June 26, '16	.10		
Silver King Con.....	Utah..	637,582	1	878,616	Apr. 22, '15	.10		Utah-Missouri, z.....	Mo..	10,000	1	10,000	May 29, '16	1.00		
Silver Mines Expl.	N. Y..	10,000	100	250,000	June 15, '10	2.00		Victoria, g. s. l.....	Utah..	250,000	1	207,500	Apr. 23, '10	.04		
Sloux Cons., l. s. c.	Utah..	745,389	1	872,105	July 20, '11	.04		Vindicator Con., g.	Colo..	1,500,000	1	3,352,500	Apr. 25, '16	.03		
Skidoo, g. s.....	Cal..	1,000,000	6	365,000	Oct. 2, '14	.01		Wasp No. 2, g.....	S. D..	600,000	1	649,468	May 16, '16	.02%		
Smuggler, s. l. x.....	Colo..	1	1	2,235,000	Nov. 22, '06	.03		Wellington, l. z.....	Colo..	10,000,000	1	850,000	Mar. 15, '16	.02		
Snowstorm, c.....	Idaho.	1,600,000	1	1,169,619	Oct. 10, '13	.01%		West End Con.....	Nev..	1,788,488	1	536,645	Jan. 15, '16	.06		
Socorro, N. M.....	N. M.	377,342	6	177,205	June 1, '16	.06		West Hill.....	Wis..	20,000	1	40,000	June 29, '16	.20		
South Eureka, g.....	Cal..	299,981	1	1,367,774	Jan. 6, '16	.07		White Knob, g. pf.	Cal..	200,000	10	170,000	May 29, '16	.10		
So. Swansea, g. s. l.	Utah..	300,000	1	287,500	Apr. 3, '04	.01		Wilbert.....	Ida..	1,000,000	1	30,000	May 1, '16	.01		
Spearfish, g.....	S. D..	1,600,000	1	165,600	Jan. 10, '07	.01		Wolverine, c.....	Mich..	60,000	25	8,760,000	Apr. 1, '16	6.00		
Standard Con., g. s.	Cal..	173,334	10	5,274,400	Nov. 17, '13	.25		Wolverine & Ariz. c	Ariz..	15,674	15	4,742,630	Apr. 31, '12	.25		
Standard, c.....	Ariz..	425,000	1	69,500	Sept. 5, '05	.50%		Work, g.....	Colo..	1,500,000	1	1,697,685	Nov. 15, '12	.35		
Stewart, l. z.....	Idaho.	1,238,362	1	2,043,237	Dec. 31, '15	.05		Yak, g.....	Colo..	1,000,000	1	2,127,685	June 30, '16	.07		
Stratton's Crip. Ck.	Colo..	2,000,000	1	300,000	Sept. 6, '08	.02%		Yankee Con., g. s. l.	Utah..	1,000,000	1	167,500	Feb. 1, '13	.01		
Stratton's Ind.....	Colo..	1,000,000	5	5,028,568	Dec. 23, '06	0.12		Yellow Aster, g.....	Cal..	100,000	10	1,185,769	June 6, '16	.02		
Strn's Ind. (new)g.	Colo..	1,000,000	30	691,250	Jan. 31, '16	.18		Yellow Pine.....	Cal..	1,000,000	1	1,393,008	June 25, '16	.16		
Strong, g.....	Colo..	1,000,000	1	2,275,000	July 9, '05	.02		Yosemite Dredg.....	Cal..	24,000	10	102,583	July 15, '14	.10		

Corrected to July 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675.00

Dividends of Foreign Mines and Works

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization			
					Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest	
							Date	Am.								Date	Am.
Ajuchitlan.....	Mex...	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrillas.....	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00		
Amistad y Concordia s	Mex...	9,600	50		429,358	July 16, '08	1.28	La Roi No. 2, g.....	B. C...	120,000	25	36,450	1,661,650	Mar. 15, '16	\$0.30		
Amparo, s.....	Mex...	2,000,000	1	200,000	2,132,176	May 10, '16	.05	Lucky Tiger.....	Mex...	715,337	10	207,445	3,470,838	June 20, '16	.03		
Bartolo de Medina Mill	Mex...	2,000	25		103,691	Aug. 1, '07	.60	McKinley-Darragh-Sav.	Ont...	2,247,692	1	134,861	4,742,630	Apr. 1, '16	.03		
Batopilas, s.....	Mex...	446,268	20		55,870	Dec. 31, '07	.12%	Mexican, l. pf.....	Mex...	12,500	100		1,018,760	May 1, '12	3.50		
Beaver Con. s.....	Ont...	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.....	Mex...	240,000	10		660,000	Mar. 10, '08	.25		
Bolao, g.....	Mex...	120,000	20		721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex...	180,000	6		4,478,500	June 26, '14	.96		
British Columbia, c.....	B. C...	591,709	5		615,399	Jan. 5, '13	.15	Minas Pedrazzini.....	Mex...	1,000,000	1		497,500	Jan. 23, '11	.06%		
Buena Tierra.....	Mex...	330,000	5		160,380	Jan. 30, '15	.24	Mines Co. of Am.....	Mex...	900,000	10		4,958,600	July 25, '13	.12%		
Buffalo, Ont.....	Ont...	1,000,000	1		2,787,600	July 1, '14	.05	Mining Corp. of Canada	Can...	2,075,000	1	259,375	1,037,500	Mar. 30, '16	1.25		
Canadian Goldfields.....	Can...	600,000	0.10		237,099	July 15, '14	.01%	Montezuma, l. pf.....	Mex...	5,000	100		402,500	Nov. 15, '12	3.80		
Cananea Central, c.....	Mex...	600,000	10		360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex...	600,000	1		100,000	July 20, '09	.04		
Cariboo-Cobalt.....	Ont...	1,000,000	1		296,000	Sept. 1, '15	.09	Mother Lode.....	Il. C...	1,250,000	1	137,500	137,500	Jan. 3, '16	.11		
Cariboo-McKinney, g.....	B. C...	1,250,000	1		66,250	Dec. 1, '09	.00%	Naica, s. l.....	Mex...	100	300		3,190,000	Oct. 11, '09	\$283		
City of Cobalt.....	Ont...	600,000	1		138,375	May 16, '09	.01	N. Y. & Hond. Rosario	C. A...	200,000	10	140,000	3,590,000	Apr. 25, '16	.50		
Cobalt Central, s.....	Ont...	4,761,500	1		192,845	May 24, '09	.01	Nipissing, s.....	Ont...	1,200,000	5	600,000	1,040,000	Apr. 20, '16	.25		
Cobalt Lake, s.....	Ont...	3,000,000	1		465,000	May 28, '14	.02%	North Star, s. l.....	B. C...	1,300,000	1		533,000	Feb. 1, '10	.02		
Cobalt Silver Queen.....	Ont...	1,500,000	1		316,000	Dec. 1, '08	.03	Paloma, g.....	Mex...	3,000			99,600	Dec. 1, '12	5.00		
Cobalt Townsite, s.....	Ont...	199,282	5		1,042,259	Aug 20, '14	.24	Panuco.....	Mex...	10,000			7,465,000	Nov. 4, '09	6.00		
Coniaras, s.....	Ont...	800,000	5	200,000	8,040,000	Feb. 5, '16	.25	Penoles, s.....	Mex...	120,000	20		6,451,687	Sept. 30, '13	1.25		
Con. Mg. & Sm. g. s. c.	B. C...	85,560	100	290 262	2,470,246	Apr. 1, '16	2.60	Peregrina, pf.....	Mex...	10,000	100		328,656	Sept. 1, 10	3.50		
Crown Reserve, s.....	Ont...	1,999,957	1		6,102,408	July 16, '15	.03	Peterson Lake.....	Ont...	2,401,820	1	42,032	294,224	Mar. 1, '16	.01%		
Dolores.....	Mex...	400,000	6		1,374,865	July 24, '11	.22%	Pinguico, pf.....	Mex...	20,000	100		750,000	Apr. 15, '13	3.00		
Dome Mines, s.....	Ont...	1,000,000	1	400,000	15,406,000	June 1, '16	.50	Porcupine Crown.....	Ont...	2,000,000	1	120,000	5,400,000	Apr. 2, '16	.03		
Dos Estrellas, (El Oro) El	Mex...	300,000	0.50		210,000	Apr. 30, '14	.01	Princeton, (El Oro) J.....	B. C...	1,500,000	15		4,000,000	Jan. 1, '08	.16		
El Oro, g.....	Mex...	1,147,500	6		9,136,842	July 11, '13	.24	Rambler-Cariboo.....	B. C...	17,500	100	52,500	472,500	June 15, '16	.02		
El Rayo, g. s.....	Mex...	260,020	2		140,410	Apr. 24, '11	.15	Res Mines, Leasing.....	Ont...	200,000	1		12,750	Feb. 20, '15	.06%		
El Triunfo, c.....	Mex...	2,000,000	1		20,000	Aug. 28, '11	.01	Right of Way.....	Ont...	1,655,500	1	16,855	560,614	June 15, '16	.05%		
Esperanza, s. g.....	Mex...	450,000	6		12,521,250	Dec. 31, '15	.10	Rio Plata.....	Mex...	374,518	6		345,744	Feb. 1, '13	.03		
Granby Con. c. g. s.....	B. C...	149,955	100	449,956	6,050,341	May 1, '16	1.50	San Francisco Mill.....	Mex...	6,000	25		445,086	Oct. 15, '08	1.00		
Greene-Cananea, c.....	Mex...	474,411	100	1,438,627	5,694,432	May 29, '16	2.00	San Rafael.....	Mex...	2,400	25		6,798,260	Jan. 11, '12	2.00		
Greene Con. c.....	Mex...	1,600,000	1	1,500,000	11,540,000	Feb. 25, '16	1.00	San Toy, s. l.....	Mex...	6,000,000	1.00		540,000	July 24, '13	.01		
Greene Gold-Silver, pf.	Mex...	300,000	10		194,571	Mar. 25, '07	.40	Santa Gertrudis Hdqrs.....	Mex...	1,500,000	5		2,855,000	Nov. 16, '15	.20		
Guanaquato Con.....	Mex...	540,000	6		600,000	Oct. 8, '06	.07%	Sta. Gertrudis, Hdqrs.....	Mex...	60,000			3,960,000	Mar. 27, '09	1.00		
Guanaquato Dev. pf.....	Mex...	10,000	100		274,356	Jan. 1, '11	.30	Sta. Maria del Par.....	Mex...	3,600	12%		5,606,000	Jan. 2, '13	2.50		
Guggenheim Explor.....	Mex...	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.86	Seneca Superior.....	Ont...	478,841	1	335,219	1,316,431	Oct. 15, '16	.30		
Halleybury, s.....	Ont...	50,000	1		50,000	Apr. 6, '11	.60	Soledad, s. l.....	Mex...	960	20		4,439,840	Oct. 17, '11	8.00		
Hedley.....	B. C...	120,000	10	120,000	1,943,520	June 30, '11	.60	Sorpresa, g. s.....	Mex...	19,200	20		3,979,240	Jan. 5, '11	34.00		
Hinds Con. g. s. l.....	Mex...	6,000,000	1		85,000	Feb. 27, '08	.02	Standard, s. l.....	B. C...	2,000,000	1	300,000	2,100,000	June 10, '16	.02%		
Hollinger.....	Mex...	600,000	5	720,000	5,694,432	June 16, '16	.02	Temiscaming & Hud. Bay	Ont...	7,761	1		1,940,250	Nov. 10, '14	.30		
Hunter, c.....	Mex...	10,000	100		975,000	Feb. 27, '11	1.00	Temiscaming.....	Ont...	2,560,000	1		1,423,156	Dec. 31, '11	3.00		
Kerr Lake.....	Ont...	600,000	6	300,000	6,420,000	June 1, '16	.25	Trinidad, c.....	Mex...	8,000	100		1,355,000	Jan. 1, '09	1.00		
La Blanca.....	Mex...	143,000	20		2,775,700	Mar. 31, '13	.90	Tough-Oak.....	Ont...	531,500	5	132,875	199,932	Apr. 3, '16	.05%		
La Republica, s.....	Mex...	400,000	6		110,000	Aug. 15, '11	.05	Tretheway, s.....	Ont...	1,000,000	1		1,061,988	July 15, '14	.05		
La Rose Con. s.....	Ont...	1,498,627	6	149,862	5,536,982	Apr. 20, '16	.05	Wettlaufer-Lorrain, s.....	Ont...	1,416,690	1		656,386	Oct. 20, '13	.05		
								Yukon, g.....	Y. T...	3,500,000	5	525,000	8,108,110	June 30, '16	.07%		

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July 15, 1916.

Plant Construction of the New Cornelia Copper Co., Arizona

By W. A. SCOTT.

The illustration on following pages represents the scene of the New Cornelia Copper Co.'s operations, as it appeared several weeks ago, at Ajo, Ariz. In the foreground, is shown the machine shop, foundation work for electrolytic tank house, coarse and fine crushing plants, ore bins, power plant, leaching tanks and railroad yards; the low, cone-shaped hills shown in the background contain the ore deposits soon to be attacked by steam shovels. The old town of Ajo, though not in view, is situated on the eastern part of the ore belt. The new townsite of Cornelia is situated west of the plant, and is partly shown in the extreme right of the illustration, which is a view looking south-westerly. The Ajo district lies in one of the most arid regions of Arizona, 42 to 45 miles south of Gila Bend, and is now reached by the Tucson, Cornelia & Gila Bend railroad, auxiliary to the Calumet & Arizona and New Cornelia Copper companies. The elevation of the camp is about 1900 ft. above sea level. As early as 1860 to 1865 high-grade copper ore was mined from these deposits, hauled to San Diego, and shipped thence by water.

The Ore Deposits.

The exposed area of the New Cornelia's deposit here amounts to 65 acres, and appears as a series of connected dome-shaped hills from which all waste or overburden has been eroded away. The deposit consists of monzonite porphyry, containing dikes of diorite and diabase, and bearing copper oxides and carbonates to a depth of 150 to 200 ft., and sulphides in the form of chalcopyrite and bornite at greater depth. The entire area has been explored by diamond drills, the total footage of drill holes thus made amounting to 23,097. Of the 88 holes sunk from 200 to 1000 ft., 19 were bottomed in ore, and by this exploration work it was ascertained that the central ore body extends to a depth of 400 to 600 ft. The holes were sampled every 5 ft., and to check the drill findings many 50-ft. test pits were sunk. An estimate of the amount and grade of ore available, based upon

this prospecting and sampling, is as follows: Carbonate and oxidized ores, running 1.54% copper, 11,950,000 tons; sulphide ores, running 1.50% copper, 28,303,600 tons; making a total of 40,258,000 tons, averaging 1.51% copper. As a result of these tests it is understood the ores contain 0.2 to 0.4 oz. silver and 0.015 to 0.01 oz. gold per ton. The dividing plane between the oxidized and sulphide zones appears to be nearly horizontal.

Leaching and Electrolytic Process.

The property was acquired in 1912, when exploration by surface work and diamond drilling began, and was continued until the data above given were worked out. In the meantime experiments along lines of leaching by sulphuric acid were carried on under direction of Stuart Croasdale, Denver, and demonstrated to be commercially practicable. When, in 1913 and 1914, a patent anode came to the attention of the company, experiments were made with methods of electrolytic deposition, and at the same time an adaptation of the old Hoffman process to leaching was tried, and with some success, all efforts being directed to devising a process of the greatest simplicity. First, a 1-ton plant was built at the property, which was operated several months; and this was supplanted early in 1915 with a 40-ton plant. With the 1-ton plant 413 charges were run, and on the 40-ton plant 301 charges were run, and in the aggregate 14,000 tons of ore were leached. The process finally adopted consisted of crushing to 4-mesh, leaching with sulphuric acid in lead-lined tanks for 8 days by upward circulation, and advancing the solution from tank to tank, the oldest charge getting the solution having a maximum of free acid content, which is approximately 3%. In this manner there is a constant inflow of high-acid solution at one end of the series and a constant discharge of neutral solution from the newest charge of ore. The solution dissolves other material besides copper, consisting principally of iron and alumina, the former as both ferrous and ferric salts. The ferric iron, being detrimental to elec-

trical efficiency, is converted to ferrous iron by reduction with sulphur dioxide gas generated by roasting sulphide ore. This reduction is accomplished by passing the solution down through a tower filled with wooden baffles, the gas passing up through the tower, or in a direction opposite to the flow of the solution. This reduced solution is now sent to the electrolytic tank house, where the copper is deposited out electrolytically. Lead anodes and copper cathodes are used, and the solution flows through the tanks at parallel to the anode and cathode surface. The solution, on leaving the tank house, is run through the leaching tanks, and thus used over and over. To keep down the fouling of solution a certain quantity will be discarded daily and its copper content precipitated on scrap iron. This cement copper will be used as an

ing information pertaining to the construction of a plant of 5000 tons daily capacity, now in progress, will be the more readily understood. The new plant, which it is believed will be ready for operation by January, 1917, is being built and equipped to put into execution the methods so thoroughly worked out in the experimental plants, on ore bodies so well explored and tested.

Thus far, the New Cornelia Copper Co. has placed orders for material and equipment amounting to over \$1,250,000, a large part of such material and equipment having been delivered or is ready for delivery.

Mining Operations.

Mining operations will begin in an arroyo, at a place between two mineralized hills, where three Osgood



Foundations for Power House and Electrolytic Plant.

NEW CORN

additional reducing agent, being brought back into solution with the ferric iron generated in the electrolytic cells.

The anodes and cathodes decided upon will be 42 by 42 ins. and will weigh 175 to 200 lbs. The quality of copper produced by this process, it is claimed, will be somewhat better than the average electrolytic, as there will be practically no arsenic nor antimony in the electrolyte to contaminate same. In the treating of the ore in the experimental plants there was an average content of 1.35% copper, the process showing an average recovery of 80%.

These facts concerning the process, and the equipment required in its operation, were obtained from the company's metallurgical department, and the follow-

100-ton, oil-fired steam shovels will be used in scooping up the ore and loading it into 30-yd. Kilburn & Jacobs, side-dump cars, of which there are 40. The haulage of about one mile from the mine to the crushing plant will be by five 70-ton switch locomotives, furnished by American Locomotive Works.

The New Plant.

The coarse crushing plant will contain a No. 24 motor-driven Allis-Chalmers gyratory crusher, followed by five No. 8 Allis-Chalmers gyratories, reducing the ore to 3½-in. size. It then passes by belt conveyor to storage bins of 10,000 tons capacity, and thence by belt conveyor to the fine crushing plant, equipped with twelve 48-in. Symons disc crushers, by

which the ore is pulverized to $\frac{1}{4}$ -in. mesh, thus making it ready for the leaching plant. Between the fine crushing plant and leaching tanks is a sampling mill, equipped with standard machinery for this purpose.

For the leaching process, 11 lead-lined tanks of concrete are being constructed, each tank 88 ft. sq. and 15 ft. deep, inside measurement, and having the capacity of 5000 tons. These tanks are being set in the open and arranged in two rows, with a central structure between the rows to support the conveyors by which the tanks will be filled with ore. Each tank is being equipped with Worthington pumps for advancing its solution at the rate of 8000 gals. per minute. The tailings, after the copper in the ore has passed into solution and has been drained off, will be discharged from the tanks into side-dump cars by

and circulating pumps. These tanks are being so arranged as to make two main aisles in the building, each 80 ft. wide and 270 ft. long. This structure, already erected, is of steel.

Power Plant.

The equipment, for steam-electric generation, is being housed in a steel and concrete building, 126 by 200 ft., and consists of five Stirling boilers, 823-hp. each, equipped for oil firing, with economizers and feed-water equipment; two 7500-kw. General Electric steam turbines, and three Westinghouse 1500-kw. motor generator sets. The boiler and steam turbine installations will be separated from each other by a partition. This power plant, including building and complete equipment, is under construction by Chas. C.



R. CO.

Oil Tanks. Machine Shop.

Hulett type of excavators, and hauled by locomotives to the tailings dump. In addition to the leaching tanks and their equipment, there will be five wash-water and acid solution storage tanks, each having a capacity of 450,000 gals.; also one sludge tank, 88x88x15 ft.

The four sulphur dioxide absorption towers, each 20 ft. diameter and 40 ft. high, will receive the neutral solution from the leaching plant, to reduce the ferric iron, as previously described, and from those towers it is pumped to the electrolytic plant, for circulation through the electrolytic cells. This plant, called the tank house, is being equipped with 158 lead-lined electrolytic tanks, each tank being about 30 ft. long, 4 ft. wide, 5 ft. deep, having accessories, such as cranes

Moore & Co., Engineers, San Francisco, who have a contract for this important work.

The machine shops and warehouse are contained in one building, so divided as to make a shop room 80x180 ft., and a warehouse 60x80 ft. Modern tools and shop equipment have been installed to handle the special work and repairing required for the entire works.

Water Supply.

A water supply for the plant and for domestic uses was developed, first by drilling, and then by sinking a 650-ft. shaft on the desert 8 miles north of Ajo. A Nordberg, electric-driven pump of 750 gals. per minute capacity was installed and a 10-in. pipe line was laid from this water shaft to steel tanks, of 300,000

gals. capacity, situated on the hill above the plant. The lift required from shaft to storage tanks is 1100 ft. Drifts will be run from the bottom of the shaft to develop a greater water supply, and an additional pump will be placed in service. The water here, though slightly alkaline, is very good, and has a temperature of 102° F.

Oil and Acid Storage.

Oil tanks, already erected, have a capacity of 15,000 bbls., and four tanks for sulphuric acid storage, equal to 150,000 gals., are being built. The oil and acid tanks are so located that they may be filled by gravity lines direct from tank cars. The acid for the leaching plant is to be supplied by the Calumet & Arizona Copper Co., Douglas, where an acid plant, capable of producing 200 tons of acid per day, is under construction. This is auxiliary to the C. & A. smelting plant, where a lead-lined acid chamber, 534 ft. long, 138 wide and 80 high, is being constructed on concrete piers. The acid will be produced from sulphide ores, five of the 24 Herreshoff roasters used at this smelting plant being connected to the sulphuric acid plant.

General and Personal.

General offices and laboratories will be constructed later in the year. A park was laid out and provided with an irrigation system, trees and grass were set, and by the liberal use of water a beauty spot on the desert is in a fair way to be created.

John C. Greenway, general manager of Calumet & Arizona Copper Co., is likewise general manager of the New Cornelia; M. Curley, general superintendent, has direct supervision of all work at Ajo and Cornelia. Fred Eckman, mine superintendent, will direct the steam-shovel operations. The plant was designed by A. G. McGregor, of the C. & A. staff. Geological data and matter pertaining to the ore deposit were worked out by Ira V. Goralemon, of the C. & A. Co. Much of the ore testing at the experimental plants devolved upon H. A. Tobellmann, chemist and metallurgist for the New Cornelia Co. Dr. Morse, of Western Precipitation Co., Los Angeles, spent some time at the experimental plant in the early stages of the research work, in a consulting capacity, and in developing the methods adopted. J. S. Olmstead now holds the position of chief engineer in the New Cornelia's engineering department.

Rich Ore Strike in the Joplin District.

A rich strike of zinc ore is reported from the Joplin, Mo., district on what is known as the Heffernan lease, between Quapaw and Cardin. At a depth of 190 ft. the shaft has been sunk into a body of ore that shows a 16-ft. face of practically pure zinc blende. Only an occasional piece of flint is found in it with the rock that chanches to stick to the ore where it joins at the top of the deposit with the rock and at the bot-

tom. The ore is hand sorted for the most part and four hand jigs are used upon the finer particles. With this sort of arrangement there is being made daily from 15 to 18 tons of cleaned zinc blende concentrates. Fourteen carloads of cleaned ore have already been made, and the mine is only being started out from the shaft. It is believed that the ore deposit is the filling of an old underground cave with the ore solutions, which accounts for the absence of the ordinary gangue matter and the high percentage of ore. Nothing like it has ever been found hitherto, and the end is not anywhere in sight. In fact, drilling seems to forecast a very large deposit of this character and the company, which is a Canadian concern, is looking forward to the development of the tract upon a large scale.

Coke-Oven Accidents in 1915.

Reports received by Albert H. Fay, Bureau of Mines, Washington, D. C., from the operators of coke ovens in the United States show a gratifying decrease in the number of fatalities and injuries in 1915 as compared with 1913 and 1914. The number of men killed in 1915 was 38, as compared with 45 in 1914 and 46 in 1913. The total number of men reported employed in 1915 was 31,060, as compared with 22,313 in 1914. The fatality rate in 1914 was 2.02 per 1000, while in 1915 it was 1.22. The injury rate in 1914 was 98.10 per 1000, while in 1915 it was 91.82.

The report represents 248 plants or companies, showing 55,112 ovens in operation, as compared with 49,895 in 1914. There were also reported 98 plants idle. The average number of days active in 1915 was 303, as compared with 286 in 1914 and 288 in 1913. This report gives for the first time separate accident data for beehive and by-product ovens and indicates a greater hazard for the latter than the former.

Treatment of Zinc Ore in Electric Furnaces.—

A difficulty encountered in treating an ore charge in an electric furnace is the formation of crusts of slag or other material in the proximity of the tap-hole. In order to obviate this trouble, Edward S. Berglund, of Trollhättan, Sweden, proposes to add to the furnace at intervals certain easily fusible materials that will combine with the melt and stiff crusts. (U. S. patent 1,160,244.) Thus in the case of zinc ore he adds 200 kg. of fluorspar to a charge of 1000 kg. of ore and carbon, mixing them intimately before charging; or he may add such fluxes as fluorspar, lime and old slag just before the furnace is tapped, introducing the substances in proximity to the tap-hole.

The state department has received from Special Agent Rodgers at Mexico City the following regarding the new mining taxes: "There will be no penalty during whole month of July. Fines will be imposed at rate of 25%, 50% and 100% after August, Sept. 1 and Oct. 1, respectively. Thereafter forfeitures may be declared."

The Metallurgy of the Rarer Metals

In a paper presented before the American Institute of Chemical Engineers, at its Cleveland meeting, Prof. J. W. Richards of Lehigh University discussed the importance and future of magnesium, calcium, chromium and other metals. According to Prof. Richards, there are many metals which may be called the rarer metals, but the most interesting among these, both to the metallurgist and economist, are those metals whose compounds are relatively cheap and which command high prices because of the difficulty of their reduction. These are metals whose market prices may at some time be reduced anywhere from one-half to nine-tenths by improved methods of reduction. He said that if his paper had been written 30 years ago aluminum would be one of the metals that would be discussed, being in 1886 one of the rarer metals selling at \$10 per pound. The silicon industry furnishes another example of great reduction in the cost of the metal. This, in 1900, was selling as a chemical curiosity at over \$100 an ounce; now 10 cts. per pound is a good market price for it.

Beryllium and Boron.—The speaker referred at length to the number of metals that at present command high prices, but which by improved metallurgical processes might be made very cheaply. These include beryllium, boron, magnesium, calcium, strontium, zirconium, molybdenum, barium, titanium, chromium and cerium (mixed metals of the cerium group). He said the present methods of reducing beryllium are tedious and costly and that it is not to be expected that this metal can be made cheaply until some one masters the direct electrolysis of the oxide, dissolved or suspended in a more stable melted salt, which is by no means an impossibility. He said this metal, being white, malleable and unchanged in air, with a specific gravity of 1.64, would make it particularly useful for objects where great lightness and permanence in air are the first consideration, with the cost secondary. He characterized it as a metal that will repay extended metallurgical research and minute physical and chemical study of its many unique properties.

Magnesium and Its Future.—Prof. Richards said that the metallurgist had not made a fraction of the progress that he should have made with magnesium. Although magnesium oxide costs only a few cents per pound, the metal sells for about as many dollars per pound and is scarce. But it is believed that, by improving the methods, the reduction of magnesium can be produced at 25 cts. per pound. He said that while the war lasts, with its enormous demand for magnesium for military purposes, the price will remain in the dollars per pound, but with improved processes that are being developed he believes that after the close of the war, with normal industrial conditions, magnesium will sell at a price which will take it out of the class of rarer metals and put it among the common ones. As the price goes down its industrial uses

will increase in geometrical proportion, and instead of the production being expressed in thousands of pounds per year it will reach thousands of tons. This will be one of the by-products of the war's stimulus to metallurgical industry.

The speaker said that the possibilities held out to the metal industry by reasonably cheap magnesium are extremely interesting, and that it is quite possible that alloys analogous to dur-alumin may be discovered, as strong as soft steel, with only 30% of its weight, which will find extensive use in aeroplanes and dirigibles. Such alloys may largely displace aluminum alloys, which are now used by the thousands of tons annually in the automobile industry, with a saving of one-third in weight, which will compensate for the higher first cost. He predicted that the metallurgical use of magnesium will also be greatly extended by its lower price, such as for deoxidizing brass, copper, bronze, nickel and monel metal, since it is a much stronger deoxidizer than aluminum. In fact, aluminum has blazed the way into numerous uses for which magnesium, as soon as it becomes cheaper, will compete and replace its older sister. He predicted a large future for magnesium as one of the common metals of everyday life.

Calcium in Alloys and as a Deoxidizer.—Calcium, strontium and barium were referred to as the trio of highly interesting elements, common enough in nature but scarce and of high price because of the metallurgical lack of efficient and cheap methods of reduction. Calcium was referred to at present as a semi-rare metal which could be produced much cheaper by present methods if made on a large scale to fill a large demand. The principal trouble at present is in finding uses for the large production. He said its possible alloys with other light metals should be exhaustively studied, and that another large possible use is as a chemical purifying agent in melting and castings metals.

A small addition of metallic calcium might be used to reduce the amount of sulphur and phosphorus in steel, and other metals and alloys whose properties are damaged by sulphur or phosphorus may be similarly refined or improved. Barium was referred to as a metal that could be obtained in large quantities if its uses were developed. As barium is a good conductor, its use was suggested for electrical contrivance, and there are possibilities that its cost can be very materially reduced.

Growing Importance of Chromium.—The fact that the use of chromium in steel is rapidly extending to all varieties of extra hard and high-speed steel was referred to, and the paper stated that the use of pure chromium is limited by its high cost of production and our lack of knowledge as to how to handle it and its possible useful effects. For example, chromium electroplating is white and durable and for many purposes

may be superior to nickel and almost equal to platinum plating, but the technique of always getting perfect plating has not been mastered.

Ferrocromium alloy carrying high carbon (6 to 8%) is produced cheaply in crucibles, cupola furnaces, blast furnaces and electric furnaces. Low-carbon ferrocromium commands three to five times as high a price because of the difficulty of decarbonizing the raw product. The speaker hoped that a test would be made in the electric shaft furnace to see if it is not possible to produce directly from the ore a low-carbon product, and said the present prices—\$100 and \$500 a ton, respectively, for the high and low alloys—would warrant a great effort in that direction.

Prof. Richards stated that the metallurgy of chromium is full of attractive possibilities and the usefulness of pure chromium in the field of alloys is only beginning to be scratched. The scratch, however, has proven very much worth while. The success of A. J. Rossi and the Titanium Alloy Mfg. Co. in producing ferrotitanium alloy from the enormous quantities of titaniferous iron ore in northern New York and Canada was referred to, and the speaker said that if uses are found for pure titanium some other than electric furnaces must be used to reduce it. These methods of reducing pure titanium are, like its prospective uses, still in the future. The metal is now quoted at about the price of silver, and if the problem is properly faced it could probably be made as cheap as chromium.

New Swedish and Norwegian Iron Works.

Iron and steel production in Sweden and Norway, with special reference to the utilization of domestic resources, is receiving special attention, according to the London Times. In Sweden large iron works are now approaching completion at Oxelösund, with the output estimated at 60,000 tons of pig iron annually and about 100,000 tons of coke, in addition to by-products.

In Norway an interesting plan for large iron works has been prepared by a committee of the technical societies, with a minimum output of 50,000 tons per year. It is urged that the plant be located near convenient water power and within 300 km. of Narvia, the Norwegian export harbor for Lapland iron ore. A coke plant is contemplated, using foreign coal, the manufacture of by-products from the coke plant, a complete steel works, a steel foundry and rolling mill. About 125,000 tons of English coal is figured as necessary, as well as a capital of about \$4,000,000. It is advised that plans should be made for an increase in output to 150,000 tons per year, which would supply the present imports of 100,000 tons and leave a margin of 50,000 for export.

Iron consumption in Norway is increasing, while the production has dwindled decidedly, with the export of iron ore growing at the same rate that imports of pig iron are increasing. The projected plant is ex-

pected to be of great advantage to the Norwegian ship-building industries, which are being greatly extended, with new ones being built.

Zinc Exports Continue at Record Breaking Rates.

Zinc exports—pig, bars, plates and sheets—from the United States for the first 3 months of 1916 continue at record-breaking rates, as the following table from Government data shows:

Period.	Gross tons.	Gross tons per month.
1915	111,788	9,315
1914	57,899	4,825
1913	6,957	579
January, 1916	12,512	10,559
February, 1916	11,357	
March, 1916	7,808	
August, 1914, to March, 1916, 20 war months	200,617	10,031

It will be seen from this that the average exports for the first quarter of this year of 10,559 tons per month were larger than the average for 1915 of 9315 tons per month. The contrast between the totals for 1913 and 1915, however, is striking evidence of the extent to which this country has displaced Germany in supplying the world's needs for zinc or spelter. The largest exports of any one month since the war started were 17,005 tons in September, 1914, with 16,354 tons in December, 1914, and 13,570 tons in January, 1915. Until October, 1915, the exports then fell below 9000 tons per month and then rose again into five figures.

A very large quantity of zinc has also been exported as brass in bars, plates and sheets. Official Government data gives the following:

Period.	Gross tons.	Gross tons per month.
1915	29,585	2,465
1914	3,176	264
1913	2,728	227
January, 1916	5,332	7,537
February, 1916	8,565	
March, 1916	8,715	

The present brass export rate is therefore over three times that of 1915, or 7537 tons per month, against 2465 tons per month in 1915, and only 264 tons per month in 1914.

The valuation of the 1915 spelter exports was \$31,332,395, or \$280 per ton, against \$955,667 for the 1913 exports, or \$137 per ton.

Water in Coal.—"Some Properties of the Water in Coal," by Horace C. Porter and O. C. Ralston, is the title of Technical Paper 113, issued by the U. S. Bureau of Mines. It deals with the manner in which water may be held in coal and how its properties and those of coal are affected by the condition in which it is held. The Bureau has analyzed many thousands of samples of coal from different coal fields and has studied the behavior of coal under the varied conditions which attend its use. The question of its water content is considered of importance in connection with the destructive distillation, the alterations during storage and other phases of the industrial utilization of coal.

The Merits of Oil and Grease Lubrication

By W. J. FOUHY.

The use of oils and greases as machine lubricants is as old as machine practice, but prior to the non-condensing steam engine, which came into practical use about the year 1800, machine practice was not extensive, and prior to the development of the petroleum industry during the last half of the 19th century, animal, vegetable and fish oils and greases were largely the only available lubricants. In fact, the development of this prime mover marked the beginning of an era of industrial advancement; subsequent machine development afforded a means for finding petroleum in abundance; the growing demand for machinery meant a corresponding demand for machine lubricants; the limited supply of the forementioned oils and greases meant a growing demand for petroleum oils and greases, and the development of machinery, and of the petroleum industry, kept pace with each other during the last half of the 19th century.

Machinery and petroleum lubricants are now used very extensively, but in view of the fact that these lubricants are not used efficiently in many instances, it is the writer's purpose to make clear the reasons why free-flowing oils are preferable to hard oils or greases under certain conditions from a lubricating standpoint, and to outline briefly the temperature, structural and operating conditions that justify the use of various greases. In fact, due to the small quantity of grease frequently required by some bearings easily lubricated with hard oil, many young engineers, students and novices, receive the impression that suitable greases afford more efficient lubrication than well applied free-flowing oils. However, careful study of this problem reveals the fact that such impressions are erroneous and misleading in a great measure. In other words, a careful comparison of the composition and molecular construction of these lubricants, and proper consideration of their differences in relation to the difference of power absorbed by "friction" make the error so clear that there is no room for argument.

As a matter of fact, every authority on lubrication, including Prof. Thurston, and numerous experiments made by careful, experienced engineers, prove conclusively that exclusive grease lubrication involves from 3 to 5% more power or "friction load" than suitable oil lubrication of the same assembly of machinery operated otherwise under precisely the same conditions.

Recognition of this advantage of free-flowing oils many years ago by some machine designers and builders, and their desire to build machinery superior to the output of competitors, prompted them to incorporate improved types of bearings in the construction of their output, and improved methods of oil appli-

cation, such as ball-race bearings, ring-oiling bearings, various types of oil bath bearings, and oil circulatory systems of much greater capacity. In fact, the adoption of these improvements of machine design, and improved methods of application meant the prevention of unnecessary oil leakage; more cleanly machinery; more dependable lubrication than afforded by oil-cup feeding, and hand oiling; recovery and repeated use of each filling of oil, and an appreciable reduction of lubrication and other operating costs.

Furthermore, we find that the more copious supply of oil afforded working surfaces of bearings by these improved methods of oil application, also reduces friction as much as 4% more in many instances, especially when supplied under pressure from large circulatory systems. In view of this, it is fair to say that grease lubrication involves fully 5% more friction than oil lubrication of improved modern methods.

In order to illustrate the meaning of 5% more friction, friction load, or more power required with grease lubrication, let us consider the lubrication of a large assembly of machinery. For instance, a flour mill having a full load of 800 hp. when lubricated with suitable free-flowing oils, and equipped with modern oiling appliances. Assume that the required power is developed by a reciprocating engine; that it is scarcely capable of pulling the full load economically with the prevailing speed, and maximum mean effective pressures, and that the owner decides to use grease exclusively in future, and equips his plant accordingly with grease feeding appliances, not being aware of subsequent results. The additional friction load promoted by the use of grease means that the engine would then be required to develop 840 hp. when working the plant at full capacity. This would mean a corresponding increased consumption of fuel. Assuming that the fuel costs average \$34 per horsepower per year, it is evident that the cost of this additional power would amount to \$1360 per annum, or \$113.33 per month, to say nothing about additional fuel cost brought about by inefficient engine operation.

On the other hand, if he preferred to develop not more than 800 hp. in order to obtain the same engine economy obtained while employing free-flowing lubricants, he would be compelled either to return to the use of fluid oils, or to restrict the output of the mill, which would mean reducing the earning capacity, or a loss of profits.

Furthermore, if he desired full output of the mill, and the best engine economy obtainable with grease lubrication, other expensive radical changes, such as either increasing the engine speed, increasing the boiler pressure, or installing a new engine, might be

resorted to. However, in either event, the exclusive use of grease would mean either a great loss of fuel, a corresponding loss of output, or a partial loss of both continuously, regardless of initial expenditures that may be involved.

Evidently, the increased fuel cost, and the loss of earning capacity due to grease lubrication, should be added to the annual, or monthly cost of grease in every instance, when comparing costs of free-flowing, and hard oil lubrication.

A common way to determine the "friction load" of an assembly of machinery is to take power readings while it is running empty or without load, at rated speed. This is accomplished with reciprocating engine-driven machinery by taking correct indicator cards during such an interval, and computing the horsepower developed. With electric motor-driven machinery it can be determined by taking proper switchboard readings during such an interval, and by computing the kilowatts or horsepower required. However, a less expensive and more accurate method of determining the difference of "friction load" or of the power required with the respective lubricants, is to find their "co-efficients of friction" by testing them on a modern friction machine.

The superiority of free-flowing petroleum oils as lubricants, or their lower "co-efficients of friction," is due to their fluidity, and high degree of purity. In other words, these characteristics embrace a molecular construction of hydrocarbons that afford lower "co-efficients of friction" or less internal or molecular resistance than hard oils or greases. Another point of superiority of free-flowing oils is their great durability; that is to say, their fluidity and purity enable them to be readily recovered, filtered, and used over again repeatedly on the same working surfaces without danger of injuring bearings and increasing friction. In fact, in some instances, good, free-flowing engine and machine oils are used over and over again as many as 14,000 times in modern circulatory systems before their lubricating qualities become appreciably impaired. However, this endurance of oil is possible only in cases where such lubricants do not come in contact with critical temperatures, and other injurious influences during service.

On the other hand, hard oils and greases, otherwise known as semi-fluid, and solidified oils, have their proper realm of usefulness or afford dependable lubrication when used in their proper places, and when rightly applied. As a matter of fact, experience teaches that there are prevailing structural and operating conditions, such as certain types of bearings, the presence of grease feeding appliances, heat conditions and exposure of bearings to excessive dust and grit, which make it impossible for free-flowing oils to lubricate as economically and efficiently as semi-fluid and hard oils, and that justify the use of solidified oils even with an expense or loss of power. In fact, such is the case to a limited extent at many cement plants, collieries, ore mills, sugar plants, cotton seed oil mills,

and other industrial establishments. The actual conditions that make grease lubrication desirable at any plant, are excessive surrounding and bearing temperatures; exposure of bearings to excessive dust and grit; the presence of grease cups, and other structural and operating features referred to later. In fact, temperature, structural and operating conditions are so extensive as to require a number of various greases.

Hard oils or greases consist of lubricating oil, and some animal or vegetable product treated in such a manner as to form a sponge or filler capable of absorbing the oil constituent, but some greases are made almost wholly of animal fats, for special purposes.

There are several grades of petroleum greases, and the manufacturers usually make each grade of two or more consistencies. For instance, there are low, intermediate and high-melting point greases of various consistencies for bearing service; special tallow compounds for locomotive service, and more adhesive greases for open gear service, chains and the like. As a matter of fact, each grade has several melting points, each consistency of each grade has its respective melting point, and all responsible manufacturers of lubricating greases rigidly maintain the uniformity of each grade and consistency.

Furthermore, for marketing convenience, each grade has a trade name, and each consistency of each grade or brand also bears a number or some other means of identification in order to place consumers and marketers of these products in position to choose and use them intelligently in accordance with their structural, temperature and operating requirements.

Generally speaking, the quality of a grease depends on the quality of its oil constituent; some grades or brands of grease contain different lubricating oils than others; the softer the consistency of a grade of grease, the more lubricating oil it contains, and the harder consistencies of any grade of grease are usually better suited for high-temperature service than the semi-fluid and softer consistencies of the same brand.

Referring specially to the grades of grease intended for bearings—the semi-fluid and soft consistencies are well adapted for several types of close fitting machine bearings not subject to high temperatures, whether operated at high, intermediate or slow speeds. For instance, ordinary solid and split bearings equipped with properly adjusted spring compression cups; ordinary bearings with pockets affording a large area of journal surface, and roller bearings of mine cars, automobiles and other mechanisms. They are also well adapted for gear-case service where the containers are not reasonably oil tight. This of course is true in every instance where either the clearance space, or the oil grooves are ample to afford proper distribution of lubricant to the working surfaces without promoting excessive leakage, and where the running and surrounding temperatures are not sufficient to cause excessive waste of grease.

However, in every instance of soft grease lubrication

tion where excessive waste of lubricant prevails, due either to constant high temperatures or to excessive clearance caused by abnormal metallic wear or otherwise, it is advisable to use either the medium or harder consistencies of the same grade if prevention of previous waste is desirable. In fact, in some instances even a consistency of another brand of grease of higher melting point may be required.

The medium and hard consistencies of the low and intermediate melting point grades of grease are also well adapted for the lubrication of ordinary wrist pins, crank pins, eccentrics, knuckle joints and like moving parts, whether or not exposed to excessive dust and dirt, where the motion is such that free-flowing oils cannot be applied adequately, easily and safely without special oiling appliances. In fact machine parts are frequently equipped with suitable compression cups.

The hard consistencies of each grade of grease of low and medium melting points are well suited and intended for bearings where the temperatures are excessive for the softer consistencies. They are desirable lubricants for bearings where the temperatures are sufficient to melt them at the required rate, and in many instances they are well suited for large, slow speed, heavy duty bearings. However, experience teaches that they should be fed from hand grip screw compression cups rather than from spring compression cups, because in many instances their resistance or density is excessive for such springs.

The high-melting point greases are well suited and intended for bearings where the room or surrounding temperatures are excessive for the hard consistencies of the medium melting point grade of grease. They are best applied either from large bearing pockets, or when fed from the locomotive type of grease cups. In fact, in railway shop practice, special greases are compressed to a desired density in special moulds suitable for locomotive driving journals, and for crank pin, and eccentric cups.

The marked distinction of the high-melting point greases is that their sponge is manufactured in a manner to resist greater or more intense heat than that of the medium grades. However, regardless of the grade and of the consistency of a grease, it is the oil that lubricates, and heat of working surfaces equal to its melting point is required to make it sufficiently fluid to liberate the oil constituent, before adequate lubrication can be obtained from it. This fact, which embraces the molecular construction of hard oils, is accountable for their higher "co-efficient of friction."

On the other hand, one of the advantages obtained in practice by the proper application of suitable greases on bearings exposed to excessive dust and grit, is that these harder lubricants completely fill the clearance spaces, prior to melting, and they form a slight fillet at the bearing ends, which prevents dust and grit from entering, increasing friction and injuring the working surfaces, thus protecting these sur-

faces from foreign matter, as well as affording dependable lubrication.

The advantage obtained by using suitable greases instead of free-flowing oils on bearings subject to high temperatures, is simply the economy of lubricant attained by the prevention of waste of free-flowing lubricants. However, this advantage can be easily reversed in cases where the construction of such bearings is favorable to adequate oil recovery, where they can be supplied from a circulatory system, and where the construction and capacity of the system can be made suitable for required oil cooling. In fact, in such instances, it is advisable to use heavy-bodied free-flowing oils instead of grease, providing the maximum temperature of the working surfaces does not greatly exceed 150° F.

Antimony Imports for April Show Large Increase.

The report of the Bureau of Foreign and Domestic Commerce for April shows that the imports of antimony (matte, regulus or metal) during that month amounted to 2,984,600 lbs., which total shows substantial increase over the returns reported for the previous month and the same period a year ago, viz., 1,202,150 lbs. and 662,995 lbs., respectively. Imports of antimony ore were 982,851 lbs., which compares with 803,097 lbs. imported in March and 297,721 lbs. in April, 1915.

The monthly imports of antimony for 1915 and to April this year are as follows:

	1915		1916	
	Ore.*	Metal.	Ore.*	Metal.
January	231,200	2,239,553	660,309	89,600
February .....	.....	1,040,836	448,684	2,246,623
March	76,608	986,164	803,097	1,202,150
April	297,721	769,949	982,851	2,984,600
May	229,001	1,516,127	.....	.....
June	117,609	1,446,979	.....	.....
July	118,195	2,439,601	.....	.....
August	772,691	661,030	.....	.....
September	109,015	2,320,412	.....	.....
October	131,906	439,413	.....	.....
November	250,066	617,598	.....	.....
December	1,040,009	3,006,868	.....	.....
Total	3,374,012	17,484,030	2,894,941	6,522,979

*Antimony contents.

To assist in a practical way those who are now exploring twenty townships in northern Wisconsin for iron ore, as the result of the examination last year by the Wisconsin Geological Survey, W. O. Hotchkiss, State Geologist, Madison, has prepared blueprints showing each of these townships, with magnetic lines, roads, streams, etc. So much activity in ore exploration has not been known in Wisconsin for many years. most active explorers and has leased considerable The W. D. Edison Co., Duluth, Minn., is one of the acreage on the royalty basis. Drilling will start July 1.

Higher wages to the right kind of miners does not mean an increased cost of production; on the contrary it means probably a very material decrease in this item.

Operating Motor Trucks Under Difficulties at Mines.

The Duquesne Mining & Reduction Co. has been using a Knox 4-wheeled tractor with a trailer to transport ore and concentrates from the mine at Duquesne, Ariz., to Patagonia, the nearest railroad connection, 18 miles distant. This equipment operates in the reverse direction over the same road to transport mining supplies of all kinds, including a large amount of new machinery, being installed in connection with the work of developing the mine.

Some idea of this 18-mile stretch may be had from

trailer load also rolls on broad, practically indestructible steel tires. The power wheels of the tractor itself, as shown by the illustration, are equipped with diagonal steel cleats that insure traction.

The complete success of motor equipment under such an unusually severe test would seem to indicate that the gasoline motor will be a permanent and important factor in getting ores from the mine to the railroad.

Manganese Ore in Colombia.—It is reported that an American syndicate has opened a manganese ore mine at Madinga, on the Gulf of San Blas, in the Province of Colon, Colombia, and that a trial ship-



ONE OF THE 64 TIMES FORDING THREE CREEKS DURING THE 18-MILE TRIP.

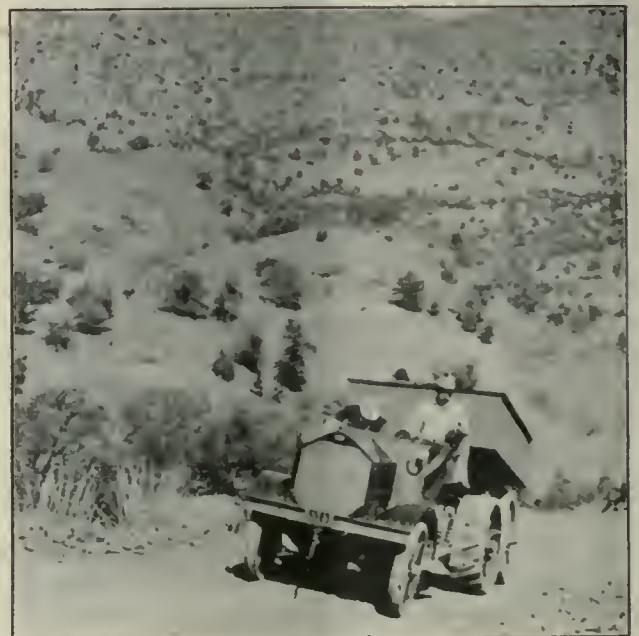
the fact that it took 3 days for a 10-mule team to make the round trip of 36 miles, hauling 3 tons of supplies on the trip to the mine and returning with a 7-ton load. To complete the comparison, it is said that the tractor covered the same 36-mile round trip in 10 hours, hauling 4 tons on the trip to the mine, and $8\frac{1}{2}$ tons on the return trip, at an estimated saving of over 48%.

The hauling has been done under the direct supervision of S. R. Montgomery, of the Knox Motors Associates. The loads varied considerably, but experience proved that an average of 10 tons per day could easily be made. The tractor hauled as much as $5\frac{1}{2}$ tons up, and 10 tons down, with the same apparent ease as when lighter loads were taken. The record of tonnage hauled shows an average of 369-ton miles over a period of six successive days, with a record for one day of 459-ton miles.

The 18-mile haul is over one of the worst roads in the state, including the famous Jigger hill and the equally well-known Rocky hill, both of which have pitches in excess of 20%, with ledges of rock crossing the road diagonally, to complicate the problem of traction. Part of the way there is no road, making it necessary to follow up Creek canyon. Three different creeks have to be forded 64 different times.

The tractor is steel shod throughout, and the semi-

ment of some 900 tons of the ore was made recently to New York. Shipments of 1500 tons a month are anticipated if vessels are available for the purpose, and a wharf at deep water has been built near the mine.



NEAR SUMMIT OF ROCKY HILL.

A History of the Homestake Mine, S. D.

By RICHARD BLACKSTONE *

The title, Homestake Mine, will be used to cover the present belt of consolidated properties, the Homestake, the Highland, the Golden Terra, the Deadwood, and the Father De Smet mines. These locations adjoin each other and extend northwesterly in the order named. The Homestake mine and the Highland mine were separately incorporated and organized, but operated by the same superintendent, the Golden Terra, Deadwood and Father De Smet each having its own superintendent and manager.

In the fall of 1875 gold was found in paying quan-

an arastra, which they ran the following winter, 1876-77, and took out \$5,000. The Manuel brothers and Hank Harney located the Golden Terra on Bobtail Feb., 1876, just north and over the hill, and in the spring, 1877, they sold the Golden Terra claim to John Bailey, of Denver, and the Durbin brothers, of Cheyenne, Wyo., for \$35,000. Then they bonded the Homestake to California parties for \$40,000 and the Old Abe to Woosten brothers for \$5,000. Mose Manuel in 1876 put up a 10-stamp mill and bought a half interest in Guinn's saw mill. He ran the ore through this



* HOMESTAKE PROPERTY TODAY, SHOWING AMICUS AND GOLDEN STAR MILLS, NEW B. & M. SHAFT AND ONE STACK OF NEW POWER PLANT.

ties on Deadwood creek. The discovery was made a little below the mouth of Blacktail gulch and claims were staked above and below discovery, extending from De Smet mine to Deadwood. In April, 1876, Mose Manuel, Fred Manuel, Hank Harney and Alex Eng found some rich quartz float on the ground later known as the Homestake. When the snow melted they located what they called the Homestake mine taking only 75 ft. on each side of the center of the crevice, this on the 9th day of April, 1876. They started to dig a discovery shaft on the side of the little draw and the first chunk of quartz that they uncovered weighed about 200 lbs. and was the richest in gold ever taken out. They ran a big open cut and saved the best quartz by itself. Afterwards they built

mill and also furnished ore to all the other mills in the neighborhood. The bond on the Homestake had expired and no sale. When Fred Manuel and Hank Harney came back from Chicago in the spring of 1877, Mose had so improved the property that they concluded it was worth much more money than the bond called for and that they would not sell for any such figures. George Hearst came up one day and wanted to get a bond on the Homestake and they agreed on a price of \$70,000 for 30 days. A few days later Capt. Urin came up and offered them \$45,000 for the Old Abe claim, which they accepted. Both bonds were completed and the money was turned over within the limits of the bonds. The Homestake claim was only 150 ft. wide, 75 ft. on each side of the crevice, and 1350 ft. long, containing 4 2-3 acres. The Golden Star claim containing about 9 acres was bought at the same

*Superintendent Homestake Mining Company; abstracted from Pahasapa Quarterly.

time. The south end of the Homestake was located at the north side of the Brick store and just south of the 80-stamp mill. These two claims constituted the whole property of the Homestake Mining Co. at the time it was incorporated.

The northerly 150 ft. of the Homestake and Golder Star claims were previously sold to C. H. Enos and others and constituted what was known as the segregated Homestake. This property was operated through



HOMESTAKE ELLISON HOIST.

a tunnel starting in the draw in the westerly line of the Golden Star claim and extending easterly into the ore under the heavy porphyry capping. The ore from this property was mined in large galleries in drifts generally without timbers and hauled by wagon to the Enos mill, which stood where the Homestake assay office now stands. This property was bought in by the Homestake Co. and closed out all adverse interests in the main ore body over on the Deadwood-Terra side. The Golden Terra extension and the Gopher locations were made between the Highland claim and the Golden Terra on the grounds that the Ophir location was illegal by reason of its discovery shaft being within the lines of the Golden Terra claim. This brought about a hard fought trial in the courts for the possession of this piece of the main ore ledge and it was awarded to the Golden Terra Extension and Gopher parties. These claims soon after the decision were bought by the Highland and Golden Terra companies and the line of division between these two properties was fixed and marked.

The Homestake Mining Co. was incorporated Nov. 5, 1877, with J. B. Haggin, Thomas Bell, William Willis, Lloyd Tevis and R. P. Lowns as directors. The principal owners were J. B. Haggin, George Hearst and Lloyd Tevis. An assessment was levied of \$200,000 to develop the property and build a mill. An 80-stamp mill was ordered from the Union Iron Works at San Francisco, Calif., to be shipped by Union Pacific railroad to Sidney, Neb., then in wagons to Lead. The tramway level at the top of the mill was extended up into the ore and open cut mining was started. The Star shaft was then sunk into the incline of the vein and in the ore from the ore shoot, which has ever since been known as the Incline ore. A vertical shaft was sunk 400 ft. north from the Star hoist to the

100-ft. level, which was only 75 ft. below the tramway. This shaft passed through the porphyry hanging-wall, struck into the ore at the 100-ft. level and a crosscut disclosed 240 ft. of ore to the slate foot wall.

Ore Bodies.

The great masses of ore extended above a plane through the tramway level and from 150 to 200 ft. above that plane up to the porphyry capping, all gold-bearing and with very little covering of debris or loose material, practically uncovered and ready for the quarry man. Gold ores to yield less than \$8 per ton by amalgamation on plates were not considered worth looking at by the California miners, and they came here with no advanced knowledge or experience and began to work along the same lines, digging out the high-grade ore and leaving ore carrying, say \$3 or \$4 per ton as not profitable.

Gravity Mining and Haulage.

The Homestake open-cut system was simple and gave millions of tons of good ore at a minimum cost of mining. The system of open-cut stoping underground was first inaugurated in the Deadwood Terra mine on ore shoots comparatively narrow, from 50 to 100 ft. wide. A foot-wall draft was run 25 to 50 ft. away from the ore and shoveling holes were cut into the ore piles at short intervals. Into these the ore was block holed to suitable size to be loaded into cars, being shoveled off of plates or boards. The foot-wall had considerable dip at this level and the ore came down the incline readily to the shovelers.

The hoisting is still done in the old-fashioned way by running the loaded ores (1 ton capacity) on the cages, hoisting to surface and then hand tramming to dump into crushers. Double-decked cages are used in



HOMESTAKE NO. 2 CYANIDE PLANT.

the B. & M., Ellison and Highland shafts, the B. & M. takes one car on each deck, the Ellison takes two cars on each deck, or four tons to one trip. Gates No. 6 gyratory crusher is the standard crusher and all rock crushing done is at the shaft where the ore is hoisted, dropping into the bins on the tramway, where the ore is drawn through gates into the tramway cars and hauled to the mill bins. When the original mills were built, Blake jaw crushers were put in on the

top floor of each mill and the run of the mine sizes of ore were dumped into these crushers. The wear and tear on the ore bins, cars and mill timbers was very great, and with the coming of the Gates gyratory they were all taken out and scrapped for their cast iron. The change of crushing from the mills to the shaft made it possible to excavate bins in solid rock with concrete and steel fronts and gates, greatly lessening the wear and upkeep cost.

Stamp Mills.

The Homestake 80-stamp mill and the Father De Smet 80-stamp mill were built by the Union Iron Works in the same year, 1878. The Homestake mill was arranged back to back, two rows of stamps, 40 on a side, with one line shaft in the center under the ore bins, belting both ways to cam shafts. The mortars were of the wide pattern with back coppers and chuck blocks in front, under the screens. Stamps weighing 800 lbs. and dropping 85 times per minute. The quantity crushed by this mill for the first year was about 5200 tons per month, or two tons per stamp per day, and was regarded as good work. The average gross yield of the ore to Jan. 1, 1879, was \$9.60 per ton. The amalgamation was upon a single copper plate 10 ft. long and under and overflow traps were used at the foot of each table, in which much of the amalgam escaping from the plates was settled and uncovered. Possibly one set of traps in the main tailing sluices constituted the whole of the gold-saving appliances. The ore was in the highest sense free milling. Ores milling \$8 to \$10 showed a loss of about \$2 per ton in

the tailings. On clean-up days, usually the first and fifteenth days of the month, the entire mill was hung up, the mortars were opened up, all of the dies were taken out and the battery sand taken out and panned or run through a rocker to recover what amalgam there was loose in the bottom of the mortar. Front



MOTOR AND 10 CARLOADS OF ORE IN HOMESTAKE.

and back coppers were cleaned and plates were scraped with chisels. Almost an entire day was devoted to the clean-up of an 80-stamp mill, while under the present-day practice there is no stopping of the mill, but only a small section is hung up daily for cleaning chucks and renewal of shoes and dies.

Concentration was not employed, as repeated assays of the sulphurets showed that their average value was but little above that of the ore from which they were derived. Later, when concentrating on blankets and carpets was undertaken, values up to \$15 and \$18 per ton were obtained, but was largely amalgam escaping from the mills and lodging in the fiber of the blankets. Hundreds of tons of these concentrates piled up below the Homestake mills, but were in reality of no value, as no method was known at that time by which the value could be recovered. These concentrates lay in a heap until the D. & D. smelter at Deadwood began pyritic smelting, when they were sold for their gold contents. When the smelter created a market for sulphides jigs were built and hundreds of tons were recovered and sent to the smelter. At this period the cyanide process was being exploited mostly in South Africa and experimental work being done to prove its adaptation as a commercial solvent of gold from its ores. Patented processes crowded the whole field of mining, and for several years it looked as if little progress could be made in the simplifications of cyanide solution methods.

Rapidly the application was worked out. Simpler and more effective methods of oxidization by means of compressed air were installed. Gravity sizing, through cones, made the passage of solutions through the sands constant and uniform, making the cyanide treatment to be as reliable and certain as any other portion of the metallurgy. The present monthly sum-



A TIMBER STOPE IN THE HOMESTAKE.

mary of metallurgy of Homestake is, operating 1020 stamps, crushing 131,497 tons, recovered by amalgamation \$410,501, or \$3.122 per ton; regrinding \$6110, recovering \$0.046 per ton; cyaniding slimes \$57,104, recovering \$0.434 per ton; cyaniding sands recovering \$88,943, or \$0.677 per ton. Total recovery \$562,658, \$4.279 per ton. Total loss \$31,249, or \$0.238 per ton. Approximate total ore value \$593,907, or \$4.517 per ton.

Statement of product and dividends paid by the companies now consolidated in Homestake Mining Co.:

	Product.	Dividends.
Homestake Mining Co., to May 31, 1900	\$ 31,204,685.28	\$ 8,668,750.00
Highland Mining Co., to May 31, 1900	13,359,398.95	3,834,717.69
Caledonia Gold Mining Co., to May 31, 1900	2,341,130.92	192,000.00
Deadwood-Terra Mg. Co., to May 31, 1900	9,001,002.61	1,350,000.00
Deadwood Mining Co., to May 31, 1900	834,192.28	275,000.00
Father de Smet Mining Co., to May 31, 1900	3,421,199.01	1,125,000.00
Gopher Mining Co., to May 31, 1900	71,140.41	.....
Clara Con. Min'g Co., to May 31, 1900	13,590.56	.....
Totals to June 1, 1900	\$ 59,246,340.02	\$15,445,467.69
	Product.	Dividends.
Homestake Mining Co.		
June 1, 1900, to June 1, 1901	\$ 3,639,232.03	\$ 1,260,000.00
June 1, 1901, to June 1, 1902	4,303,977.57	1,260,000.00
June 1, 1902, to June 1, 1903	4,526,942.04	819,000.00
June 1, 1903, to June 1, 1904	4,800,558.48	655,200.00
June 1, 1904, to June 1, 1905	5,221,089.30	819,000.00
June 1, 1905, to June 1, 1906	5,100,445.49	1,310,400.00
June 1, 1906, to June 1, 1907	4,541,096.07	1,201,200.00
June 1, 1907, to June 1, 1908	4,717,746.20	546,000.00
June 1, 1908, to June 1, 1909	5,725,046.67	1,365,000.00
June 1, 1909, to June 1, 1910	4,498,751.11	982,800.00
June 1, 1910, to June 1, 1911	5,251,453.75	1,310,400.00
June 1, 1911, to June 1, 1912	3,661,151.60	764,400.00
Total	\$115,233,830.33	\$27,738,867.69
	Product.	Dividends.
Homestake Mining Co.		
January 1, 1912, to December 31, 1912	\$ 6,600,953.12	\$ 1,310,400.00
January 1, 1913, to December 31, 1913	6,186,651.78	2,146,224.60
January 1, 1914, to December 31, 1914	6,160,160.59	2,210,208.00
Total	\$134,181,595.82	\$33,405,700.29

Metal Recovered from Scrap and Drosses.

The value of the copper, lead, zinc, tin, aluminum and antimony recovered in the United States from scrap skimmings and drosses in 1915 was \$114,304,930, against \$57,039,706 in 1914, a 100% increase. This large gain, says the U. S. Geological Survey, was caused by greater recoveries and much higher average values for all metals. A large demand for metal products, particularly for those to be exported, made 1915 the most prosperous year in the waste metal trade.

The imperative demand for zinc and copper by munition manufacturers and for foreign trade made spot metal very scarce. Secondary metals not desired for these purposes were generally available for domestic uses when virgin metal could not be purchased for prompt delivery. The incentive of high prices caused all metal wastes to be more carefully saved, segregated and refined.

The output of secondary copper, including that in brass and other alloys, was 196,000 tons in 1915, against 128,000 tons in 1914. The value of this copper and brass amounted to more than \$70,000,000.

The secondary lead recovered in 1915, including that in alloys, was nearly 79,000 tons, an increase of 28,000 tons, a quantity exceeded by the primary

output of only three states—Missouri, Idaho and Utah.

The amount of secondary zinc recovered in 1915 was 92,575 tons. At least 4000 tons of zinc chloride and 46,000 tons of lithopone were manufactured. The zinc used in these products is derived mainly from zinc drosses and skimmings.

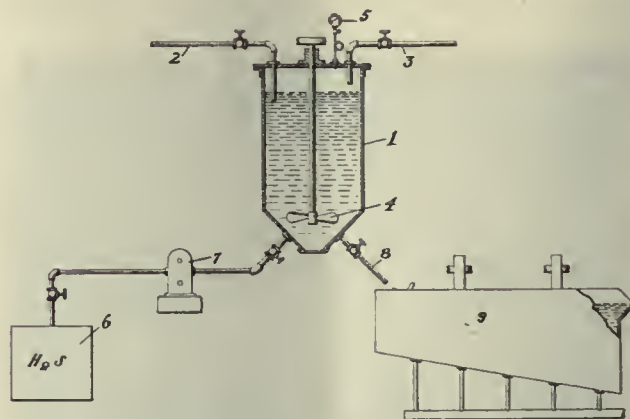
The output of secondary tin increased from 12,447 tons in 1914 to 13,650 tons in 1915, and was equal to 24% of the tin imported as metal or as oxide into the United States.

The average price of antimony was abnormally high and the secondary recoveries in 1915 amounted to 3102 tons, valued at \$1,811,568, an increase in quantity of 355 tons, and in value of about \$1,367,000.

Aluminum was both scarce and very high priced the latter part of 1915 and the secondary metal recovered, 8500 tons, was valued at \$5,802,000.

Flotation of Minerals.

A method for effecting the flotation and separation of oxidized ores from the gangue with which they are associated is embodied in the recently issued U. S. patent (No. 1,180,816) issued to Raymond F. Bacon of Pittsburgh. The oxidized ores are first converted, in a finely divided condition, into sulphides by the action of a soluble sulphide, such as hydrogen sulphide, and then the ore is subjected to any of the familiar



METHOD FOR FLOTATION OF MINERALS.

processes for effecting the separation of sulphides from gangue.

In the drawing 1 indicates the vessel in which the ore and water is received, and which may be provided with a rotary propeller or stirrer, 4. Suitable pipes, 2 and 3, are provided for the introduction of the ore and oil (where oil is used), and a pressure gage, 5, is provided for indicating the pressure within the vessel. Hydrogen sulphide is generated at 6 and forced into the vessel, 1, under a suitable pressure by means of the pump, 7. From the vessel, 1, the treated ore is discharged through the outlet pipe, 8, to the flotation tank or cell, 9, which may be of any suitable type.

Necessity for Water Power Development

By HENRY J. PIERCE.

Everyone agrees that the sole reason why our water powers are held back from development is because congress has failed to provide suitable legislation permitting their development.

It seems almost unbelievable that an enlightened government like ours should not only fail to encourage, but should blindly bar the way to, the development of a great natural resource so important to the interests of the country and so necessary to national safety. The fault is not with private enterprise. As has been shown, Americans have repeatedly tried, but in vain, to get the right from our government to establish hydro-electric plants upon navigable streams or within the government domain upon fair and equitable terms that would justify the risk and the large expenditure of time and money involved, while fully protecting the public interest.

They have been met by impracticable conditions which no prudent man could agree to. Prevented by the laws and policy of their own country from engaging in developing a great natural resource of incalculable value to any country possessing it, they found in other lands the welcome for their enterprise and capital denied to them at home. And so Canada and Norway are now enjoying the advantages of American energy, enterprise and capital in the successful establishment and operation of great manufacturing plants involving the expenditure of many millions of dollars and giving steady employment to thousands of men.

The production of hydro-electric energy is a hazardous business. Cost of installation is difficult to determine in advance, and often costs more than anticipated. Floods sometimes destroy dams and power houses, and yet men of business and of technical and scientific experience, who have made hydro-electric development their life work, as well as manufacturers of all of the great products for which the hydro-electric energy would be used, stand ready to undertake the development of our now wasting water powers and the other vast commercial features connected with it as soon as our present impossible federal laws are corrected to a fair business basis, under which practical men will give their time and capital will invest.

The internal development of a country must precede its external commerce. In every one of the 20 years ending with 1913 the foreign commerce of Germany has exceeded that of the United States, and the excess has been steadily growing greater. For the single year 1912 it was \$853,000,000, and for the whole 20 years it was \$7,700,000,000. There is nothing in that record for the United States to be proud of, even if the two countries stood somewhere near on equality. But we have an area 17 times as great; we have 30% more population; we have nearly three times the ac-

cumulated wealth, and our natural wealth and our natural resources are 20 times greater than those of Germany.

Then why not give those who would develop our wasting water powers the right to work, the right to build and expand and develop, the right to help create a greater and more powerful industrial nation? Why not give them a law to work under which shall encourage and not hamper their just activities?—a law which, while placing them under the constant supervision of the public authorities, and sufficiently safeguarding every public interest, yet shall be of such a fair and businesslike nature that under its operation men may hope for a generous return for their work and risk, and capital be assured of a safe investment.

Reasonable, sensible, practical regulation safeguarding the public interest no one objects to. The trouble is that the federal policy covering the use of water power is so narrow, so full of restrictions, so loaded down with conditions that no prudent man will venture to embark in the business.

There are some who would place a federal tax upon water power. Coal and oil used to produce power are not taxed, then why tax turning water into power? Why place burdensome legislative restrictions upon developments so necessary to the advancement of the nation?

The belief that any law that congress may enact will be eagerly accepted by would-be water power developers and the investors upon whom they are dependent for the means of developing is a delusion, and the sooner it is abandoned the better will be the opportunity for obtaining legislation based upon business principles and business experience. The investor must know in advance the conditions under which he is to conduct his business, and federal water power laws should specifically define the terms and conditions under which permits for use of government property necessary to the development of water powers shall be issued. This is just as necessary to the guidance of ever-changing heads of government bureaus in conducting the affairs of their departments as it is to those who would invest their money in the development of our water powers.

To be of effect, federal legislation governing water power development must be of a nature to protect the public interest, be fair and businesslike toward capital, and place not a featherweight more burden on the operation of water powers subject to the control of the federal government than is borne by competing hydro-electric developments not subject to federal control. There is no reason why these things should not be so co-ordinated upon a solid business basis as to protect every interest and bring results.

Thus it is apparent that there is vital and impera-

tively urgent necessity for the enactment of practical federal water power legislation of a character which will promote and encourage in every way the development and utilization of the enormous quantity of energy latent in our streams and now wasting to the sea; a necessity in no way local, but national. It is necessary for the development of our mineral industry; necessary for the manufacture of fertilizers; necessary for the electrification of railroads for the cheap carrying of freight, and to provide a means of rapid and comfortable transportation for the people; necessary to the irrigation of vast tracts of lands, meaning the building of thousands of homes on lands now silent; necessary to the establishment of great and entirely new industries in the United States, meaning the investment of hundreds of millions of dollars, the building of new cities and towns and the employment of thousands of men and women; necessary if we are to maintain our commercial standing among the manufacturing nations of the earth; necessary in order that coal and oil may be preserved for the use of future generations; and finally, of vital necessity toward promoting the safety, the comfort, the welfare and the prosperity of every citizen of the United States.

A New Hand-Operated Resuscitation Device.

A new hand-operated device for the resuscitation of victims of drowning, electric shock, mine accident, collapse and asphyxiation by poisonous gases is known as the Type "B" pulmotor. This machine is practically nothing more than a valve with indicators for measuring both inhalation and exhalation pressures. Interposed between a pump or oxygen cylinder and the patient's lungs, it measures, regulates and registers the exact pressures, both of inhalation and exhalation, exerted in the lungs. The operator does not attempt to regulate the volume of air exchanges or the rate of respiration; these are all controlled by the patient's lung capacity, just as in natural breathing. The operator simply moves the valve lever handle to right or left for inhalation or exhalation when the indicator gauges show him that the proper and natural lung pressure of either inhalation or exhalation has been reached.

When the lever handle is at the extreme right, air or oxygen from a pump or cylinder passes through the pulmotor valve in a controlled flow to the patient's lungs. As they fill to their normal expansion, their resistance is registered in the inhalation gauge. By watching this the operator can tell when to move the lever to the extreme left for exhalation.

This closes the direct passage to the lungs, and the air from the pump escapes through a by-pass in the pulmotor valve, drawing with it the air in the lungs, thus gently assisting them in their natural collapse. As they deflate, their action is accurately measured in the exhalation gauge. By watching for the indicator in the gauge to come to rest, the operator can know when to move the lever for the next

inhalation. These operations are continued until the patient is strong enough to breathe without assistance.

The smaller the patient's lung capacity the more quickly will his lungs fill, and the more quickly will the indicators reach their minimum point of travel. Hence the more rapidly must the lever be moved and respirations caused. This is entirely in accordance with nature, and is in itself a convincing demonstration of the naturalness of the respirations produced.

The pressure gauges perform another valuable function—that of signalling the operator when and how the patient wishes to resume breathing. If he should attempt to inhale, the indicator in the exhalation gauge will move to the right and center. If he should attempt to exhale, the indicator in the inhalation gauge will move to the right and away from the



HAND-OPERATED RESUSCITATOR.

center. By watching the indicators the operator can continue to assist the patient until he is well on the road to recovery. Yet even if the operator did not work the machine in harmony with the patient, the latter could resume breathing of his own accord while the mask is on, and independent of the operation of the machine. It is impossible to suffocate or gag the patient, or injure the lung tissues by failing to operate the machine properly.

In order to make the Type "B" pulmotor available for every conceivable use it is provided with two milled headed escape valves; one for inhalation, and one for exhalation. By adjusting these, the operator can obtain instantly and hold any combination of inhalation and exhalation pressures the case calls for regardless of the efforts of the man at the pump.

The machine which weighs only 12 lbs., with all accessories, and costs \$115, and is expected to find its greatest field as a supplement to the standard pulmotor. Its compactness and portability make it ideal for emergency work.

Reopening the San Juan, in Graham County, Arizona.

The San Juan, one of the old, historic mines of Arizona, located in the early eighties, has been taken over by a syndicate, headed by F. W. Estabrook, a director of the Miami Copper Co. The twelve claims, comprising the group were originally located by a woman, who had come out to Arizona from the east and prospected in the Lone Star Mining district. She was able to interest eastern capital and a company was formed, which resulted in a partial development of the claims, the deepest work being prosecuted to 335 ft. with a little over 1500 ft. of lateral work. Records show that this company shipped over \$385,000 worth of ore, but owing to the then slump in copper and disagreement between the stockholders and

mountains running northwest and southwest. The principal formation in the section being diorite, the strike is nearly east and west. The copper occurs principally in the monzonite and in the fractured and blended zones of the diorite and monzonite, the monzonite being of later origin. The surface and outcroppings show very much copper carbonate. Various old shallow workings show strong evidence of copper leaching. An examination of the logs of the drill holes bear strong evidence of copper leaching and precipitation of copper, light in iron. The mineralized area, other than the brecciated is cut and intersected with small veins and veinlets, some of which are rich in copper contents.

The new management, under the superintendency of E. Walker, immediate representative of the Estabrook Syndicate, will continue development by churn drilling, and will also continue the shipping of the



THE SAN JUAN COPPER PROPERTY IN GRAHAM COUNTY, ARIZONA.

the management of the mine, operations suspended and the property was worked only in a spasmodic manner, until 3 years ago, when extensive churn drilling was carried on. It is estimated that by this drilling over 1,000,000 tons of milling ore, averaging 3.67% copper has been developed. Last February the property was secured from the old company by T. J. Sparkes, R. W. Craig, Gus Hirschfield and J. C. Adams, all of Phoenix. Louis A. Dunham, who figured prominently in the sale of the Inspiration property, near Miami, and the Ray Con., at Ray, promoted the transaction between these owners and Estabrook Syndicate. During the short time the above mentioned owners had the property 19 cars of ore were shipped to the Calumet & Arizona smelter at Douglas.

The San Juan has the largest known deposit of copper ore in Graham county. It is located at 4100 ft. elevation and lies at the base of a high range of

carbonate ore. The possibilities of the mine are variously estimated at from \$10,000,000 to \$20,000,000. With the present tonnage and its possibilities there is every reason to believe that the San Juan will very shortly be added to the list of Arizona's best coppers.

The Federal Mining & Smelting Co., which recently acquired the North Star-Triumph mines, near Hailey, Idaho, has begun a 300-ton daily capacity concentrator, with flotation system and electric separator, for treatment of North Star-Triumph ores. The mill at the Federal Co.'s Morning mine at Mullan, Idaho, is being enlarged, and as soon as the additional equipment is ready for service the output will be increased.

The application of preservative compounds to wood by immersing it in them or by pouring or brushing them upon it is the basis of the wood-preserving industry as it is developed today.

What the Mining Companies are Doing

North Butte, Montana.

According to its report to the assessor of Silver Bow county, Montana, the North Butte Mining Co.'s net profits for the year ending June 1 were \$1,229,339, or \$2.86 per share on 430,000 shares.

From the company's quarterly reports it is safe to estimate the copper production for the 12 months to June 1 at not over 22,000,000 lbs. Costs as per the report to the assessor were \$3,873,912. This would indicate a cost of 18 cts. per pound, except that it is customary in Butte to credit gold and silver recoveries to the operating account. For the period under review precious metal yield was probably \$900,000. The net cost per pound of copper, after crediting gold and silver, therefore, was apparently 13½ cts.

For the year ended June 1, 1913, the company showed net profits of \$1,613,046, treating 451,297 tons of ore. The metal then averaged around 16 cts. For the year just ended it earned \$1,229,339 in the treatment of 495,275 tons of ore on a metal market which must have averaged at least 18 cts. A very much lower grade of ore explains some of this poor showing.

The following report was issued to the county assessor of Silver Bow county:

	1916.	1915.	1914.	1913.
Tons ore mined.....	495,275	262,615	463,437	451,297
Total yield	\$5,103,252	\$2,583,071	\$5,020,372	\$5,219,151
Mining cost	2,079,484	1,163,963	1,831,839	1,896,549
Transportation	61,154	31,548	46,494	53,741
Cost reduction	1,733,274	993,536	1,784,452	1,624,816
Total costs	3,873,912	2,249,331	3,726,365	3,606,105
Net profits	1,229,339	333,739	1,294,006	1,613,046

Trimountain Mining Co., Michigan.

The Trimountain Mining Co., incorporated under the laws of Michigan, has filed with the Massachusetts secretary of state a statement of its financial condition, dated March 31, 1916, which we compare as follows:

	1916.	1915.
Assets—		
Real estate	\$ 803,000	\$ 803,000
Stock of Michigan Smelting Co.....	110,000	110,000
Copper and supplies.....	438,138	492,909
Cash and debts receivable.....	785,015	84,850
Construction	1,859,332	1,859,332
Total	\$3,995,486	\$3,350,092
Liabilities—		
Capital stock	\$2,000,000	\$2,000,000
Accounts payable	73,813	33,571
Surplus	1,921,672	1,316,521
Total	\$3,995,486	\$3,350,092

Braden Copper Co.

In its application to list its stock on the New York Stock Exchange the Braden Copper Co. makes the following statement of its profit and loss account for the 15 months ended March 31, 1916:

46,822,116 lbs. copper sold at 19.356 cts.....	\$9,063,212
Operating cost	4,501,048
Net profit	\$4,562,164
Total net after miscellaneous income	\$4,618,626
Interest credits	609,777
Total	\$5,228,404
Interest debits	1,628,427
Balance	\$3,599,977
Less discount on bonds.....	1,350,000
Balance	\$2,249,977

The company has 2,800,000 shares assuming conversion of \$8,000,000 bonds.

Pope Yeatman, consulting engineer, on Jan. 1, 1915, estimated the mine contained 113,694,880 tons of ore, assay value 2.84% reduced to 2.5% with allowance for dilution in mining. He estimates value of copper contents on 14-ct. copper market and an 80% mill extraction, a 95% smelter extraction and a 6½-ct. cost of production, delivered to European markets (under normal conditions all the Braden production is sold

abroad) as \$324,030,408, and the life of the mine 32 years, with a plant capacity 10,000 tons of ore per day.

There were milled during the first quarter of 1916, 371,852 tons of 2.15% ore, and the production was 12,802,898 lbs. of copper at average cost of 9.67 cts. per pound. Net earnings were \$1,940,783.

Plant is being increased to 10,000 tons daily capacity. When in full operation it is estimated this plant will produce 136,800,000 lbs. of copper per annum, which would yield annual profits of \$10,260,000 on 14-ct. copper, \$12,996,000 on 16-ct. copper and \$18,468,000 on 20-ct. copper. At present rate of production net earnings exceed \$500,000 per month. Company employs at its properties in Chile 1500 to 1800 men.

Anaconda Co., Montana.

The report of the Anaconda Co. to the assessor of Silver Bow county, for purposes of taxation, for 12 months ended June 1, shows net earnings of \$14,363,881, against \$6,468,439 last year.

Report for the past 3 years follows:

	1916.	1915.	1914.
Ore mined, tons.....	4,946,061	3,311,488	4,714,653
Gross proceeds	\$59,334,085	\$29,608,184	\$39,464,004
Total mining cost.....	20,466,854	13,304,562	17,816,505
Cost of transportation....	1,234,773	690,553	1,405,558
Cost of reduction.....	10,092,566	6,352,895	8,057,896
Cost of marketing.....	4,460,581	2,791,743	3,570,478
Total costs	\$44,970,204	\$23,130,745	\$30,850,439
Net proceeds	14,363,881	6,468,439	8,613,564

*Includes \$8,715,428 spent for improvements.

Calumet & Hecla Properties.

The May outputs of the Calumet & Hecla and subsidiary mines compare as follows (in pounds of copper):

	May.	April.	March.	5 mos., 1916.
Ahmeek	2,070,551	2,158,451	2,175,930	9,180,272
Allouez	953,069	929,960	1,028,054	4,215,323
Calumet & Hecla.....	6,865,907	5,709,434	6,234,418	20,939,745
Centennial	231,879	257,790	252,428	1,052,778
Isle Royale	1,128,461	950,580	1,112,206	4,896,952
La Salle	123,592	95,863	108,221	563,228
Osceola	1,775,222	1,783,470	1,633,711	8,219,725
Superior	331,432	385,034	296,380	1,472,341
Tamarack	620,314	559,374	594,991	2,931,094
White Pine	446,607	404,587	345,641	1,888,024

Wilbert Mining Co., Utah.

The report of the Wilbert Mining Co. for the year ending May 1, 1916, shows cash on hand amounting to \$42,467.61 and total receipts of \$251,939. Disbursements totaled \$209,472. The report follows:

Receipts:	
Cash on hand May 15, 1915.....	\$ 3,342.06
Ore sales	223,382.27
Boarding house	24,368.51
Miscellaneous receipts	846.86
Total	\$251,939.20
Disbursements:	
General expense	\$ 2,097.20
Mill operating expense and supplies.....	33,267.29
Mine operating expense and supplies.....	69,338.58
Ore hauling	43,188.05
Boarding house expense and supplies.....	23,293.91
Office and management.....	4,342.00
Insurance	2,357.46
Assaying	520.50
Tallings test	120.00
Taxes	837.10
Mill watchman	110.00
Dividends	30,000.00
Total	\$209,472.09
Cash in banks.....	42,472.61
Total	\$251,939.70

Manager Knight says in part: "During this period we have milled 15,204 tons of ore assaying 25% lead and 3.86 ozs. silver. From this was produced, by sorting and concentration, 5787 tons of product assaying 52.06% lead and 8.02 ozs. silver. In metal contents this represents 6,025,600

lbs. of lead and 46,419 ozs. silver. Since our mill first went into operation in 1912 we have been impounding our tailings and have now accumulated some 30,000 tons. The cost of extraction has been \$54,579.07, or \$3.56 per ton. In the assets the mill is placed at \$65,000, mine plant at \$50,000 and boarding house at \$2500."

Trethewey Silver-Cobalt Mine, Ont.

The balance sheet of the company as of Dec. 31, 1915, shows as follows:

Assets—	
Mining property at cost.....	\$ 880,004.50
Buildings, plant and equipment, less depreciation....	121,246.50
Investments	15,321.32
Supplies on hand.....	8,766.70
Unexpired insurance	2,913.45
Accounts receivable	26.75
Cash on hand and in bank, less deductions.....	97,476.92
Total	\$1,125,755.64
Liabilities—	
Capital stock	\$1,000,000.00
Unclaimed wages and accounts payable.....	2,438.28
Unclaimed dividends	2,644.45
Balance at credit of revenue account.....	120,672.91
Total	\$1,125,755.64

The operating account shows as follows:

Receipts—	
Gross returns from ore sold, less charges.....	\$ 3,682.58
Gross value of silver unsold, less charges.....	38,476.34
Interest	1,711.57
Rentals from cottages.....	344.30
Total	\$44,214.79
Disbursements—	
Mining	\$13,314.27
Mill operation	7,229.62
Shipping and marketing charges.....	427.28
Insurance	2,576.27
Miscellaneous expense	120.00
Mine office expense.....	1,569.62
Camp maintenance	4,203.06
Superintendence and engineering.....	2,375.00
Taxes and licenses.....	127.77
Head office and administration.....	5,819.86
Carried to revenue account.....	6,452.04
Total	\$44,214.79

Miscellaneous Company Notes.

During May, 1916, the total production of the Goldfield Con. Mines Co. was 32,400 tons, from which resulted net realization of \$50,693; 2658 ft. of development work was performed, at a cost of \$5.59 per foot.

At the Greene-Canaan Copper organization meeting of directors J. W. Allen was elected secretary, to succeed F. R. Kennedy. Mr. Allen will continue as treasurer. E. J. Dudley was chosen assistant secretary at New York, and J. W. Neukom was made assistant secretary at Duluth. J. B. Cotton, general counsel.

The Nipissing Mines Co. made \$200,000 in May, a high record. It was during that month that the sensational advance occurred in silver prices, on the crest of which Nipissing made substantial sales at 77 cts. an ounce. When silver prices touched 66 cts. Nipissing sold 50,000 ozs. at that level without any difficulty.

At the Greene Con. Copper Co. annual meeting Dr. L. D. Ricketts was elected director to fill vacancy caused by the death of S. E. Searle. At subsequent meeting J. W. Allen resigned as director and Walter Douglas of Phelps, Dodge & Co. was chosen to succeed him. Mr. Allen will continue as secretary and treasurer. Retiring officers were re-elected.

The United Verde Extension Mining Co. has declared an initial quarterly dividend of 50 cts. a share, payable Aug. 1 to stock of record July 15. In a letter to stockholders, directors say in part: "We are now shipping to smelters in Arizona, at considerable distance from Jerome, over 70,000 tons ore per month, which has been averaging about 20% copper, resulting in net profits of about \$350,000 a month for several months past. These earnings are due in part to the prevailing high prices for copper. Cash on hand as of this date is \$793,882; there is due us from ore shipped approximately \$1,000,000, making a total of \$1,793,882. Although we have

this surplus available, it has been decided to accumulate larger surplus for purpose of developing the property and constructing necessary reduction works."

The Shannon Copper Co. earned approximately \$100,000 on its June operations when its usual 1,000,000 lbs. of copper was produced. The cost of producing per pound of copper was 16.6 cts. and the average selling price was 26.6 cts., leaving a profit of 10 cts. per pound. Production during the 6 months of 1916 totaled 4,404,000 lbs., from which net earnings of \$420,000 were realized. The company has now a net working capital of about \$1,000,000, which compares with \$555,000 on Dec. 31 last.

At the recent meeting of Kennecott directors a statement was submitted showing cash and copper on hand as of July 5, all of which copper has been sold, amounting to \$18,037,000. This is after disbursing approximately \$4,200,000 for dividend of \$1.50 per share, for quarter ending June 30, 1916. The above figure includes dividend of \$1,213,000 received from Utah Copper Co. June 30, but does not include Kennecott's interest in cash and copper on hand of Braden Copper Mines Co., or Utah Copper.

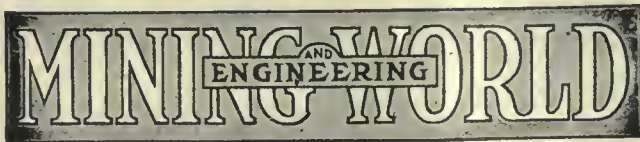
East Butte Copper Co.'s June production will amount to about 1,500,000 lbs., the same as in the 2 previous months. For the first half of 1916 the company's output will have totaled 6,661,000 lbs., or at the rate of 13,000,000 lbs. per annum, against an 18,000,000-lb. rate for the past 3 months. June earnings should be in the vicinity of \$200,000, although it is difficult to forecast with accuracy because East Butte settles for its copper on the basis of the average price the week it arrives in New York.

Dividends on the \$2,000,000 8% preferred stock of the Colorado Fuel & Iron Co., which has declared a 30% dividend on account of accumulated payments, were omitted from 1903 to 1911, inclusive. In 1912 $2\frac{1}{2}\%$ was paid, and in 1913 $4\frac{1}{2}\%$, while the first semi-annual dividend of 4% was paid in 1914. No dividends have been paid since until the present declaration. Total dividends due for the period from 1903 to July of this year were 108%, of which 78% will have been paid on Aug. 15 next, making the balance accumulated on the preferred stock 30%.

The balance sheet of the Consolidated Interstate-Callahan Mining Co. as of March 31, 1916, as filed with New York Stock Exchange, shows net current assets amounting to \$771,000. The company earned \$812,782 net for the quarter ended March 31, 1916; for the year ending same date net was \$3,309,321, or \$7 per share on the 464,990 shares outstanding, which have been listed on the New York Stock Exchange. The company's ore reserves amount to 350,000 tons, sufficient on basis of present operations to last for more than 3 years. Extraction during 1915 was 113,795 tons of ore, averaging 28.4% zinc.

The Quincy Mining Co., it is estimated, will earn \$1,540,000, or \$14 per share, in the half year ended June 30. In the same period the company will have paid two dividends totaling \$7 per share on its 110,000 shares. Production for 6 months to June 30 will approximate 11,000,000 lbs. turned out, at an average cost of 11 cts. a pound, and sold at an average price of 25 cts. This does not include delivery of copper sold at highest prices, as the metal sold several months ago at 29 cts. will be delivered during July. On June 30 Quincy paid a quarterly dividend of \$4, which was the 112th disbursement to stockholders since the company was formed in 1848.

The East Butte Copper Mining Co. in its annual statement filed with the tax authorities at Butte for the year ending June 1 shows gross value of 240,120 tons of ore mined, \$4,505,700; net profits, \$1,070,069; gross value per ton, \$18.76; cost per ton for mining, \$4.73; total cost of mining, \$1,136,057; reduction cost, \$1,011,497; deductions for smelter losses, \$845,708; freight, refining and selling charges, \$422,090; cost of improvements, \$14,278. The Pittsmtont mine yielded 16,124 tons of first-class ore, valued at \$2,141,880, and 126,127 tons second-class, worth \$1,643,568. The Dutton mine yielded 13,400 tons first-class ore, valued at \$364,722, and 26,269 tons second-class, valued at \$330,991.



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*Illustrated.

New Revenue Bill Would Place Heavy Toll on Copper Producers.

Copper producers will be called on to pay a heavy tax if the general revenue bill just introduced into Congress is enacted into a law. The section affecting producers of copper provides for a graduated tax on the gross receipts from the sale of refined copper or copper alloys as follows: In excess of \$25,000 and not exceeding \$1,000,000, 1%; exceeding \$1,000,000 and not exceeding \$10,000,000, 2%; exceeding \$10,000,000, 3%.

There is no denying that the present high price of copper is the result of the European war, but there is no expectation of a continuance of such prices for the metal. This is surely reflected in the low prices for standard copper mining stocks, which are earning large incomes. At the same time the expectation of a tax on smelter outputs means just so much decline in profits and is not a very good argument for any further increase in dividends.

By examining the following figures it can readily be seen that such companies as Anaconda, Calumet & Hecla, Inspiration, Kennecott, Nevada Con., Ray Con. and Utah Copper would never be called on to pay less than 3% of their gross receipts, notwithstanding a substantial decrease in present prices.

The figures as published show in what way the tax would fall upon various producers, with copper at 25 cts. and 15 cts. a pound, respectively:

	Copper at 25c.	Per share.	Copper at 15c.	Per share.
Ahmeek	\$ 125,000	\$.60	\$ 75,000	\$.37
Alhough	50,000	.50	30,000	.30
Anaconda	2,250,000	1.00	1,350,000	.60
Calumet & Arizona	600,000	1.00	360,000	.60
Calumet & Hecla	562,500	5.50	337,500	3.37
Copper Range	300,000	.75	120,000	.30
Inspiration	900,000	.80	540,000	.50
Kennecott	1,275,000	.40	765,000	.25
Miami	375,000	.50	150,000	.20
Mohawk	60,000	.60	36,000	.36
Nevada Con.	600,000	.30	360,000	.18
North Butte	125,000	.25	75,000	.18
Old Dominion	175,000	.60	100,500	.33
Osceola	100,000	1.00	60,000	.60
Quincy	100,000	1.00	60,000	.60
Ray Con.	515,000	.30	350,000	.20
Utah Copper	1,425,000	.90	855,000	.45

It will be noted that, with the exception of Calumet & Hecla, the tax with copper at 15 cts. per pound would make little impression on earnings per share, but with copper at 25 cts. several companies would have to pay the government close to \$1 per share earned, Calumet & Hecla topping the list with a tax which would be the equivalent of \$5.50 per share on its 100,000 shares outstanding.

From Butte comes word that all Montana is protesting against the tax on copper, and commercial bodies, banks and individuals are flooding Washington with telegraphic protests against the tax and the classification of the copper industry with the manufacture and sale of munitions. Vice-President Kelley of the Anaconda Co. declared proposed law was unquestionably a discrimination against the copper industry, would amount to \$3,000,000 on Anaconda Co. alone, and on normal copper market would amount to more

than 10% of total net income of company. He says company is ready to bear its just share of taxes or war revenue, but protests against being singled out and made to carry a load out of all proportion to other industries of like character.

Employers Exemplify True Patriotism.

The patriotism of employers of labor was never more clearly demonstrated than in the voluntary offer of continuing the wages of those of their employes who responded to their country's call in its time of need, and further announced that the position of these men would be held open to them on their return. It was certainly a commendable act and should be the means of bringing capital and labor into a closer union.

Among the foremost with announcements along these lines were those from companies allied with the mining industry, employing thousands of men. The United States Steel Corporation was among the first with the announcement that men in its employ who are already in the military service and to those who contemplated enlistment, so long as they remain in the military service of the country, will receive their present salary or wages until otherwise ordered. Independent steel companies took like action, among them being the Bethlehem Steel Co., the Carpenter Steel Co. and others. Other lines have been equally as prompt in making a similar announcement.

Among the hundreds of metal mining companies that have made provisions for their employes is the Homestake Mining Co. of Lead, S. D., which, in keeping with its established policy of guarding and providing for the welfare of its employes, both in connection with the discharge of their duties and in their social and domestic life, has announced a plan by which employes will receive pay while engaged in military service, incident to the hostilities with Mexico. This applies to all men who have been in the employ of the company for 3 months.

Alaska Society Condemns Actions of Delegate in Congress.

We are in receipt of a copy of a set of resolutions adopted at a recent meeting of the Alaska Mining and Engineering Society at Juneau, Alaska. After citing the efforts of various societies to secure a passage of a bill by Congress "to provide a commission to codify and suggest amendments to the general mining laws," the society proceeds to take the following rap at James Wickersham, delegate from Alaska:

Whereas, The Hon. James Wickersham, delegate from Alaska, who also appeared before the House Committee on Mines and Mining, chose to attack the personalities of these engineers, as well as their honesty and motives, and through his abuse and ribaldry brought the people of Alaska into ridicule and contempt, now, therefore, be it

Resolved, That the Alaska Mining and Engineering Society assembled at Juneau go on record as expressing its earnest disapproval of the tactics adopted by the Hon. James

Wickersham, and to express also a feeling of humiliation at being represented in Congress by one whose chief method of argument against the bill was personal abuse.

P. R. Bradley is president of the society, G. T. Jackson vice-president, R. J. Wulzen secretary-treasurer. The executive committee consists of P. R. Bradley, C. E. Davidson, G. T. Jackson, John Richards, B. L. Thane and R. G. Wayland.

Lake Mine Officials Predict Iron-Ore Shortage.

One of the possibilities in the very near future is a famine in Lake Superior ore. Despite the fact that a new record of 8,450,000 tons of ore moved in May, the weekly consumption of ore is in excess of the weekly rate of delivery from Lake iron regions.

According to advices from the Lake region, Lake carriers are now delivering ore at the rate of about 54,000,000 tons for the season, which closes Oct. 15, but they will have to do 10,000,000 tons better to carry the industry over the year if consumption holds at the present rate. This is the only difficulty for the mines can produce the ore when wanted.

The American blast furnace industry has been running for nearly 3 months at a rate of 40,000,000 tons of pig iron. It takes on an average 1.9 tons of ore to produce a ton of pig iron, which would mean an ore consumption in 12 months, allowing for no increased production of iron, of 72,000,000 tons. Ore men include some allowance for increase in depleted reserves and call it 75,000,000 tons. Of this 75,000,000 tons of Lake ores will represent probably 85%, or from 61,000,000 to 64,000,000 tons.

As a result of the enormous premiums it has received for its high-grade spelter, the New Jersey Zinc Co. has been able to distribute unusually large dividends to its fortunate shareholders. With the payment of the extra 10% dividend on July 10 and the regular quarterly dividend of 4% on August 10, the company will have distributed this year a total of \$52 a share, or a total of \$18,200,000 on its \$35,000,000 capital stock. During the first 6 months of 1915 dividend payments totaled 50% on its then capital stock of \$10,000,000. Directors a year ago declared a 250% stock dividend and the capital stock was increased to \$35,000,000. The company stands at the head of the concerns manufacturing oxide of zinc and this constitutes its principal product. The rise in zinc carried with it all by-products, and as a result the company has been reaping extraordinary profits. The company also puts on the market the highest grade of spelter—the Horsehead brand—which has sold as high as 40 cts. a pound, against a quotation of about 8 cts. a pound in normal times.

The labor problem in the carrying out of large mining operations frequently presents many serious aspects. The mere getting together of a certain number of men is of but small importance as compared to the question of efficiency.

PERSONAL.

A. F. Duggleby is superintendent of the Juragua Iron Co., Santiago, Cuba.

A. H. Gracey, operating gold properties near Nelson, B. C., has removed to Oatman, Ariz.

T. R. Van Campen, superintendent of the Beatson mine, Latouche, Alaska, has left for New York.

Lyon Smith has accepted a position as metallurgist with the Snyder Electric Furnace Co., Chicago.

M. B. R. Gordon is in charge of development work for the Boulder Mining Co., Rice Lake, Manitoba.

W. C. Browning, general manager of the Magma Copper Co., Superior, Ariz., is in Salt Lake City, Utah.

George Farish, mining engineer, New York, has returned from inspecting properties in Nevada county, California.

B. MacDonald, mining engineer, announces the removal of his offices from Los Angeles, Cal., to El Paso, Texas.

Charles W. Harkison has accepted the position of chief engineer for the Boise Rochester Mining Co., Atlanta, Ida.

E. M. Haug has become a member of the engineering staff of the Tonopah Extension Mining Co., Tonopah, Nev.

Walter A. Fitch, general manager of the Chief Con. Co., Eureka, Utah, has returned from a visit to Houghton, Mich.

L. O. Kellogg is on his way to Ecuador, where he will be superintendent for the South American Development Co.

T. A. Miller, mining engineer with the Cleveland Cliffs Co. at Ishpeming, Mich., has been visiting at Houghton, Mich.

T. P. O'Malley of Butte, Mont., will leave shortly for South America where he will have charge of a mining property.

J. G. Parmalee, Pullman, Wash., has accepted a position as underground surveyor for the Stewart Mining Co., Kellogg, Ida.

Andrew Engles, master mechanic of the Shattuck at Bisbee, Ariz., is at his old home, Lake Linden, Mich., on his vacation.

Nelson A. Reinert, representing the H. A. Riedel Investment Co., mining brokers, Denver, Colo., was a Chicago visitor this week.

Daniel Harrington, mining engineer with the U. S. Bureau of Mines, is in Butte, Mont., investigating health conditions of the district.

Harrison A. Dunn, Michigan College of Mines, who was reported to be in a prison at the Mexican capital, is at his home in Los Angeles.

T. C. Denis, provincial superintendent of mines, Montreal, Quebec, has been released from military service and is again active in his former position.

V. M. Archibald, chief engineer for the Canadian Con. Co. has returned to Trail, B. C., from a trip including the larger cities on the Pacific coast.

M. W. Lee, Duluth, Minn., president of the Marsh Mining Co., Wallace, Ida., is now in Spokane, Wash. He will visit California before returning.

J. E. Spurr, consulting engineer for the Tonopah Copper Co., Tonopah, Nev., is superintending the opening of company property near Schist lake, Manitoba.

James A. Lannon is now general superintendent of the Atlas Mining & Milling Co., Ouray, Colo., having been appointed to fill the vacancy caused by the resignation of W. P. Cary.

A. G. Maxwell, formerly with the Randfontein, is now consulting metallurgist for the General Mining & Finance Corporation, Johannesburg, South Africa.

Ernest Klepetko of the engineering staff at the Washoe smelter made a brief stop at Houghton, Mich., while returning with his bride from New York to Anaconda.

President R. M. Edwards of the Franklin, South Lake, North Lake, Indiana, and Algolah Company has returned North Lake, Indiana, and Algolah companies, has returned

J. N. McLeod, an engineer and assayer, formerly in business at Denver, Colo., is now with Smith, Emery & Co., San Francisco, in charge of their mining department.

N. C. Whitten, mill foreman formerly in charge of the flotation plant of the Anaconda Copper Co., Great Falls, Mont., is now with the Cerro de Pasco Copper Co., Peru.

Robert W. Thompson, formerly assistant secretary of the American Mining Congress, has been commissioned quartermaster of the First Illinois Field Artillery with the rank of captain. He served in the Philippine campaign as first lieutenant in the First United States Infantry.

Carl J. Trauerman, mining engineer, has resigned the position of mill superintendent for the August Mining Co., Landusky, Mont., and is inspecting the properties of the Beaver Creek Mines Co., of Zortman, Mont. After examining mines in the Kendall, Elliston and York district of Montana, he will return to his headquarters at Butte, Mont.

OBITUARY.

A. R. Kenner, mining engineer, Chicago, was drowned at Nevada City, Cal., on July 5, 1916.

SCHOOLS AND SOCIETIES.

Columbia School of Mines.—Prof. Raymond has been in the Michigan Copper Country with a class of students visiting the different points of interest.

Case Scientific School.—Professor Thos. Bains has been conducting a number of students through the mines, mills, and smelters in the Lake Superior Copper district.

Montana State School of Mines.—The Alumni Association recently held a meeting at Finlen hotel, Butte, Mont. This was one of the regular monthly gatherings and many interesting and instructive talks were given by members of the alumni. Prof. Art E. Adami, who accompanied this year's graduating class on a trip to Alaska, gave a very interesting lecture on the methods of mining and milling in the far north. He explained in detail the workings of the larger companies in that district. Emmet Cullity, who spent some time in Canada inspecting the newer mining districts, told of his experiences in that country. The meeting was in the nature of a smoker and in the future it is proposed to have papers pertaining to the mining and metallurgical industry read by various members of the alumni.

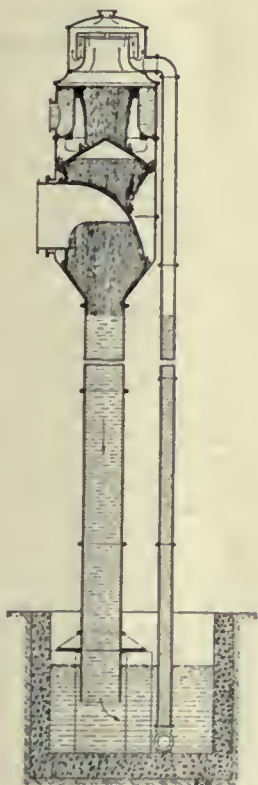
Massachusetts Institute of Technology.—The announcement is made of the establishment of a new school of chemical engineering, which is expected eventually to develop means of making this country independent of foreign nations in the production of chemical supplies. The school will include regular courses with a resident professor at five or six industrial plants, each equipped with a fireproof research laboratory. These stations are to be located in Somerville, Mass., Bangor, Me., Niagara Falls, N. Y., Allentown, Pa., and New York or Chicago. The course, which leads to a master's degree after five years of study, includes 3½ years at the institute, nine months at the several industrial plants and the last nine months in the institute laboratories. The school will be opened in time for registration in September.

Progress Made in the Manufacturing Industries

Beyer Barometric Condenser.

The Ingersoll-Rand Co. is now offering complete steam condensing plants for all service conditions. This equipment includes the Beyer barometric condenser, for which the company has secured the patent rights, Imperial duplex and Ingersoll-Rogler straight line, reciprocating, dry vacuum pumps and, where required, Cameron simplex and centrifugal pumps.

The Beyer barometric condenser is of the counter-current type, in which air and cooling water flow in opposite directions. The steam inlet is at the bottom of the condensing vessel, the water inlet above and the air removal opening at the top. The sheets of cooling water overflowing the pool at the inlet point meet the entering steam. The two are



SECTIONAL VIEW OF BEYER BAROMETRIC CONDENSER.

brought into intimate contact by conical baffle plates assisting the water to absorb to its full capacity the latent heat of the steam. The non-condensable air liberated in the condensing action rises through the falling water to the removal point at the top, being cooled to practically the temperature of the incoming water. Ample opportunity is given for the removal of the air content of the water before it mixes with the steam. This the manufacturer points out not only facilitates the mixing process but permits the removal of air and vapor at a comparatively low temperature.

The steam inlet is of large diameter to secure low velocity and is hooded in such a way as to discharge the steam into the center of the condensing vessel. The air removal opening is also of ample area and is protected by a self-draining baffle and trap. This, it is said, positively prevents water being carried over into the vacuum pump.

The hot waste water is discharged through the self-draining tail pipe. This pipe straddles the hot well and rigidly supports the condenser.

The Imperial and Ingersoll-Rogler vacuum pumps are high-speed reciprocating machines, wholly enclosed, and automatically lubricated.

When a water pump is required to elevate cooling water

to the condenser head Cameron pumps are provided. These may be either reciprocating or centrifugal as desired. Where the level of the cold well is of sufficient height above the hot well, the condenser will lift its own cooling water.

The manufacturer in presenting this equipment brings out the point that the vacuum and water pumps, being independently operated, can be regulated to suit varying water temperatures and conditions, and that this plant, in addition to its efficiency in general service, is admirably adapted for duty as a central condensing unit serving a number of prime movers.

TRADE PUBLICATIONS.

Boiler Scale and Accessories. William B. Pierce Co., Buffalo, N. Y. Booklet; pp. 20; illustrated.

This booklet is entitled "The Logic of the Dean," and is intended primarily for the management of the plant, although it contains information of unusual value to the chief engineer or his assistants. The booklet, besides describing and illustrating the operation of the Dean cleaner, discusses the scale problem in detail. Some of the subject headings are: The Formation of Scale Cannot Be Prevented; The Relation of Scale to Fuel Consumption; How Shall Scale Be Removed; Some Things That Compounds Will and Will Not Do.

Loaders for Motor Trucks and Cars. Lee Loader Co., Chicago. Catalog; pp. 18; illustrated.

Views in themselves are given as sufficient explanation of the method by which the loaders operate. Several loaders are used and these may be filled while the truck is on its trip. On arriving the contents of the loader is dumped directly into the truck in 30 seconds. In this way the time required to shovel the truck full is saved and may be used by the truck in making a trip instead of waiting. For the greater part the catalog is given over to discussing tabulated data on cases where the loader is and is not used, the efficiency in dollars and cents being eventually arrived at.

Magnetic Separation Magnets. A. H. Kidney, M. E., Orange, N. J. Circular; pp. 4; illustrated.

It is stated that the rapid, clean and automatic discharge of the magnet makes it possible to determine what percentage of an ore is made up of magnetic materials. The magnet is of the horseshoe type and each pole is constructed with angled stop-grooves. There is also a composite sheath with conducting and non-conducting sections; a flat-loop spring attached to the composite shield; two channel-guides, having insulated recesses, are connected with the loop spring; and a tension-disc and finger piece is attached to the inner top circle of the loop spring. All parts are adjustable, and the magnets are made $5\frac{1}{4}$ by $2\frac{1}{2}$ ins. and 8 by 4 ins. They are of use in the laboratory or field, and for cleaning shop sweepings or bench waste.

Soot Cleaners. Vulcan Soot Cleaner Co., Du Bois, Pa. Booklet; pp. 91; illustrated.

The greater portion of the booklet is given to a general treatise on the inefficiencies caused by soot accumulations. Tests with specific data and results obtained are given and accompanied with both sectional drawings and illustrations, and the question which is brought up at that point is thoroughly discussed. The booklet was published because of the rising importance of the soot question and no available text-book on the subject. The seven sections are as follows: What Soot Really Is; Why Clean Heating Surface Pays; How Soot Cleaning Can Be Accomplished; Design of the Vulcan Soot Cleaner; The Cleaner Applied to Different Types of Fire-Tube Boilers; Vulcan Cleaners Applied to Economizers; Details of Construction of the Vulcan Cleaner. The frontispiece is a four-color reproduction of specimens of soot from different boilers and with different fuels.

INDUSTRIAL AND TRADE NOTES.

The Hercules Powder Co. of Wilmington, Del., paid its regular dividend of 2% on June 24, together with an extra of 13%.

Owing to increased business, it has been decided to double the capacity of the plant of the Utah Ore Sampling Co. at Murray, Utah. The present capacity is 500 tons a day.

The United Copper Co., operating 6 miles from Chewelah, Wash., has just purchased a Jefferey four-wheel drive motor truck. It will be placed in commission at once.

On July 1 the Seattle office of the Lidgerwood Mfg. Co. was removed from its present location, 807-809 Western avenue, to its new quarters at 63-65 Columbia street.

Engineers of Western Precipitation Co., Los Angeles, are at Northport, Wash., designing precipitation installations for the smelting plant at that place, being the Cottrell electrical precipitation process.

Dredge No. 15, built by the Yuba Construction Co., San Francisco, for Yuba Con. Goldfields, at Hammonton, Cal., began operating July 5. This dredge has 100 17-cu. ft. buckets, will dig to a depth of 80 ft. below water level, and will handle 10,000 cu. yds. of material in 24 hours. Its design represents the latest ideas in dredge manufacture and utility.

The Joseph Dixon Crucible Co. advises that those employees who had joined the National Guard prior to its being called by the President and subsequently sworn into the federal service in June, 1916, will receive full pay while away doing military duty. These men will have their places kept open for them. This provision holds good until future developments make it necessary to change it or modify it.

The executive departments of the Western Electric Co. at New York have been moved from 463 West street to new offices in the Telephone & Telegraph building at 195 Broadway. The move was made necessary by steady growth of the company's distributing and engineering and patent departments, which will occupy the space that has been vacated. The change also brings the firm's executive departments in closer touch with the heart of New York's business district.

The United Verde Copper Co., Jerome, Ariz., has ordered equipment for sinking a three-compartment shaft from the 1,000 level. It is to consist of an Allis-Chalmers mechanical hoist, with Westinghouse electrical equipment. It is described as a geared double-drum hoist, driven by an electric motor set, adapted to receive alternating current, and to furnish direct current to the hoist motor and controlling apparatus. The hoist will have a speed of 1900 ft. per minute, and will be capable of operating to a depth of 3000 ft. It will carry seven-ton skip loads and will operate in balance.

Lane Mill & Machinery Co., Los Angeles, is having a good run of sales of the Lane slow-speed Chilian mills and other equipment, among which may be mentioned the following: To the Royal Exploration Co., Stemple, Mont., a complete 20-ton amalgamation plant; a 40-ton amalgamating plant to Alaska-Peerless Gold Mining Co., operating near Juneau; a 20-ton cyanide plant to Cavallero Hermanos, Arequipa, Peru; a 10-ft. Lane mill to a South African agency, for use in Rhodesia; a 40-ton amalgamating plant to H. H. Kelly, Quincy, Plumas county, Cal., and an order from Hallidie Machinery Co., Seattle, for an Idaho mine.

Pacific Tank & Pipe Co., San Francisco, is handling the largest volume of business in its history this year, its products being shipped all over this country and to South America, China, Japan and Honolulu. F. W. Schmitz, manager of this company, states that to meet increasing de-

mands, a new factory, for manufacturing tanks and pipe, is being built at Oakland. The new equipment will be housed in four buildings of mill construction, on pile foundations, each structure to be 125 by 225 ft. The site secured for this purpose embraces 30 acres. A force of 400 men will be employed at the new plant.

An automatic pulmotor for resuscitation has been put on the market by the Draeger Oxygen Apparatus Co., 422 First avenue, Pittsburgh, Pa. A feature of the apparatus, aside from its light weight, 12 lbs., is the use of valves with indicators to measure the inhalation and exhalation pressure exerted in the lungs. It is explained that the operator does not attempt to regulate the volume of air exchanges or the rate of respiration, these being controlled by the patient's lung capacity just as in natural breathing; instead he simply moves the valve lever handle either to the right or left for inhalation or exhalation when the gages show him that the proper and natural lung pressure for either case has been reached.

NEW PUBLICATIONS.

Further Experiments on the Volatilization of Platinum. By G. K. Burgess and R. G. Waltenberg. Washington, D. C., Bureau of Standards. Scientific Paper 280; pp. 9; illustrated. For sale by Mining World Co., 15c.

This investigation consists of a series of observations on change of weight of several platinum crucibles of various degrees of purity when subjected to heat at 700, 1000 and 1200 C. Determination of the loss in iron content from heating and of other materials soluble in hydrochloric acid were made, as well as some tests made with hydrofluoric acid to detect silica. The investigations are continuations of those already made by Burgess and Sale.

Strength and Other Properties of Concrete as Affected by Materials and Methods of Preparation. By R. J. Wig, G. M. Williams and E. R. Gates. Washington, D. C., Bureau of Standards. Technologic Paper 58; pp. 172; illustrated. For sale by Mining World Co., 45c.

This paper gives conclusions drawn from about 20,000 tests as to the effect on the properties of concrete and Portland cement mortars of varied conditions and constituents of fabrication. The value of knowing thoroughly the constituents is emphasized, and methods of proportioning and graduation are discussed. With the percentage of the cement to the total aggregate fixed the strength was found to vary as to the density of the mixture.

An Interlaboratory Photometric Comparison of Glass Screens and of Tungsten Lamps, Involving Color Differences. By G. W. Middlekauff and J. F. Skogland. Washington, D. C., Bureau of Standards. Scientific Paper 277; pp. 21. For sale by Mining World Co., 20c.

The national standard of light has been maintained by the Bureau of Standards since 1909 by means of four watts per candle carbon filament lamps. The paper transmitted herewith covers an investigation of the variations in results which might be expected in various laboratories. The agreement may be considered remarkable in view of the difficulties and the different characteristics of the observers and the wide difference in methods employed.

Valuable Minerals; How to Find and Know Them. By Arthur J. Burdick. Gateway Publishing Co., Beaumont, Cal. Book; pp. 44; illustrated. For sale by Mining World Co. 50 cts.

In a very elementary way it is pointed out what things the prospector should look for or others should look for in seeking minerals. These very elementary phenomena, indicative of minerals, are followed by descriptions of more specific tests which may be used to determine more exactly what the mineral is and of what value it may be. For the greater part the tests are based on the physical characters of the rock or mineral noticed and in some few cases blowpipe tests are given as well as mineral association.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Anchorage.

The Happy Valley Coal Co. has been incorporated and capitalized at \$50,000. The principal interests in the company are David Gross, R. M. Aistrop and J. R. Uhl, all of this city. The main office of the company is also in this city and they expect to take advantage of the leasing of coal lands recently passed on by the government.

The railroad from Matanuska Junction to Moose creek is about completed. Coal for the Commission is being mined at Moose creek and will soon be brought out over the new road.

Cordova.

McKinley Lake gold quartz property, owned by Charles Canavan, was bonded by George C. Hazlet for a sum said to be \$100,000. The property consists of 10 claims, 18 miles from here and 3 miles from the Copper River & Northwestern railroad. It has been held for years by local people.

Dawson.

Thomas Aitken has sold his Silver King group of gold properties to Manley, Ives, Price & McGinn, who will start immediate development on a large scale. The properties are located in the Mayo district in the upper Stewart river valley. Aitken, it is said, took out 1700 tons valued at about \$150 per ton, during the winter season. Manley says that they expect to build a road from the landing to the mine so that shipments can continue summer and winter. The plan is to put on heavy motor trucks or tractors, and draw the ore to the Stewart river at Mayo landing as fast as mined. He hopes to have 15 to 20 tons shipped daily this season if the road can be put in suitable condition, and to deepen the shaft and open other shafts. Water is to be pumped from the present shaft, and the depth extended. New stopes will be started and Mr. Ives will remain on the ground as active mine superintendent.

Fairbanks.

The Crow Creek Mining Co. has made a recent cleanup of \$5000 and sent the same to the Union Savings & Trust Co., Seattle.

Joe Henderson, Foss & Farvin, have been working the Homestake quartz mine at the head of Fairbanks creek. They have made a recent cleanup, the result of the milling of 20 tons of ore from the rich but narrow ledge of the mine. Henderson reports that the ore averaged \$100. Foss & Farvin have been working the mine for several years and with Henderson will continue work, hoping that the ledge will widen.

Nome.

The American Dredge Building & Construction Co. has received good returns from its holdings in this district. It now has two dredges working on the Anacovich river, 150 miles north of here. The tin dredge installed by the company in the York tin district in the Arctic country has achieved success during the past season, recovering 60 tons of tin in a 30 days' run.

Seward.

B. Bernard, general manager of the American Dredge Building & Construction Co., Seattle, has a large drilling crew operating on Lewis river, where the strike was made last year. His company controls 5 miles of the stream. In addition to placing the dredges on Lewis river Bernard will remove the Herron dredge from Sunrise to the Nacochna river for the Nacochna Dredging Co. A new hull has been built for the dredge in Seattle and will be shipped immediately after investigating the transportation facilities up Susitna

river by which route water transportation to the property is possible.

George Eberhardt, who has been operating in the Falls creek district since 1905, has returned from Seattle to resume operations on his placer ground on Cache creek. He has a hydraulic plant and will employ about 12 men during the season, work having recently been started.

Susitna.

The Willow Creek district has been producing since 1908. In 1915 three quartz mines operated and produced \$315,000 in values, with an average of 200 men employed at the Mabel Mining & Milling Co. William Bartholf is general manager. A contract was let last fall to Charles Bartholf and Ira Isaacs for 100 ft. of tunnel. They ran 82 ft. without finding any good indications and were compelled to stop on account of lack of mining timber. Late this spring Bartholf and Irwin resumed work and at about 100 ft. in and at a depth of 40 ft. they struck pay. This pay, which is 2 ft. wide, has caused considerable excitement, being of high grade. Their new 20-ton Denver high speed mill is being installed and active work has commenced. The ore carries considerable free gold.

J. R. Austin will spend his second season in the district this year. He is developing a quartz vein on Reed creek. Properties surrounding his have been proven and he therefore expects good results. His property is within 1500 ft. of the McCoy-Martin group and in the immediate neighborhood of the Mabel and the Billy Martin mines. Austin has 12 claims, and has stripped the ledge for 1500 ft. He will drive a tunnel this summer, tapping the ledge at the 800 level. Assays sent out last fall show values from 40 cts. to \$400.

ARIZONA.

Prescott.

The work of installing electric power, wires and appliances at the mine and mill of the Big Pine Mining Co. is practically completed. A large working force is engaged on the property and a considerable tonnage of gold-silver ore is being mined. It is the purpose of the management to reduce all ores in the company's mill. The contract with the electrical company calls for 150 hp. daily. Duluth, Minnesota, capital is back of the enterprise.

Jerome.

Having selected a site for a main working shaft and the development of its property, the Green Monster Mining Co. will this month begin mining operations on its holdings in the lower Verde contact in accord with the recommendations of A. P. Thompson, who recently completed an examination of the property. He recommends the development of the Green Monster vein, including the adjacent deposit on the Cliff claim; development of the outcrop of quartz and hematite at the southern end of the Revenue claim; development of the iron-stained quartz blowout on the Protector claim, and, through the medium of crosscuts and drifts, the development at depth of the veins apexing on the Lone Pine claim to the south. He likewise suggests an investigation of the possible downward extension of the copper-stained diorite on the Amazon claim. The company is capitalized for 1,500,000 shares of a par value of 50 cts. each. Five hundred thousand shares were issued to the Green Monster Syndicate in consideration of \$33,000 in cash, title to 31 claims and the taking over of an option to purchase 32 additional. The directorate then sold 700,000 treasury shares at 75 cts., which netted the company \$525,000. This sum, plus the \$33,000

paid in by the syndicate, gives the company a treasury fund of \$558,000. The treasury fund is intact, save for the amount drawn bi-monthly to pay mining expenses, and is drawing interest at the rate of \$1600 per month. In addition, the company has in treasury 300,000 shares. No effort will be made to sell this stock until such time as the property has been developed to a stage where it is necessary to erect a reduction plant.

Vidal.

On the California side of the Colorado river the section around Vidal is the scene of constantly growing activity. The Bendigo Mines Co. of Los Angeles, which has shipped 450 tons of gold-copper-silver ore netting \$45 per ton during the last few months, is preparing another shipment, and several individual operators operating properties nearby are also preparing shipments of ore which as a rule go to the Hayden smelter. One notable find of silver-lead ore of high grade has been made in the district during the week, while on another property an 8-ft. vein of copper-silver-gold ore has been opened which yielded shipping ore at surface in several places.

On the Parker side of the Colorado river mining activity is constantly increasing, and such a large aggregate tonnage of ore is being shipped that several interests are figuring on building a custom smelter on the Colorado river, near Parker, where it may be reached by mine operators on both sides of the river. Mining men who have studied this district state that the formation and mineralization is similar to that of the Copper Queen, Old Dominion and Arizona Copper mines. The ore is found in fissure veins of great lateral extent, the veins capped by an iron gossan, followed by the leached zone containing copper carbonates and oxides and some sulphides, and all containing gold and silver. The gangue matter is principally quartz, but much calcite and baryte is found with lenses of manganese and iron oxides.

Mayer.

Operations have been resumed at the Holmes mine in Black canon. The property was recently taken over by Willard Bonderant and associates of Los Angeles, who purpose to develop it at depth. The history of the Holmes mine dates back to the early sixties, and its record as a producer of high-grade, gold-bearing ore runs concurrently therewith. Early development was prosecuted by means of a tunnel and disclosed free milling ore. The general average grade of the ore at that time mined is said to have been \$60. It was reduced in a small mill erected on the property at a fair profit. A wagon road has been built connecting the property with the camp of Mayer, and the old workings are now being rehabilitated as a preliminary to extensive mining research.

Walker.

An oil-flotation plant of 100 tons capacity is to be built at the property of the Major Mining Co., near Walker. The decision to erect this plant is the outcome of the returns received on 5 carloads of concentrates shipped to the Humboldt smelter.

CALIFORNIA.

Mokelumne Hill.

The Sullivan and Paul Con. gravel mines have been taken under bond by J. J. Foltz and operations will begin within 40 days. Both mines formerly produced heavily but have been idle several years. It is planned to work the holdings from a central level. Considerable rich gravel is stated to be still in sight in the old workings.

The McKnight Mining Co. has installed a 20-stamp mill and complete mine plant at the Hamby mine. The hoist is operated by steam, generated with fuel oil, but will be later driven by motors. A large tonnage of good-grade quartz has been blocked out. Luther Everitt is superintendent.

The Mokelumne Mines Co. has arranged to sink a 3-compartment shaft at the Easy Bird property and intends to soon install a 75-ton reduction plant, including amalgamating, concentrating and classifying equipment. A cyanide unit may be added later. A 650-cu. ft. Sullivan compressor has been

placed in position, and much new work is advancing from the main tunnel. Above this level a large tonnage of ore averaging around \$8.50 has been developed. An electric hoist is contemplated. H. J. Wendler is manager and A. M. Howat superintendent.

Jamestown.

Bonanza ore has been encountered below the 800 level of the Jumper mine in the Stephen Rowe lease. The rich shoot is believed to be the extension of the ledge which yielded much specimen ore above the 700. Three sets of lessees are working the property with good results.

Sutter Creek.

Unwatering of the Old Eureka mine has progressed to a depth of 170 ft. and three shifts have been put at work in the shaft. Timbers are found in excellent state of preservation, although under water 30 years. At present rate of progress the management expects to be in a position to start important developments before the summer ends.

At the Central Eureka 20 of the 40 stamps are dropping on quartz from the 2800, 3000, and 3100 levels. Preliminary work has started on a winze from the 3200 level, and drifting from the 700 is planned in expectation of intersecting a new ledge. Seventy men are employed.

Jackson.

Preparations are being completed for the sinking of the Kennedy shaft to a depth of 3900 ft. The ore opened on the deeper levels is the best in the mine, with the big vein showing excellent strength. The 100-stamp mill is turning out approximately \$90,000 in gold per month.

Lewiston.

The Trinity Star Dredging Co. is building a dredge on the Paulsen ranch, costing approximately \$300,000. It will be equipped with buckets of 5-cu. ft. capacity and will go into commission early in 1917. The property embraces 700 acres of proven placer ground. Fred Paulsen is manager.

Pine Grove.

The Pitts quartz mine has been taken under bond by M. Robinson, who has purchased the old Climax 10-stamp mill and is moving it to the Pitts. A fair tonnage of excellent mill ore has been opened, some of the quartz containing specimen values.

Washington.

The Columbia Con. Mines Co. has acquired 160 acres of patented ground at Ormonde, above Washington, and is preparing to work the area. The Columbia mine is yielding ore of profitable grade and the mill is running steadily. The company also holds bonds and options on the German and Ocean Star mines, both of which are showing well. E. C. Klinker is manager.

Keeler.

A new lead-zinc ore body has been encountered in the Buena Vista tunnel of the Cerro Gordo, at an approximate depth of 115 ft. It is 30 ft. wide, of good grade throughout, with streaks of high-grade showing. The management is contemplating the building of a reduction plant to cost about \$250,000. It is designed to separate the zinc and lead ores before shipments to smelters. L. D. Gordon is general manager.

Forest.

Under the management of W. F. Copeland three shifts are driving a short tunnel to intersect the old Bald Mountain adit back of the caved section. The new tunnel will be 300 ft. long and as soon as completed will be used to prospect a promising quartz vein in the Bald Mountain mine. It is likely attention may be devoted to the gravel channel later.

The North Fork Mining Co. has purchased from the Wisconsin Co. a piece of disputed ground for \$5200, and will proceed to extensively prospect its quartz deposits through a new incline. The Wisconsin Co. is driving a new tunnel to open its gravel channel to best advantage. G. F. Stone is superintendent of the North Fork, and D. E. Hayden of the Wisconsin.

Clipper Mills.

Prospecting of manganese deposits is active at this point. A. A. Davis and T. F. Hornung are sinking on a promising ledge and running crosscuts. Indications are favorable for development of a large body of commercial ore. Binet

brothers of Oroville are working claims adjoining the Woolley group, the vein apparently being an extension of the high-grade ore body exposed in the Woolley holdings. Operations at the latter have been temporarily suspended as a result of friction between the owner, G. Woolley, and the Noble Electric Steel Co., which has been working the property under bond. The ore is high grade and is desired for the electric smelter at Heroult.

New Idria.

The New Idria Co. has installed a 250-ton concentrating plant at its mines and is also operating the old 300-ton furnaces. Most of the ore is being drawn from the San Carlos mine, where the deposits are broader than in the Idria, and an 8000-ft. aerial tramway is being built from the property to the new plant.

Grass Valley.

After an idleness of 2 years the Sultana mine is again being worked. Fifteen men were put at work last week, and prospecting of the lower workings is going on. The Sultana adjoins the Empire group and formerly produced much profitable quartz, but the principal vein was lost in the deep levels. It is thought extensions of the Empire ledge traverse the mine. A. W. Crase is superintendent.

Hawkins Bar.

The placer mine of the Corona Mining Co. is producing gold and platinum and sufficient water is available for another month of activity. Three bars worth \$1000 each have been shipped since the season commenced, and the final cleanup will take place in July. About 1 oz. of platinum is recovered for each 50 ozs. gold.

Downieville.

Representing Arizona capitalists, Thomas Wilson has taken a bond on the Shady Flat gravel mine, owned by John Mason. The property lies between Downieville and Sierra City and produced well in pioneer days. Orders have been placed for a pumping and hoisting plant and exploration of the old channel will be pushed.

Bishop.

Lessees are opening rich ore on the Santa Rosa mine, controlled by the West End Co., of Tonopah, Nev. The vein averages 4 ft. wide and was encountered at a depth of a few feet. Assays range from \$35 to \$70 in gold per ton. The owning interests are arranging for work on company account.

Sonora.

Rich ore has been opened in the deep levels of the Dutch mine, operated by the Dutch-Swenney Co., controlled by New York people. Splendid ore is also showing in the App workings with a tonnage of large proportions exposed. The mill is treating 250 to 260 tons per day and making a high recovery. Much new machinery has been installed in the past few weeks and since Nov. 1, 1915, upward of 3000 ft. of development work has been accomplished. It is probable the purchase of the group will be consummated in August, as the operators are reported well satisfied with conditions.

COLORADO.

Boulder.

The Tungsten Metals Corporation has completed its mine boarding and hunk house, offices, compressor house, machine shop and store house in Boulder canyon. Its Red Sign mill, being built by the Colorado Iron Co., will be completed by Aug. 1. The capacity of the mill will be 25 tons. The building is placed on a concrete foundation a foot thick, all the footings are of concrete and the timbers used are of large size. Some of the timbers are 12 by 12 and 20 ft. long. The elevator pit, which is now complete, is concrete. All flooring on the ground floor is to be cement. The roof and sides are covered with lightning-proof Galvanite roofing, which is a heavy, gummy paper covered with flake mica.

East of Nederland the McKenzie mill, formerly treating gold ore, has been reopened as a tungsten concentrating plant. New machinery has been installed, consisting of a table and 5 new stamps. These with other machinery in the mill gives it a capacity of 10 tons. Besides custom ores the

mill will be supplied with ore from the McKenzie mines, and a considerable amount of material from old stopes will be run.

The Primos Mining Co. announces that leases upon its tungsten property were renewed at expiration, July 1, upon the same terms as in the past at the schedule of from \$12 to \$20 now in force. This is indicative of the confidence of the company that the lowest prices have been reached and a steady market is in view. There are 500 men employed in Primos ground by lease operators aside from the force on company account in the Conger and other mines. During the past 2 months Primos lessees have sold their ore without delay at contract rates.

Cripple Creek.

The shaft at the C. O. D. mine is being sunk further, work having commenced on July 5. While this work is in progress lease operations, excepting by such lessees as are mining and shipping ore, will be temporarily suspended as the hoist will be running to capacity hoisting such ore and the waste from the shaft. Supt. Williams will give personal supervision to the work of sinking and will maintain his office at the mine.

A vein has been opened on Newton hill by the Cripple Creek General Mining & Exploration Co. It is 4 ft. wide and averaging \$4 for its full width. The vein is cut at a depth of 300 ft. by the New York tunnel penetrating Newton hill from its west slope. It is proposed to survey the course of the new vein and crosscut for it from the tunnel level. The tunnel has caved badly in places through disuse, and it will be necessary to retimber the caved ground. A basalt vein carrying low values is exposed in the New York tunnel and will be explored later. The basalt dike lies on the Katie Hollis. Frank Vetter is in charge, with power to issue prospecting permits with lease option, on advantageous terms. Maps of the property may be seen and examined on request.

One car of mixed ore, a cleanup of the bins and mine, preparatory to hoisting ore from the more recent discovery, brought settlement at the rate of \$19 a ton for lessees on the Shoo Fly. The second car, containing coarse ore from the new strike, was settled for at a rate of 2.70 ozs. gold. They have been breaking ore at the junction of two distinct veins—a vein having come in from the southeast—6½ ft. wide. The shoot under development lies at a point 40 ft. north of the shaft, and as the incline drift is carried northwards, the values are improving and the present prospects for one of the richest ore shoots opened in the western section of the district are considered excellent. Ore is being hoisted after every round of shots and lessees will ship again in a few days.

During June there were 76 cars, about 2000 tons, shipped from the El Paso Con. Co.'s property. Returns have not all been received, but an estimate of better than 1 oz. of gold per ton is given. The company mined 19 cars, 500 tons, from No. 1 shaft, on the south end of the property, and 10 cars, about 265 tons, from the No. 2 shaft, on the north end of the property. The company ore, it is estimated, will average \$15 to \$20. The lessees working under a graded scale of royalties or under the split-check system, were accredited with 47 cars, about 1245 tons. The lessees' ore at the 1st level, south of the No. 1 shaft, was of a higher average value than the company ore and is estimated at \$30. There are at this time 17 sets active. Twelve sets of lessees are working under the graded royalty, and five on the split-check.

GEORGIA.

Dahlonega.

The Etowah Milling & Power Co. has been formed and begun preliminary work on the Etowah river, about 5 miles from here. Associated in the company are: D. S. Walraven, C. H. Butts, W. L. Tumlin, T. H. McGahee, J. T. Ritigan, H. E. Cabiness, H. H. Turner, S. A. Osborn, J. H. Simms and Dr. Hulancy. The method to be used is suction dredge on a large scale. It is well known that there are deposits of gold in the Etowah bed. Work of installation has begun

and mining work will start as soon as equipment can be completed.

G. W. Tonson, operating the Standard mine and Toledo mill, is continuing development. At the mill work as yet is of an experimental nature. There are three shafts, none of which have reached any considerable depth. All show large veins of gold-bearing quartz rich in sulphides. The amalgamating plates save only \$4 to \$7 of an assay value of \$25 to \$40 per ton, but the concentrates are being saved for either cyanide or flotation treatment. The black sands, rich in magnetic iron, show an assay value of \$40 to \$50 per ton. Additional stamps will be installed in the Toledo mill, and the Mary Henry mill will be started in the near future. All the mines are being worked for hard ore and compressed air is being used for drilling and hoists.

IDAHO.

Burke.

Development of the Got-Em-Now vein of the Marsh Mining Co., soon to be reorganized as the Consolidated Marsh Mines, is to begin from the long lower tunnel of the Gertie mine, adjoining, according to M. W. Lee of Duluth, Minn., recently elected president of the Marsh Co. "The principal purpose of my visit at this time was to dissolve the attachment on the Marsh property, and this has been accomplished," said Lee. "All interest in the Marsh heretofore held by C. L. Cowell and his Montana associates has been acquired by persons associated with the present management, and we shall now proceed with the execution of our plans to restore the property to its place among the producers of the Coeur d'Alenes."

Wallace.

F. C. Bailey of Spokane, who recently organized a syndicate to take over control of the Vienna-International Mining Co., states that a crew of men already has been put to work repairing the old workings preparatory to beginning active development. Arrangements are now being made for a hoist and compressor. A boiler has been secured and the compressor will soon be on the ground. The company owns a good water right which it expects to utilize later for power purposes. Bailey stated that he expected to buy a hoist from the Hypotheek Co., but this was not certain. He expects to have all machinery in operation by the middle of July. The development of this property will be watched with unusual interest, as it is in a new section so far as mineral production is concerned. The showing of lead ore on the property is one of exceptional merit, and all indications point to the development of a body shipping ore.

The Chicago-Boston Mining Co. is preparing to construct a mill of from 200 to 250 tons daily capacity, and work probably will begin in the next few weeks. The company now has the Western Union Mining Co.'s mill under lease, and for several weeks has been making tests with a view to determining a treatment system for the proposed new plant. These experiments lead to the belief that a straight flotation system, with modern crushing machinery, will do the work successfully, and plans along this line now are being formulated. The company now is employing 12 men in development. The property is equipped with a compressor, electric lighting system, power for actuating the machinery being provided by a Pelton wheel. There is an adequate supply of water for power, and several capable engineers who have examined the holdings recently assert that with suitable treatment facilities the mine soon will be on a producing basis.

Definite plans have been made for the 100-ton mill for the Constitution mine, in the Pine creek district, and it is expected that it will be completed and operating in the next 90 days, according to Judge George Turner, president of the Constitution Mining Co., who says: "Much of the machinery already has been ordered, and a 100-hp. motor to drive the equipment already has been bought. We also have purchased a saw mill and a 30-hp. motor, to be delivered immediately at Pine Creek station, and as soon as these are installed we will begin getting out the timbers for the buildings. The mill will be of similar type to that of the

Ray-Jefferson Co., the flow sheet being nearly identical. Development of the mine is progressing satisfactorily. The main tunnel is in 875 ft. and has shown a continuous ore body containing three shoots or lenses of good average width. These shoots were, respectively, 75, 125 and 350 ft. long, the last ore body still showing strongly in the face. On the 200 level of the shaft, sunk a little to the north of the portal of the main tunnel, the drift to the south under the tunnel is now 200 ft. long. It started in the new ore shoot developed by the shaft, which rakes to the south, and is now nearing the first ore shoot developed by the tunnel, which it will open at an added depth of 200 ft."

Porthill.

Shipments will be resumed from the Idaho-Continental Co.'s mine, 26 miles from here, soon, and it is anticipated that by Aug. 1 a car of concentrates will be forwarded daily to the smelter, according to A. Klockmann, president and general manager. The company's mill and compressor plant were totally destroyed by fire about a year ago, just after they had begun to operate, and this has seriously interfered with production. "About 50 men are employed getting the wagon road from Porthill to the mine in shape for traffic, and taking in the machinery that has been at the railway since last fall," said Klockmann. "There are between 30 and 40 tons of this equipment, but we soon will have it delivered and installed. We have been doing but little development in the mine, centering our efforts chiefly in getting the concentrator ready for service, but we have several months' ore ready that will reduce about four into one, producing a concentrate that will average 60% lead and 30 ozs. silver."

Wardner.

The Independent property, taken over this week by Pat Gearon and associates for \$300,000, will be developed as fast as machinery can do the work, according to reports from Kellogg.

Machinery sufficient to handle 600 ft. of shaft has been ordered and will be installed at once. Electric power will be carried to the property by the Washington Water Power Co. as soon as the line can be surveyed and the poles installed. Men are now at work preparing to erect buildings on the ground and put up shaft house and compressor foundations.

"Sufficient capital is in the bank to operate a large crew continuously," stated George McKinnis, who closed the deal. "We expect to rush the work and open the property as fast as miners and machinery can do it. Engineers, who have examined the property for us, report the showing to be one of the best in the district for the development of a big mine, the ledge on the surface showing over 20 ft. in width. We have been working on the deal for 4 months and now have everything lined up for immediate operations."

Kellogg.

Plans for operations being perfected by the lessees of the upper workings of the Big Creek Mining Co. indicate that the ore showings must be of unusual merit, although no definite reports on the physical condition of the property are obtainable. Rumors are circulating that some rich ore has been encountered, together with extensive deposits of a similar grade to that shipped in the last year, which yielded from 70 to 110 ozs. silver. The leasing company now is installing an electrically-driven compressor plant, and soon will begin construction of an aerial tram from the mine to the railway shipping bins.

Net returns of \$3001 from the 36-ton carload of ore recently shipped by the Big Creek Leasing Co. have been received by Dan Price, president of the company. This car sampled 285 ozs. silver and 9% lead, and was marketed when silver was worth 67 cts. The shipment was entirely of crude ore. Another car has been loaded and will be shipped soon.

LAKE SUPERIOR.

COPPER.

Houghton.

Worden-Allen Steel Co. has begun the construction of the new steel shaft-rockhouse at No. 2, Ahmeek. The foun-

dations were laid last year ready for the steel. The seventh stamp went into commission the 10th. The mine will soon be crowding this stamp, as it has the others, and the daily tonnage will then reach 4900.

Mohawk, Wolverine and the Quincy have granted the bonus of 25 cts. a day to all employes for the last half of the year, as had been announced by the Calumet & Hecla. Copper Range has given out a wage scale of \$3.50 for miners on company account and \$3 for trammers and other underground labor.

Ontonagon county is more and more becoming a center of interest to the mining men through the success of the White Pine, White Pine Extension, and the explorations at Carp Lake, the finding of good cores at the Tremont-Devon, the diamond drill explorations recently begun at the old Norwich, and the equipping of the Victoria with a new hoist and the providing of a new-skip-way, so that its output can be made profitable even at low prices of the metal, and the disclosure of rich rock in the reopening at the Michigan. Consequently the possibilities of land that has been held for years are being looked into.

Isle Royale's development work for the past month is over 1600 ft. This is rather remarkable as the tonnage is over 2900 daily. The ground is so "bunchy" that much more ground has to be opened in order to maintain the reserves to the proper amount than at most of the mines of the Copper Country. Of the daily shipments 2200 tons go to its own mill, where the efficiency has been greatly raised through the addition of new machinery. No. 7 shaft is down about 300 ft., and it has been raised 140 ft. from the 5th level, which is about as high a raise as can be profitably carried, leaving only about 150 ft. to be cut through.

South Lake is still forwarding about the same amount of rock to the Franklin mill—100 tons—and each lode is furnishing about the same quantity. They are all maintaining about the same average of rock they had when first opened by the crosscuts. A little development work is being done on the 5th level.

Mohawk is carrying on a large amount of new work and has been sinking at four of its shafts. No. 6 is down to the 15th level; No. 5 to the 18th; No. 4 to the 23d; and No. 1 to the 23d. Sinking is just being resumed at No. 1. At No. 6 the work is almost wholly exploratory.

Houghton is still getting a fair grade at the northern drift at the bottom, the 12th level, and is in 160 ft. from the shaft at the 4th level, having passed through the lode 50 ft. west of the shaft. The crosscut that is seeking the West vein of the Superior mine is in 140 ft. from the Superior lode. This work will be carried to a distance of over 200 ft. if necessary.

Champion at the high grade stretch south of its No. 4 shaft where the first levels were being extended to its limit of 3500 ft. is now running drifts on levels below these and finding the same good grades. It is also extending new levels under those already opened in territory north of No. 1 shaft, which was for a long time left untouched after about 200 ft. had been opened with poor results, and which when reopened about a year ago and ever since, has been giving high values. The whole extent of the lower levels of all four shafts is averaging high at the present time.

Calumet & Hecla is holding its daily tonnage up to 10,500. The leaching plant will be started this week and will probably have to pass through the usual period of adjustment before it can be put into regular operation.

Algonac, as the four sections between the Nonesuch and the White Pine Extension are termed, has about completed its diamond drill explorations. It has proved up $1\frac{1}{2}$ miles of rich ground—enough for a good sized mine. The eastern end towards the Nonesuch has not so far shown good values and will not be explored further at present.

Cass, which is the Norwich or Copper Crown property, is putting a second drill to work. The first has reached a depth of about 400 ft. The work is being done on virgin ground, which is believed by our geologists to be quite promising.

Keweenaw should be ready for the mill test about the middle of August; it has been delayed greatly by the non-

arrival of all the timber for the trestle. Sinking has been discontinued for a while. A rich quantity of mass copper has been recently come upon.

Franklin has been having its smelting done at the Quincy until June 1, but the quantity was becoming so large that it could no longer be handled and the Michigan smelter, which has a very large capacity, is now taking care of it.

Carp Lake, it is reported by Supt. Rourke, in the examination that is being made along the outcrop, is finding the same values as in the shaft that was recently unwatered. Another shaft, No. 9, according to an old map, is now almost wholly unwatered, and there also are being encountered the same high grades. At this point, which is half a mile from the first mentioned shaft, it is the intention to crosscut the vein about 200 ft. from the surface. It is quite noteworthy that in every case where copper has been discovered, silver has also been met with.

Victoria will not have its shaftway and new hoist ready for operation until about Aug. 1. By the last of next week the installation of the machinery will be begun and will probably take about 2 months. The new skipway will be in in another week down to the 25th level, one level from the bottom, and the tracks are laid to the 16th level. The tonnage of good rock was lessened last month by the necessity of getting out as much as possible of the waste rock that was coming from the raises on a number of levels, and there was produced at the mill only 83 tons of mineral, which will average over 12 lbs.; but this month the waste rock has been less and the mineral will run up to 100 tons. When these two improvements are made this mine for the first time in its history will have an opportunity of taking out an amount of rock that will pay even with low prices. It has a large amount of reserves on hand now and consequently it will not have to push its development to its utmost, although as much will be done as is consistent with getting out a good tonnage, as it is believed that its ground, as in the past, will improve with depth, and sinking will be resumed as early as possible.

Adventure has received its timber, which came from the Pacific coast, and has begun on repairing the lining of the collar of the shaft and will begin to unwater at once. A sufficient number of men have been taken on and the work of exploring the Knowlton and Butler lodes will be begun immediately after the uppermost levels have been drained of their water. It is thought by our mining men that with the prevailing price of the metal the mine will begin to pay as soon as enough ground can be opened to afford the proper tonnage.

Lake will probably, after the expected visit of President W. A. Paine, open up the old shaft on the Knowlton lode, which has a depth of 900 ft. and explore that lode and the other adjacent lodes, including the Butler.

Mass is holding to about the same figures for its daily tonnage, a little over 1200, and to about the same yield, almost 16 lbs. For a remote and rather out-of-the-way mine the management has been very successful in getting men, and it would appear that there is not so much difficulty generally here in getting them as for the past 6 months.

IRON.

Ironwood.

A new shaft has been commenced at the Aurora, which under the present conditions will be completed by January, 1917. The Pabst shaft, which it was intended to start in June, has been delayed by lack of equipment, which was not delivered. It will, however, be started during the latter part of July. These two new shafts will supplant the three shafts formerly found necessary.

possible with steam shovels is attained, the usual course of employing the milling system to about 400 ft. depth and then an actual underground system, is the company's intention.

The labor trouble here is being carried on in a more quiet way at present and it is said an end to the trouble is near. Some of the men are returning to work and good productions are being made from stock piles and open pits whose operations are not affected by the trouble. Not being successful in

the superlative degree with arousing the miners to stop work on, the iron ranges an unsuccessful attempt was made to call a strike of the dockmen at Duluth.

Duluth.

The strike apparently has had little to do with production, for during June the Lake Superior district shipped 9,507,578 gross tons, which in the face of unsettled conditions was the banner month in the history of the district as an iron ore producer. This figure was 58.32% higher than June, 1915, and exceeded the shipments for May, 1916, by 1,057,996 gross tons.

Virginia, Minn.

The first ore from the Mahnomen mine was shipped to Duluth 2 weeks ago and July 8 the second steam shovel was started in the large open pit. Manganiferous and plain ores are produced and it is rumored that 1917 will see the property a shipper of 1,000,000 tons annually. After the greatest depth

MISSOURI-KANSAS.

Joplin, Mo.

The lowering prices of ore has had the effect of casting considerable depression over some portions of the mining district, especially in those camps where the percentage of recovery is 2½% and less. Mines having this percentage are facing difficult conditions of the high prices of supplies which are being maintained and raised from week to week, while for 2 months, now the prices for ore have been steadily going down. The only places the operators have been able to recoup themselves has been in the lowering of the wage schedule, and this has met opposition from the miners, but even with the wage scale reduced, the margin of profit on this class of mining is small (\$60) at the present time, and already a number of producers have been forced to close down. That others will follow is a foregone conclusion. These mines that close down operate automatically in reducing the production and will help materially in preventing the further increase in the stocks of ore that have been accumulating in the last 2 months, and which is the largest local factor which helps to hold down the ore market. However, many of these producers will be replaced by newly developed properties in the Miami (Oklahoma) field, where the cost of production will not be as high as in the low-grade deposits of some of the central camps. They will be able to operate profitably at even a lower price level than is now prevailing. The Miami field has just been reaching the point in its development period when a very large new production will begin to be added.

Prospecting at the old Thoms Station camp by Bilger & Co. on the Mexico & Joplin land tract has opened up a deposit of ore which warrants the building of a 150-ton concentrating plant. Contract for the plant has been let, and the material is now on the ground and is ready for construction. On the adjoining lease at a depth of 103 ft. a very rich run of lead has been struck by the Sweetheart Mining Co. Along with the lead is now appearing some zinc blende and the operators expect to have a good production of both from now on.

Following the resignation of J. L. Burch from the state mine inspectorship of Joplin, Joseph Myers was appointed by Gov. L. W. Majors to fill the unexpired term. Burch has been employed by the Lincoln Mining & Smelting Co. as field manager, and will look after the prospecting and development of its recently acquired leases in the Webb City district.

T. B. Baker and W. R. Baker have started operating a new concentrating plant under the name of the National Mining Co. on a lease of the Empire Zinc Co.'s land southwest of Joplin. The company has developed an 18-acre lease and is turning out a good production of both lead and zinc. The dirt now being mined is running 5 to 8% and the concentrates are high grade.

At the Airedale mill west of Joplin, the Kenefick Zinc Corporation is making a number of improvements in its plant. The sludge department is being increased by the addition of tables. A larger crushing department is being added,

an increased power plant and increased facilities for handling tailings.

On the Dixon land north of Joplin, the Babcock Mining Co. has opened a very rich deposit of lead at 182 ft. The ore occurs in soft ground, and at one point a solid chunk of galena ore weighing 8000 lbs. rolled out of the face and demolished a set of timbers. This company is sinking two of its shafts deeper in an effort to open up what has been found to be an extension of the ore deposit in a lower level. The company is handling its ore over a 150-ton mill. J. K. Davidson is superintendent with offices in Joplin.

The Napoleon mine on the Perry land at Thoms Station has just been drained after being under water nearly a year and a half. The production has been resumed and its usual output of 1 to 2 cars a week may be expected. It was due to cave-ins of the ground to the surface directly in the path of a water course that the mine was drowned out, and not until the surface water course was changed were the operators able to re-open the mine. Edward Cunningham of Joplin is the manager.

A new prospect known as the Mary Jones mines has just been developed on the Phillips land at Thoms Station. The operators claim the mine is turning out ore that will mill 30% zinc. Another new shaft is being put down and the ore is being cleaned on hand jigs until a concentrating plant can be erected. The mine is near the Bonnie Bell property, which has been one of the best producers developed in that field.

Miami, Okla.

In the Miami field the building of the new railroad connections between Miami, Commerce, Cardin, Picher, Baxter and Century is rapidly being completed. The line has already been completed as far as Picher and service is being maintained. A belt line is being built from Picher back to Century and Commerce, while the line is being extended directly to Baxter Springs, where the line will join the M. O. & G. railroad for connection with Joplin. This will give the camps in the new mining field both passenger and freight service. It will no longer be necessary to haul heavy machinery from Miami or from Baxter Springs into the new camps over bad roads, as the cars can be placed directly on switches at any of the new mines in the field. Had this been possible last winter the camp would have had 15 new mills in operation by the first of April, instead of being held up till the first of August.

The Commerce Mining & Royalty Co. will build a new concentrating plant on a 160-acre lease of the Goodwin and Cooper land just north of Picher where the state line joins Kansas. Drilling has developed a very rich deposit of ore, and the company plans an early production from the lease.

C. H. Strecker and associates are developing a sublease of the Picher land a mile north of Cardin. Drilling shows the existence of two runs of ore, the first at 115 ft. showing an 18-ft. face, and another at 200 ft. showing a 16-ft. face. The drilling will be continued until the lease is thoroughly developed.

The Eagle-Picher Lead Co. is putting down two new shafts on the James Goodwin and the Roy Harvey lands just north of the Picher camp. The company plans to erect a new concentrating plant at this point as soon as the shafts reach the 240 level. This makes 19 shafts the company has in operation, or are putting down in that field.

The Commerce Mining & Royalty Co. has just completed the installation of Dorr thickeners and Deister tables and enlarged settling tanks for the handling of the sand and slimes made at its two mills on the Blue Goose and Beaver mines near Cardin. These two properties are known as the richest properties in the Oklahoma camp; the amount of slimes made at the two mines is very large, and while it already had 10 tables at each mill, the equipment was inadequate for handling the ore.

L. P. Buchanan and J. W. Hoffman of Kansas City have completed the drilling of 18 drill holes on the George Toskoff land southwest of Baxter. In 10 of these holes on one 40 acres there has been reported some very good strikes. The ore was discovered at a depth of from 252 to 277 ft. Two shafts will be sunk immediately and preparations made for the erection of a concentrating plant.

MONTANA.

Butte.

Regular shipments of ore from the Nettie, which was recently unwatered by the Anaconda Co., are being made. It is estimated that there has been blocked out probably 40,000 tons of silver-zinc ore. The Nettie was a big mine in early days as a producer of silver, being one of the chief contributors to the old Colorado smelter, long since dismantled. The ores became base as the water came in and the mine finally was shut down. Now metallurgical conditions have changed and in addition to the materially lower smelting charges, the presence of zinc, especially if the content be heavy, carry a value, especially for the Anaconda, which has under construction a 2000-ton zinc flotation concentrator at the Washoe works in Anaconda and an electrolytic zinc reduction plant at Great Falls. Both these plants it is expected to have under way in the early fall. Preparatory to increasing its shipments from the Nettie, the Anaconda has two ore bins under construction at the mine and numerous other plans have been formulated looking to a greater production.

Butte & Superior produced 15,200,000 lbs. of zinc concentrates in June, as compared with the production for the previous period, which was 16,000,000 lbs. The Black Rock mill produced 14,400 tons of concentrates from the treatment of 52,600 tons of ore. The mill recovery for June averaged approximately 94%, as compared with 93 for May. Fifty-four thousand tons of ore were milled in May, with a concentrate recovery of 15,200 tons. Silver in concentrates for the past month approximated 310,000 ozs. The lead production for June reached 540 tons. Butte & Superior concentrates carry approximately 80 cts. gold. The new shaft of the company has reached a depth of 1400 ft.

The Davis-Daly Co. soon will begin the pouring of concrete for the foundation for its new Norberg hoisting plant. Anchor bolts are en route from the plant at Milwaukee, and upon their arrival the foundation will be rushed to completion. The excavating and the placing of the foundation timbers and works have been finished. It is planned to have the plant in commission by Sept. 1. This, it is believed, will enable the company to increase its output of ore. Timbers now are being framed for the housing of the engine.

Anaconda's June production of 28,100,000 lbs. of copper compares with 30,000,000 in May and 33,300,000 in April and 22,100,000 in June, 1915.

A judgment for \$177,704.40, in favor of the Clark-Montana Realty Co. against the Butte & Superior Co., was rendered last week by Federal Judge George M. Bourquin in a final decree handed down in the Elm Orlu case. In addition to the judgment, interest at the rate of 8% per annum was allowed beginning June 1, 1916. The decree allows the amount named for ore taken by the Butte & Superior from the Elm Orlu lode prior to the time of starting the suit. At the same time the prayer of the defendant for damages for ore alleged to have been taken from its property was denied. The decree of the court holds that the Elm Orlu claim is the property of the Clark-Montana Realty Co. and its co-plaintiff and tenant, the Elm Orlu Mining Co. It holds that the Butte & Superior is the owner of the Black Rock, Jersey Blue, Admiral Dewey and Silver Lode claims. Each party is to pay its own costs.

In a few days the sinking of the shaft of the Emma mine by the Anaconda will be commenced. The Emma is down 800 ft. and it is intended to carry the shaft down an additional 800 ft. before any mining is done. The engine installed is working smoothly and all the new buildings about the property are completed.

Troy.

Improvements at the Banner & Bangle mine, recently acquired by the Snowstorm Mines Co., will be completed by September, unless prevailing high waters in the region interfere with construction, according to Leo Greenough, president and general manager of the corporation. "We are employing 275 men at present, and by July 15 probably will have 400 on the payroll," said Greenough. "Work on all

three constructions, the railroad, concentrator and hydro-electric power station, is going forward rapidly and they probably all will be completed about the same time. The betterments will cost not less than \$500,000, but when we are ready to operate we will have things in such shape that we can keep the property producing at the limit for years. The railway is under construction from one end to the other from the mine to Troy. All the rock work for the power plant is covered. The mill is well under way and the construction of ore bins will be begun in a day or two. We have 25 cars of lumber ready to ship to the work whenever the Great Northern is ready to move it."

NEVADA.

Goldfield.

The Goldfield Con. Co. has completed installation of its 1000-ton flotation plant and has the first unit of 500 tons in commission. Within a few days the plant will be working at capacity. An extraction of 92 to 93% of the gold and 99% of copper values is made. Production from the deep levels has been resumed for the first time in 2 years, and bulk of ore milled will hereafter be drawn from below the 600 levels of the various properties composing the group.

Operation of the flotation unit of the Florence Co. has been delayed by the non-arrival of the ball mill, but the management expects to start the machinery within a few days. Late work on the 650 level has opened a good vein of milling ore, with portions assaying \$40.

The north crosscut from the 770 level of the Velvet shaft of the Jumbo Extension has penetrated a wide vein assaying \$11 to \$14. This occurs in virgin territory 250 ft. from the shaft. In the southeast section of the Velvet claim shipping ore has been opened in the contact zone at a depth of 900 ft.

A new vein has been indicated in the Silver Pick at a point 450 ft. west of the main shaft by the Calyx drill, operating from the 500 level. Parts of the core assays high in gold. Sinking of the main shaft to reach the shale-latte contact is progressing rapidly and within 30 days the management expects to start important lateral work.

Searchlight.

The Quartette gold mine has been sold to the Dupont Copper Co. of New York for \$120,000. The mine was one of the premier gold yielders of Nevada from 1900 to 1907 and has since yielded rich ore at various periods. Late work in the lower levels uncovered ore of good grade and it is said the new owners will erect a mill to replace the plant burned 7 years ago.

Tuscarora.

The syndicate of eastern capitalists recently acquiring the Tuscarora group of silver-gold mines is sampling the old dumps with a view to their treatment. A large quantity of ore is available, sampling around \$5 in gold and silver, chiefly silver. Sampling equipment has been installed and several miners are engaged.

Kennedy.

The new mill at the Kennedy mine has been placed in commission on ore of good grade. Work was resumed in the mine several weeks ago and a good tonnage is available for extraction. L. St. D. Roylance is manager, and S. L. Berry superintendent.

Gweenah.

The Lemaire mine at this place, owned by Henry Lemaire of Battle Mountain, is yielding high-grade silver ore from the 100-level workings. The shoot has been opened for over 100 ft. and several small shipments have been made. The richer ore carries much native silver, mixed with hornsilver. The discovery has revived interest in this camp, situated 7 miles west of Austin, and prospectors are again showing much activity.

Pioche.

Shipments are going out at the rate of 86 tons per week from Pioche mines, with the Prince Con. contributing 75 tons. The new mill of the Con. Nevada-Utah is running steadily and producing an excellent grade of concen-

trates. A southwest crosscut is being driven from the 1400 level of the No. 1 shaft to prospect promising ground south of the main dike.

Austin.

The Nevada Equity Co. is developing its holdings in this district with a view to opening the rich ore bodies exposed by the Cummings interests. The tunnel will be driven to a point about 1400 ft. from its portal and will prospect a broad area of virgin territory.

Ludwig.

Another shoot of rich ore has been struck in the Ludwig mine of the Nevada-Douglas Co., the discovery being made in the limestone footwall. Developments have kept the reserve well ahead of production. The plant is being gradually placed in shape for capacity operations. The company shipped 18 cars of ore in May, for which it received net returns of \$2320 per car, after paying freight and smelter charges. During June it shipped 22 cars, which, at the same price per car as May, would yield the company \$51,040. The above does not include returns from ore treated in the leaching plant, on which the company has not yet issued any definite data.

Rochester.

The north end of the Rochester Mines workings is offering interesting developments that indicate the approach to the high-grade ore shoot which apexes in Block 4 of the Crown Point No. 1, the most northerly point yet reached. Both the East and West veins in Block 3 are showing some of the best ore ever mined in Rochester hill. The East vein on the 250 point below the apex now shows 2 ft. of ore that returns \$154.70 in silver and \$5.20 in gold. The West vein in practically the same longitudinal portion of the mine is showing 6 ft. running 22 ozs. in silver and \$5.50 in gold. The veins are very close together in this territory and it is an open question which is the one mined at the apex under the regime of the old Hunter lease from which very rich ore was shipped. Preparations are going forward rapidly for the new mill equipment which will bring the treatment rate up to 150 and 200 per day. The work requires the installation of an additional tube mill, a classifier, an agitator and two settling tanks. This innovation can be affected at little expense, but will add greatly to the bullion production the current year.

Seven Troughs.

The recent strike reported on the 1660 in the Seven Troughs Coalition is developing into a good ore body. In the north drift they are now cutting 1 ft. of \$600 ore. Since first encountered in the main winze which penetrated the vein at the 1660 point, the shoot has measured from 1 to 1½ ft., the first values being in the neighborhood of \$300. At this writing the assays have doubled across 12 ins. with every indication that it is the big ore body exposed on the north 1600 and continuing on past the present deepest working. Development is being urged along the 1660 level occasioning a slowing up in the north winze from the 1600, which is down about 50 ft., all in ore ranging from 1½ to 3 ft. and running from \$200 to \$300.

NEW MEXICO.

Mogollon.

The Oaks Co. is shipping ore to custom mill from development work on both the Eberle and Clifton mines. No stopping is being done on either property.

At the Mogollon Mines Co. operations for last half of June resulted in 14 bars of gold and silver bullion, making a total of 28 bars for the month. During the week 875 tons of ore were milled, producing several tons of high-grade concentrates. Good progress is being made in sinking new shaft.

Socorro Mining & Milling Co., in conjunction with local property owners, is cribbing and filling road in cañon through Mogollon to facilitate heavy hauling during rainy season, now at hand. The new tailings elevator system is expected to be in commission at an early date.

Pacific mine, through unavoidable causes, has been delayed in delivery of lumber for ore bins at terminal of aerial

tramway, but hauling is now going on and the work will be rushed to completion. It is expected to ship from 50 to 75 tons of ore daily to the Socorro Co.'s mill as soon as the tram is finished.

Deadwood mine engineers have been making an examination of the property with the view of unwatering the mine and starting operations under bond and lease.

Silver City.

The capitalization of the Carlisle Mining Co. has been increased to \$3,000,000, divided into 600,000 shares. Carlisle has 500,000 tons of ore ready for stoping. At the present prices of metal the gold, silver, copper, lead and zinc contents are worth \$30 a ton. The deepest working is 627 ft. With the above work done it is rumored that the concern is to erect an electric plant at Duncan, Ariz., or nearby point on the Frisco river. The plant will not only furnish power for mining, but may also supply current for a 13-mile electric road from Duncan to Carlisle.

A group of claims a short distance northwest of the Carlisle property will also be opened in a short time by the recently formed Progress Mining Co. The company is composed of James V. Parks, L. A. Hohstadt and Charles Hanson.

OREGON.

Champion.

The Champion Con. Mining Co. has been formed with 3,000,000 shares, par value 10 cts. It will operate property in the Bohemia district. The property was located in the early days when over \$2,000,000 were produced in gold. The old 30-stamp mill will be increased to 50 stamps and it is thought now that flotation will be used on some of the ores. Considerable timber is on the ground and a hydro-electric plant will be erected. Mr. Jeldness is president, J. S. Lewis, vice-president and treasurer; C. V. Bobb, managing director, and H. C. Mahon, Portland, secretary.

Sumpter.

H. M. Parks, A. M. Swartley and G. E. Goodspeed of the Oregon State Bureau of Mines will spend the summer in field work in eastern Oregon. Next fall the bureau will publish a bulletin covering the results of their observations. A shipment of 20 tons of asbestos at \$150 per ton has been made from here. It was produced from mines in Grant county. R. Baird has returned to operate the West Side mine, near Greenhorn. For several seasons the property has given good returns. The Buffalo mine is now being worked under lease by H. Norkus.

William Schluting is now operating the Susan D, or White Swan mine. There is sufficient ore on hand now for a year's run. They are talking of remodeling the milling plant. The power question is unsettled as yet, but the owners are negotiating with the Eagle River Co. for power.

Bourne.

The American Zinc, Lead & Smelting Co. have an option on the E. & E. mine, with the privilege to buy at \$400,000. At present C. O. Lindberg is examining the property for the company. Considerable preliminary work will have to be done to unwater the mine before sampling. The E. & E. is one of the best-known mines of this vicinity. After extensive development and the installation of equipment worth \$200,000 work was stopped in 1887 because it was found the ore could not be treated by the process. In 1890 the property was under lease 2 years and by use of cyanide paid. The operators could not secure an extension of the lease and the mine has lain idle since.

SOUTH DAKOTA.

Lead.

A hubernite tungsten deposit has recently been uncovered in the Two-Bits district at the head of the west fork of the creek, not far from the Monarch mine. The prospecting was being done on patented ground, which was formerly

worked for gold. P. H. Smith owns the property and M. Brosnahan made the find.

Custer City.

R. M. Malone now has a force at the Deadbroke and will soon have the property in shape. It has produced gold in former days and the water will be taken from the 2000-ft. incline and stopes. Several stopes have been opened up in the past and a great deal of ore taken out. Besides these stopes, there is a vast amount of ore blocked out in the property, and as it is of a grade which will pay to ship and mill, it is expected that this will be done so soon as the work which is now in hand has been completed.

The annual report of the Mogul Mining Co. shows that during 1915 the company had milled 31,213 tons of ore and had treated 6206 tons of purchased ores, or a total of 37,419. From this ore had been extracted 7,371,7129 ozs. gold, valued at \$153,387.64. Silver extracted, 16,493.49 ozs., valued at \$8217.44. A larger tonnage than in the previous years was extracted from the company's property and there was a similar increase in the tonnage purchased. The North Lode produced 50% of the ore from company property and was operated on company account, the other workings being mined principally by lessees. The Mark Twain ore was lower in grade; lessees found a few small bodies of good ore in the McDonald; the Oriole, mined close to surface, was disappointingly low in grade; the Passaic work was of prospecting character; the Pluma tailings came from an old chlorination mill dump, of fair grade, but yielding poor extraction. The small apparent progress in mine development, shown as 100 ft. of the Mill raise and 172 ft. in Carstreet tunnel is not a fair measure of the year's preparatory work. This raise is the proposed main working shaft mentioned in previous reports as the outlet for ores from the Ben Hur quartzite level, to start it required much preliminary work. In addition to this work all air compressing plants were assembled as part of the main power plant at the mill and a trunk air line was extended to the North Lode in one direction and to the Hardserabble in the other. This work was all classified as mine development and the total cost, \$6550, was charged off as mine operating. The necessity of diverting funds to other channels prevented further progress in underground work. There was an operating loss of \$1050.53 after charging \$6242.59 to depreciation. Other figures show that the loss was not indicative of more poor operation, but rather that of meeting many former liabilities.

Deadwood.

A 500-hp. boiler plant has recently been installed and is now operating a compressor plant at the Custer Peak Co.'s property. Work of sinking in the main shaft has been resumed from the 350-ft. level, and will be continued to the 800-ft. level. At present there is plenty of ore available in the property, but as it is practically a native copper proposition, it is the intention of the company to at once erect a milling plant and install concentrating machinery.

Owners of the Snoma group are contemplating co-operation with neighboring claim workers in building a road to the property for hauling out their ore on. The group is on Squaw Creek and recent assays show a trace of gold; 47 ozs. silver, and 22.12% manganese. Ore carrying less than 40% manganese does not pay to mine exclusively for that metal, but 22% would pay in connection with other values. With silver at 65 cts. per ounce, 47 ounces would make the value \$30.55 per ton.

UTAH.

American Fork.

The Lavaun Mining Co. has been incorporated to operate in this district. The Fissures Development Co. has selected the site for its mill which will be at the mouth of the Dutchman tunnel east of the dump. The mill is intended to work the ore from the Dutchman lease. The tunnel is being retimbered and will be in condition for use in a few weeks. The Dutchman is known to have immense bodies of low-grade ore in its lower workings. The mill will probably have a capacity of 60 tons per day and a part of the machinery from

the old Pacific mill will be used. The engine was brought down and sent to Salt Lake to be repaired for this purpose. The balance of the plant will come from Bingham, where an old mill has been purchased. Work on the construction of the buildings has commenced. A great deal of the Pacific ore will be sent through. For every ton of high-grade in the mine there is about 20 of low-grade. The high-grade copper ore is ribbed every few inches with quartz which may make it desirable to run this class through the mill. All ore going through the mill only pays the original owners of the mine 15%. A contract was let to build a new road 1 1/4 miles long from the Pacific tunnel to the site of the new mill. This road will be built on an even grade and will probably be ready for use in 3 weeks. The Pacific has shipped 4 cars since spring. Returns from the first 2 cars have been received and show an average of 41% lead, 14 ozs. silver, 1 1/2% zinc, 26% sulphur and 15% iron. It is desirable fluxing ore, so that a very favorable smelting rate was obtained. First car brought \$2447.62 and the second \$2089.67.

Belorophon has finally struck the ore where the new tunnel encountered the fissure which outcrops prominently through the property. This is at a depth of 100 ft., and the tunnel is now in 280 ft. They are 12 ft. in the fissure, and have not yet reached the hanging wall. The tunnel is cross-cutting the fissure at right angles. The foot wall is quartzite and the hanging wall has not yet been determined, but will be either limestone or shale. The first of the vein matter encountered carried well in lead and silver, and as the work progressed further into the vein the values were changed to copper, silver and gold. They will probably crosscut until the hanging wall has been reached, then drift north along the vein. The mineralization is much stronger on the north side. This will also give depth as the work progresses.

Eureka.

Because the smelter has refused any more than 50 tons per day at present from the Eagle & Blue Bell Co. it has decided that during this lull is an opportune time to sink from the 1700 level to the 1850, and work was started the first week in July.

A vein carrying values in silver and lead has recently been opened on the Eureka Lily property. It was found by drifting several hundred feet on the 500 level and is about 10 ft. wide. It is of quartz and is now being explored. The vein is well defined and is in sight for some distance beyond the cave that was first encountered when the work was resumed in the drift. The fissure was caught on its dip from the workings above at about the angle that was expected. Since this development took place drifts have been started to the north and south and at present there is some lead ore showing in the north drift. It has been decided to thoroughly explore the ground from this working.

July 7 work was started in sinking a 2-compartment shaft on the Homansville property by the Chief Con. Co. It will be used to develop a large block of ground recently acquired by Chief. For some time grading for the shaft has been under way. New machinery is now in place, the headframe and all shaft equipment ready for use. An electric hoist is to be used. The sinking of the shaft has been contracted to W. Fitch, Jr., who is carrying on extensive operations under contract for a number of Tintic mines. The drifting in the R. G. W. property, now a part of the Chief Con., is to be discontinued as soon as the sinking operations are well under way. An electrically driven compressor plant has been in use in its Homansville or East Tintic work for several months and will furnish air for the shaft work.

Cottonwood.

According to Manager T. W. Bell the Big Cottonwood Coalition Co. has its incline shaft down 150 ft. on the vein. Ore has been showing all the way, but recently miners have struck high-grade. About 20 tons have been broken and a shipment will be made soon. The main tunnel is in 1000 ft. and has a depth of 550 ft. Three fissures have been cut. The first one was encountered at the 400 point and shows small silver and copper values. The second one at 550 ft. is 3 ft. wide and shows lead, silver, gold and copper values. The third fissure was cut at 950 and is 2 1/2 ft. wide and shows zinc, lead, silver and copper values.

WASHINGTON.

Spokane.

The Laurier Mining Co., which owns and operates the Laurier mine, on Huckleberry mountain, near Laurier, a station on the Kettle river valley branch of the Great Northern railway, is shipping 2 cars of ore weekly to the Granby smelter at Grand Forks, according to E. K. Erwin, secretary of the corporation. Erwin states that the shipments, extracted in development, average 5 to 6% copper and 3 to 3½ ozs. silver, and that the net returns are about \$25 a ton. "Until we get a larger compressor installed we will have to limit our work. At present we are confining activity to sinking the incline shaft to connect with the No. 1 tunnel, to which it already has been joined by three upraises. For its entire length the shaft follows an ore body 8 ft. wide, all of which is being extracted, so that our shipments show its exact average value. Lying above this ore body is another shoot of unknown extent and entirely different character. Wherever it has been broken into a highly complex material has been exposed, the average values running 2½ to 3% copper, 10% each lead and zinc and 30 ozs. silver. This is much richer ore than the body we are mining, but as it is unmarketable in its crude form we are not exploring it now."

The Columbia Copper Co., capitalized for 1,000,000 shares at \$1 each, has been organized by Spokane men to take over and operate the holdings of the old Highgrade Mining Co. in the Deer Trail district of Stevens county. C. M. Carroll is president, Alex Robinson is vice-president and general manager, Oscar Olson is secretary-treasurer and T. J. Vaughan Rhys is consulting engineer. The purchase price of the group is \$100,000, payments extending over a period of 10 years. "This is one of the old-time holdings on which large sums were expended years ago," said Robinson. "I believe the owners built a smelter on which I am informed they spent \$114,000. It never was of any value to the mine, but there still is some good machinery on the ground, consisting of boilers, engines, blowers, etc. Carson Bros. and other farmers of the Reardan section were the former owners. By this deal we have acquired a group of copper properties which may develop into one of the big mining enterprises of the state. We have 9 ft. of solid copper ore. We have sorted and hauled to the railroad at Davenport a carload which will run from 10 to 24%. When these estimates and our sorting are verified by the smelter returns we expect to let a contract for hauling this ore to the railroad and then will ship at least a carload a week. We have put up buildings and have 8 men now at work in the mine."

WISCONSIN-ILLINOIS.

Platteville.

Ore deliveries for June up to and including the 24th, were reported by districts as follows:

Districts:	Zinc, lbs.	Lead, lbs.	Pyrites, lbs.
Benton	17,282,000	206,530	
Cuba	4,668,000		2,556,600
Miffin	4,662,000		
Galena	4,492,000		
Hazel Green	3,544,000	66,400	
Linden	2,642,000	250,960	
Platteville	2,212,000		
Montfort	816,000		
Shullsburg	694,000	135,300	
Highland	314,000		
Mineral Point	114,000		
Potosi	70,000		
Totals	41,510,000	659,190	2,556,600

Surplus ore was sold the latter part of the month, the bulk being low grade, to concentrating plants, but there remained in the field, conservatively estimated, about 8000 tons of concentrates. Shipments of high-grade ore direct to smelter exceeded 20,000,000 lbs. for the month. The New Jersey Zinc Co. delivered one-fourth of this from its refineries at Mineral Point to smelter at DePue, 66 cars, 5,012,000 lbs. The National Separators and Wisconsin Zinc Co.'s plants contrib-

uted 100 cars, while considerable high-grade was sent from mines direct to smelters.

Reports showing deliveries for week ending the 8th reveals unusual activity in shipments, 122 cars of zinc ore reaching track, 4926 tons; 3 cars of lead ore, 200,000 lbs.; 9 cars pyrites, 825,800 lbs. The actual recovery of concentrates during week fell off considerably and much reserve ore was worked off. Net shipments of high-grade separator ore to smelter, 5,100,000 lbs. The Mineral Point Zinc Co. delivered 16 cars of refinery ore to smelter at DePue, 1,224,000 lbs.

There was no change in the offerings on blende over the figures of the week before, top grades selling on a base of \$67 to \$68, with the range down to \$62 for 50%. More buying of low-grade ore by the New Jersey Zinc Co. enabled independent operators to get into the market.

Local producers were in evidence on the returns, the East End mine shipping 3 cars to Galena, 132 tons; Hodge mine to Cuba, 2 cars, 85 tons; M. & H. Mining Co., 1 car high-grade to LaSalle, 44 tons; West Hill to LaSalle, 32 tons; Kistler Mining Co. to LaSalle, 2 cars, 88 tons.

Cuba.

The Linden Zinc Co. is operating the Campbell Magnetic plant at this point with a force of 20 men. National Separators received 707 tons of green concentrate last week and reported out to Illinois Zinc Co. 2 cars 60% ore, 74 tons; to Granby Mining & Smelting Co., 7 cars, 290 tons; to Eagle-Picher Lead Co., 1 car, 37 tons.

Benton.

Shipments last week were below average, only 40 cars of zinc ore reaching track, 3,438,000 lbs. The Hird mine is included with an initial shipment. Development was undertaken on this property 4 years ago, the Frontier Mining Co. at one time spending \$1500 monthly for power on pumps alone. A new 200-ton power and concentrating plant now in running order has been delayed in service. The lease includes 160 acres, and two additional ranges have since been determined with drills on the same tract, making it one of the richest in the field. The ore will not run high, but is of a uniform grade and in heavy quantities.

Shipments of high-grade ore came from the Benton Roasters, 3 cars to LaSalle, 185 tons; Wisconsin Zinc Roasters to LaSalle, 2 cars, 99 tons; to American Zinc Co., 4 cars, 179 tons; Edgar Zinc Co., 3 cars, 127 tons.

Hazel Green.

Shipments continue from regulars only, Kennedy, 2 cars, 86 tons; Cleveland, 4 cars, 183 tons; Lawrence, 1 car, 42 tons, all to Mineral Point, and Lawrence to Wisconsin Zinc Roasters, 2 cars, 76 tons.

Galena.

Ore deliveries for week of the 8th were heavier than usual, 19 cars reaching track, 1,484,000 lbs. Two new producers figured in the returns, the Coleman and Nickpencross, each 2 cars to Cuba, 176 tons all told. Two others are in shipping order, the Graham and Birkbeck. Ten cars high-grade ore cleared from refinery plants.

Cuba City.

A new plant released by the Galena Iron Works Co. to Standard Metals Co. is in fine running order on the new Anthony mine. Five shafts are complete and down to ore beds on deposits blocked out with drill 2 years in advance. The mill will be able to handle 100 tons each 12 hours. Motive power is furnished by two 4-cylinder, 40-hp. gasoline engines for hoists and compressors, and the mill is operated by a 66-hp. automobile engine. Kerosene oil feed is being used satisfactorily. Heavier pump equipment, it is thought, will be required. The company acquired the Dall lands, and pumps are now being installed. One hundred and twenty acres of land under lease to Anthony Selleck and Hooper, local operators, has been optioned by the company, and contracts for 12 borings at likely points. A new 100-ton mill will be built here. Another mill is now being rebuilt for the company on the Gritty-Six mine, an old-time producer, to be ready by Sept. 1. Longendyke, Smalley, and others, of Cuba, have secured mining rights on the Carr land, adjoining the once famous Baxter property. The mine has been unwatered and a small concentrating plant is in operation. The ore is

coming from a pitch 5 ft. thick and from 60 to 70 ft. wide, of exceptionally high-grade zinc content.

The National Separating Co. shipped last week 4 cars to Illinois Zinc Co., 164 tons, and 8 cars, 326 tons, to Granby smelters. Low-grade receipts were light, only 12 cars reaching the plant, 526 tons. Utt-Thorne Co. delivered 6 cars low-grade to Benton Roasters, 240 tons.

Highland.

Shipments of carbonate zinc ore last week came from the New Jersey Zinc Co., 4 cars to Mineral Point, for oxide making purposes, 105 tons; 1 car from Muldoney & Co. to DePue, 30 tons.

Linden.

Ross Bros. Mining Co., Optimo No. 2 and Optimo No. 3, and the Saxe-Pollard mines shipped all told last week 9 cars of concentrates, 335 tons. Production continues with all producers in this district, and two new shippers are anticipated within the month.

Recent strikes with drill on the Gilman mine assure production of zinc ore for 5 years to come at least. Efforts are being made to locate the original range of Optimo No. 1 mine, which has been succeeded by Optimo No. 2 and Optimo No. 3, each fully equipped and in operating order. The Silver Dollar mine on the Tolmes farm is being explored with drills and a shaft is down to ore level. Kletsch Bros. of the Republican house, Milwaukee, are engaged with drills on the Ovitz farm in Linden township. Kletsch Bros. have been operating the Lucky Six mine at Mifflin for the past 5 years successfully.

Mifflin.

The Grunow, Phoenix, B. M. & B., Biddick, Coker and Rundell mines reported ore deliveries last week, 12 cars, 473 tons. Considerable reserve ore was carried over. New producers are rounding into shipping form. Mineral Point locals delivered small lots, 23 tons in all. Dodgeville district made no shipments, but several hundred tons of ore are held awaiting bids. The O. P. David at Montfort shipped last week 1 car high-grade to LaSalle, 44 tons.

Shullsburg.

The Winskill mine on mine run ore coming from new deposits in the glass rock strata shipped 5 cars last week to Galena, 179 tons. This district is experiencing a real boom, two-score drills being engaged in prospect work alone.

WYOMING.

Casper.

The Midwest Refining Co. is receiving 3 cars of oil daily from the Hudson Oil Co. The Hudson Co. had its tanks full when order was placed and it was expected that the production would not run high enough with the present wells to keep up the 3 cars a day shipment. However, the storage has not been run down and the wells apparently are producing 3 cars a day. Midwest has also received 4000 barrels from the Wyopo Co. in the Dallas field for trial. If it proves satisfactory and a price can be arranged shipments will continue.

The Merritt Oil & Gas Co., Duluth, drilled into oil sand on its leased land in section 3, T. 33 N., R. 76 W., 15 miles south of here, and in what is commonly known as the Big Muddy field. The top of the pay sand was encountered at 970 ft., in the Shannon sand, and in less than 2 hours the well had filled up 400 ft. in a 10-in. hole. According to T. A. Merritt, president, the present production will not exceed 40 or 50 barrels a day, but other operators near where the well was brought in declare that it will reach 100 barrels.

CANADA.

BRITISH COLUMBIA.

Camborne.

A \$75,000 lease and bond has been taken on the Revenue group of lead-silver claims, 5 miles from the upper end of

Upper Arrow lake, by W. D. Poole of Spokane and associates. The holdings consist of four claims, owned by William Boyd. Considerable development has been done on the properties, and Poole states that there are more than 100 tons of ore now on the dump that runs 60% lead and 30 ozs. silver. The veins are opened by two tunnels, one 100 ft. long and the other 150 ft., besides a series of open cuts. Poole announces that extensive development and exploration will be inaugurated as soon as men and supplies can be assembled.

Nelson.

The Granite-Poorman mine at Beasley, near Nelson, has been bonded to Butte and Spokane capitalists. The first payment of \$10,000 was made recently to Dr. W. H. Willson, Barney Crilly, Thomas Gough and H. Y. Anderson, who have a lease and bond on the mine and have been operating it profitably for some months. They had it under lease from the Kootenay Gold Mines, Ltd., which holds the titles. The purchasers under the new bond are John McGinnis, Butte; W. E. Cullin, and R. A. Carnochan, Spokane. The deal was put through by A. G. Larson, who took an option on the mine. A new company is to be organized under the bond and it is stated that the plans for the future include remodeling the 20-stamp mill with which the mine is equipped. Work in the mine will include the unwatering of the workings of the Poorman vein and the development of that vein. The Willson-Crilly syndicate has been operating since January on the Hardscrabble vein where a shaft opened up some high-grade ore, which has given splendid returns through the mill. Last month the syndicate is said to have made profits which will run close to \$20,000 when the complete clean-up has been made. F. H. Skeels of Spokane has arrived to take charge of the mine for the new operators. He is an engineer of wide experience in the Coeur d'Alenes and Montana. The Granite-Poorman has been one of the most consistent producers of gold from free-milling ore in the Nelson district. It has been in operation, with the exception of a short period, for many years. It was sold to the Kootenay Gold Mines, Ltd., by Thomas Gough, the late John Swedberg, E. E. Guille and associates and was operated by the company for several years. Financial troubles caused the company to cease work. It then gave a lease to the Willson-Crilly syndicate, which has been operating it for nearly a year with good results.

The Erie mining district, about 30 miles from Nelson, is attracting considerable attention from investors, and representatives of American capitalists recently have been examining the mines of the region with a view to securing leases and bonds on the more promising groups, according to Fred A. Starkey of Nelson, president of the Association Boards of Trade of Eastern British Columbia, who personally has been investigating conditions there in recent weeks. "One of the most promising properties of the district, the Arlington gold-silver group, is being negotiated for. The mines, formerly owned by an English syndicate, are credited with a production in excess of \$800,000. They were leased 2 years ago, and it is said that the leasers made a considerable profit, but, owing to insufficient capital to properly develop, they confined their efforts to extracting the ore in sight, and eventually possession reverted to the owners. The Second Relief group, also in the Erie district, is being extensively developed, and today it is in better shape to produce than ever before. In the past the different owners of this property made it pay well, but the present management is having difficulty with the new mill recently installed. It was anticipated that the equipment would successfully treat the refractory ores and make a full saving of the gold and silver values, but since the plant was put in commission it has been discovered that radical changes in the system are necessary. Manager Westby hopes to have the remodeled mill in operation soon, however, and before many months it is believed that the company will be paying dividends. The Keystone property, another old timer, which several years ago produced heavily and at a good profit, has been bonded by a local syndicate. Development has revealed new ore bodies and arrangements now are being made to enlist more capital to put the mine on a producing basis. Shipments made to the Trail smelter in a former period of operations returned from 3.98 to 5.28 ozs. gold to the ton,

together with fair values in lead and silver. Plans are under consideration to equip the property with a concentrator and increase the output to the maximum. The Lion and Eagle claims and the Norway group already have been bonded by men who are in position to develop them, and several other groups have been transferred. There are deposits of almost any mineral desired in different parts of this great region, the values appearing in combination as copper-gold, gold and silver and lead-silver-zinc, and there are all the natural facilities for mining operations at hand. There is unlimited water power that can be harnessed at small cost and an abundance of timber for all purposes. The only thing lacking to make this one of the most important mineral producing sections in western Canada is capital, and this we hope to secure soon."

Ainsworth.

The Florence Silver Mining Co., which is developing the Florence group, shipped 2 cars of ore and 3 cars of concentrates to the Consolidated Smelting Co.'s smelter at Trail, last week, according to Ferd R. Wolfe, president and general manager. The crude shipments will average about 50% lead and 20 ozs. silver, and the concentrates around 60 to 65% lead and 25 ozs. silver. The week's production will net not less than \$12,000. Sixty tons of ore are being milled daily, all the ore coming from development work on the south vein, which is now being opened. Good progress is being made in the lower tunnel.

Smelter returns received by the Florence recently show net values of about \$70 on 60% concentrates, the settlement being on the basis of \$8.10 to \$8.13 for lead at the Montreal quotation and around 69 cts. for silver at the New York quotation.

ONTARIO.

Cobalt.

The Trethewey Co., operating the Rochester mine at Brady lake, has drifted 100 ft. on the vein of high grade which they recently encountered on the 300 level. Good ore shows the entire distance in the drift. Part of the distance the ore is a high-grade smaltite. The character of the vein has now changed, and it is a calcite with ruby and native silver. The management now intend sinking a winze on the vein to find out the depth the values persist to.

Since all Lake ore is now being trammed to the No. 7 shaft of the Townsite mine, where it is hoisted for treatment in the mill of the Cobalt Reduction Co., the Cobalt Lake mill of the Mining Corporation of Canada has been closed. The company intends using the old City of Cobalt shaft for raising and lowering men and materials. For the present the old mill will remain idle, but the ultimate intention is to use it to house a flotation plant for treatment of tailings. The mill was built in two units, the first being erected in 1912, and consisting of 20 stamps, the second addition of 20 stamps was made in 1914.

The Buffalo Mines, Ltd., is contemplating the treatment of its flotation concentrates on the property. The process will be similar to that at the Deloro smelter now treating Cobalt ores. No new equipment is being installed with the exception of a roasting furnace and accompanying dust collectors. The furnace is a large 2-chamber type, measuring over all 16 by 8 ft. It will be equipped with burners for crude oil. The ore is mixed with the necessary proportion of sodium-chloride and roasted in the furnace, being continually rabbled by hand during the process. By this roasting the silver forms silver chloride, which is successfully treated by the cyanide process, which the Buffalo has had in use for several years. As the output from the flotation plant in concentrates will be about 30 tons a day, both freight and treatment costs will offer a saving.

Crown Reserve has made a find on the 700-level, 200 ft. below any of the old workings. Manager Stewart decided to sink a winze on a vein on the 500 level. At the 700 level Keewatin was encountered and drifting commenced on the vein with the above result. The vein is 12 ins. wide and is composed mainly of smaltite with some calcite and native silver. As far as known it is in Keewatin-diabase contact. Stewart is strongly of the opinion that the vein will hold in the lower formation, and intends continuing work. The continuation of the work on this vein will be of interest, as it

has previously been found by different mines in the camp that little of value is to be found in the underlying Keewatin.

Porcupine.

A 2-drill compressor has recently been added to the equipment of the Keora mine for sinking the shaft to the 110-ft. level. The shaft is now down over 80 ft. For the last 20 ft. they were in ore all the way with neither walls in sight. The shaft was sunk at some distance in the foot wall on account of the dip of the vein. The latter was caught at a depth of 60 ft. The ore is of a fair milling grade. Good progress is being made since the compressor plant was installed and two shifts are working. A new headframe has been built, the shaft timbered and all buildings put in shape. They plan to continue sinking and at greater depth crosscut to the vein. At the angle of dip it is expected that the vein will not cut out of the shaft for another 20 ft.

MEXICO.

Santa Rosalia, almost wholly owned and officered by Michigan men, is a property that seems to have considerable merit. This property is located about 100 miles from the Arizona border, about 6 miles from the old town of Arizpe in Sonora, and its fissure vein, which carries principally gold with some silver, lead and zinc, has an extent of $3\frac{1}{4}$ miles. In the old Mexican days before the advent of the "gringo," it produced several millions of gold, but was shut down about 80 years ago, on account of a sudden influx of water. In 1886, John Daggett, at that time superintendent of the U. S. Mint at San Francisco, organized a company of 100,000 shares, of which 51,000 were taken mainly by employees of the mint at 18 cts. a share, to be paid for in monthly payments, and the remaining shares were given to the locators as the purchase price of the mine. It was a close corporation, no stock being sold to the public, and no salaries were paid the first year. Considerable ore of high values was taken out, values less than \$600 a ton being rejected, as it had to be hauled by wagon 75 miles, and then shipped by rail to Nogales. It paid dividends at the rate of 10 cts. monthly. Afterwards it was taken over by parties in Watertown, N. Y., and the present secretary of state, Robert Lansing, was a director. It came into the hands of the present owners some few years ago, and in Madero's time was worked up to his assassination, when it had to be closed down and could not be opened, owing, of course, to the internal disturbances. At that time 7 tons were taken to Douglass which yielded \$7300. There is a shaft 700 ft. in depth with over 4000 ft. of workings. There are authorized 500,000 shares, but only 284,000 have been issued, and there is \$10,000 in the treasury, with all the debts paid, and \$10,000 more due from delinquent stockholders. The officers are E. D. Johnson, president; Oscar Bruns, secretary; F. H. Kohlhaas, treasurer; Will Harris, John Gibbens and Harry Hill—all of the copper country; C. A. Phelps of Watertown, N. Y., and M. L. Stevens of Montreal are the remaining directors. The company which is organized under the laws of Arizona is a holding company for the Mexican company.

According to George Kingdon, general manager of the Greene-Cananea, the company's property is not in the hands of the Mexican government. He says: "When I left Cananea I put a man in charge of the property and authorized him to continue operation there in both mine and smelter. He is proceeding with this work in the capacity of a representative of the Cananea Con. Copper Co. and not as a representative of the de facto government. Further than this, General Calles has given assurances that all the copper produced at Cananea under the present arrangement will be delivered at the border line at Naco, as in the past." J. S. Williams, Jr., manager of the Moctezuma Copper Co., and L. R. Budrow, manager of the El Tigre, explained the situation in much the same way. Both said their store had been seized by the Calles government, as they were needed, but the mines have not been molested. Mexicans are now running the Nacozari plant. At El Tigre minor repairs are being made. General Calles has taken no action to indicate the radical step reported from Mexico. If General Carranza has ordered anything of the kind, General Calles has failed to comply.

World's Index of Current Literature

A Weekly Classified Index to Current Periodical and other Literature, Appearing the World Over Relative to Mining, Mining Engineering, Metallurgy and Related Industries, in Four Parts.

Part 1. *Geology*—(a) Geology; (b) Ore Genesis; (c) Mineralogy.

Part 2. *Ores and Metals*—(a) Metals and Metal Ores; (b) Non-Metals.

Part 3. *Technology*—(a) Mines and Mining; (b) Mill and Milling; (c) Chemistry and Assaying; (d) Metallurgy; (e) Power and Machinery.

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- (6) Number of pages. Illustrated articles are indicated by an asterisk (*).
- (7) The price.

I. GEOLOGY

GEOLOGY AND MINERALOGY Geology

Cox, G. H.; Dake, C. L.—*Geological Criteria for Determining the Structural Position of Sedimentary Beds*. [Various marks left on sedimentary deposits are taken up with some structural phenomena of igneous rocks].—Bull. Mo. School of Mines; May 1916; pp 59*.

Nevis, N. J.—*Notes on the Randsburg Tungsten District, California*. [The geology of the placer deposits and general conditions in operating in the district are reviewed].—Mg. World July 1 1916; p 7; pp 1¼; 10c.

Rau, A. E.—*Goldstone District, San Bernardino County, California*. [The geology, topography and nature of the ore deposits and formation is described].—Mg. & Oil Bull. June 1916; p 149; pp 7*; 25c.

—*Iron Ore Deposits of Cuba and Method of Mining*. [Both hard and soft ores are found].—Mg. World July 1 1916; p 13; pp 1¼*; 10c.

II. ORES AND METALS

(I) METALS AND ORES

Copper

Gaebelein, P. W.—*Cyaniding Copper-Bearing Ores*. [On operations at the Baker Mines Co., Cornucopia, Ore.].—E. & M. J. July 25 1916; p 22; pp 1¼*; 25c.

Mudd, S. W.—*Mining and Metallurgical Progress in the Southwest*. [Address delivered before the Chamber of Mines and Oil, Los Angeles, being on the production of ores and methods].—Mg. World July 1 1916; p 11; pp 2; 10c.

Scott, W. A.—*Operations of the Magma Copper Co., Superior, Arizona*. [Gives a brief detailed description of the mine, crushing and concentration].—Mg. World July 1 1916; p 9; pp 1¼*; 10c.

Scott, W. A.—*The Old Dominion Copper Co.'s Operations, Arizona*. [Haulage, mine water and concentration problems are reviewed].—Mg. World July 8 1916; p 43; pp 2¼*; 10c.

Gold Fields and Mining

Alderson, M. W.—*Mining Possibilities in Colombia, South America*. [The general conditions to be found in the country and ways of the people are dealt with].—Mg. World July 8 1916; p 51; pp 4*; 10c.

Gaebelein, P. W.—*Cyaniding Copper-Bearing Ores*. [On operations at the Baker Mines Co., Cornucopia, Ore.].—E. & M. J. July 25 1916; p 22; pp 1¼*; 25c.

Plummer, W. L.—*Successful Dry Placer Operations at Plomosa, Arizona*. [Speaks of early operations and the present methods of dry crushing and concentrating. Tables using air instead of water are used].—Mg. World July 1 1916; p 1; pp 3*; 10c.

Rau, A. E.—*Goldstone District, San Bernardino County, California*. [The geology, topography and nature of the ore deposits and formation is described].—Mg. & Oil Bull. June 1916; p 149; pp 7*; 25c.

Smith, R. W.—*Flotation of Flour Gold*. [Gravity concentration failed with this lead-zinc-silver-gold ore. Flotation of slimes and treating the coarse portion by gravity concentration and electrostatic separation gave results].—E. & M. J. July 1 1916; p 25; pp 2¼*; 25c.

—*Gold Placers of La Paz District, Arizona*. [On the history and operation of the deposits in the district].—Mg. & Oil Bull. June 1916; p 160; pp 2*; 25c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

—*Electric Power in Southern Mines*. [Deals with hydroelectric installations at the iron mines surrounding Birmingham, Ala.].—I. Tr. Rev. June 29 1916; p 1413; pp 2*; 25c.

—*Iron Ore Deposits of Cuba and Method of Mining*. [Both hard and soft ores are found].—Mg. World July 1 1916; p 13; pp 1¼*; 10c.

Iron and Steel

Cain, J. R.; Rawdon, H. S.—*Properties of Ladle Test Ingots*. [Extract of a paper read before the American Soc. for Testing Materials. The question is

treated from a metallographic view].—I. Tr. Rev. June 29 1916; p 1419; pp 3*; 25c.

Iron and Steel: Foundry and Furnace Practice

Boynton, A. J.—*Handling the Blast Furnace Charge*. [Discussion read before the American Iron & Steel Inst. Some drawings of installations are shown].—I. Tr. Rev. June 29 1916; p 1415; pp 2½*; 25c.

Silver

Handy, R. S.—*Bunker Hill & Sullivan Milling Data*. [Flow sheets and drawings, with brief description of operations and detailed cost sheet are dealt with].—E. & M. J. July 1 1916; p 35; pp 2¼*; 25c.

McDonald, P. B.—*Mining Around Lovelock, Nevada*. [Costs and accounts of the silver properties in the district, with some information on their production is given. The principal companies are Rochester and Seven Troughs Coalition].—M. & S. P. July 1 1916; p 14; pp 2*; 20c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tungsten

Hartman, M. L.—*Chemistry and Metallurgy of Tungsten*. [From the Pahasapa Quarterly. Several gravimetric chemical methods for the quantitative analysis of the metal are given].—Mg. World July 8 1916; p 55; pp 1½; 10c.

Nevis, N. J.—*Notes on the Randsburg Tungsten District, California*. [The geology of the placer deposits and general conditions in operating in the district are reviewed].—Mg. World July 1 1916; p 7; pp 1¼; 10c.

Runner, J. J.—*Specific Gravity Method for Tungsten Analysis*. [Curves for use in this connection are reproduced].—M. & S. P. July 1 1916; p 11; pp 2¼*; 20c.

Zinc

Mudd, S. W.—*Mining and Metallurgical Progress in the Southwest*. [Address delivered before the Chamber of Mines and Oil, Los Angeles, being on the production of ores and metals].—Mg. World July 1 1916; p 11; pp 2; 10c.

Scott, W. A.—*Operations of the Mag-ma Copper Co., Superior, Arizona*. [Gives a brief detailed description of the mine, crushing and concentration].—Mg. World July 1 1916; p 9; pp 1¼*; 10c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Jackson, C.—*Rock Excavation in Coal Mines*. [Five types of drills are described, including electric and compressed air drills, the latter getting its air from a portable electrically driven compressor].—Coal Age July 1 1916; p 32; pp 2¼*; 20c.

Edsall, H. J.—*Some Modern Coal Tip-ples*. [Discusses the designs of tipples and proper equipment to be used there-in].—Coal Age July 1 1916; p 4; pp 4*; 20c.

Symons, S. W.—*Compressed-Air Coal Cutters in Canadian Mines*. [The drill is somewhat similar to the ordinary post rock drill].—Coal Age July 1 1916; p 28; pp 1¼*; 20c.

Warden-Stevens, F. J.—*Coal Handling Equipment on the Great Lakes*. [De-scribes several loading docks].—Coll'y Guard. June 16 1916; p 1133; pp 2*; 35c.

Winnmill, T. F.—*The Absorption of Oxygen by Coal*. [A number of tests and analysis along this line are given].—Coll'y Guard. June 16 1916; p 1135; pp 3½*; 35c.

Coal Preparation, Marketing, Etc.

Allen, Andrews.—*The Preparation of Bituminous Coal*. [A paper read before the Kentucky Mg. Inst.].—Coal age July 1 1916; p 9; pp 5½*; 20c.

Edsall, H. J.—*Some Modern Coal Tip-ples*. [Discusses the design of tipples and proper equipment to be used there-in].—Coal Age July 1 1916; p 4; pp 4*; 20c.

Raymond, M.—*New Tipple at Glouc-ester, Ohio*. [Drawings, illustrations and detailed description are given].—Coal Age July 1 1916; p 30; pp 2*; 20c.

Natural Gas

Earhart, R. F.; Wyer, S. S.—*Deviation of Natural Gas from Boyle's Law*.—Nat-ural Gas June 1916; p 231; pp 11*; 35c.

Manning, V. H.—*The Conservation of Natural Gas*. [A paper read before the Natural Gas Assn.].—Natural Gas June 1916; p 225; pp 3½*; 35c.

(B) STRUCTURALS AND CERAMICS

Brick and Tile

West, John.—*Silica and Fireclay Mate-rials*. [A paper read before the Manches-ter District Institution of Gas Eng. Gives analyses of the composition of several bricks and describes the making of the same].—I. & C. Tr. Rev. June 16 1916; p 691; pp 1*; 35c.

Concrete

Lawrie, W. W.; Smith, G. H.—*Con-crete Shaft Equipment at the Bantjes Consolidated Mines, South Africa*. [De-tails of construction, costs and labor are given].—Jnl. of Chem. Met. & Mg. Soc. of S. Afr. April 1916; p 202; pp 3½*; 85c.

scribed, including electric and compressed air drills, the latter getting its air from a portable electrically driven compressor].—Coal Age July 1 1916; p 32; pp 2¼*; 20c.

Symons, S. W.—*Compressed-Air Coal Cutters in Canadian Mines*. [The drill is somewhat similar to the ordinary post rock drill].—Coal Age July 1 1916; p 28; pp 1¼*; 20c.

Shafts and Shaft Sinking

Lawrie, W. W.; Smith, G. H.—*Con-crete Shaft Equipment at the Bantjes Consolidated Mines, South Africa*. [De-tails of construction, costs and labor are given].—Jnl. of Chem. Met. & Mg. Soc. of S. Afr. April 1916; p 202; pp 3½*; 85c.

Pumps and Pumping

Knowles, C. R.—*The Use of Oil En-gines for Pumping*. [A paper read be-fore the Illinois section of the American Water Works Assn. The results of a number of tests on different kinds of fuel are given].—Canadian Eng. June 29 1916; p 676; pp 2¼; 35c.

Miller, H. L.—*Efficient Mine Pumping*. [The adaptability of different types is taken up].—Mg. & Oil Bull. June 1916; p 158; pp 2*; 25c.

— *Prices of Machinery for Mines*. [The average prices for mine equipment are plotted in curves for separate classes of machinery, according to the size and capacity].—Coal Age July 1 1916; p 22; pp 3*; 20c.

Transport

Warden-Stevens, F. J.—*Coal Handling Equipment on the Great Lakes*. [De-scribes several loading docks].—Coll'y Guard. June 16 1916; p 1133; pp 2*; 35c.

Haulage and Conveying

Gates, A. O.—*Belt-and-Bucket Eleva-tors*. [Details for designing and formu-las for use in the same are discussed].—E. & M. J. July 1 1916; p 40; pp 5½*; 25c.

Robertson, A.; Johnston, A. M.—*The Use of Belt Conveyors*. [Abst. of a paper read before the S. Afr. Inst. of Eng. Reviews qualities of different kinds and gives the results of tests made on some].—E. & M. J. July 1 1916; p 9; pp 7¾*; 25c.

Scott, W. A.—*The Old Dominion Cop-per Co.'s Operations, Arizona*. [Haulage, mine water and concentration problems are reviewed].—Mg. World July 8 1916; p 43; pp 2¾*; 10c.

— *Automatic Drop-Bottom Mine Car*.—Coal Age July 1 1916; p 25; pp 1½*; 20c.

Sanitation

— *Rand Mine Managers' and Miners' Phthisis*. [Tells of methods adopted and methods suggested for deal-ing with the disease in the future].—S. Afr. Mg. Jnl. May 20 1916; p 175; pp 2; 35c.

Labor and Management

Alderson, M. W.—*Mining Possibilities in Colombia, South America*. [The gen-eral conditions to be found in the coun-try and ways of the peoples are dealt with].—Mg. World July 8 1916; p 51; pp 4*; 10c.

Lawrie, W. W.; Smith, G. H.—*Con-crete Shaft Equipment at the Bantjes Consolidated Mines, South Africa*. [De-tails of construction, costs and labor are given].—Jnl. of Chem. Met. & Mg. Soc.

of S. Afr. April 1916; p 202; pp 3½*; 85c.

Production

McDonald, P. B.—*Mining Around Lovelock, Nevada*. [Costs and accounts of the silver properties in the district, with some information on their produc-tion is given. The principal companies are Rochester and Seven Troughs Coal-ition].—M. & S. P. July 1 1916; p 14; pp 2*; 20c.

Mudd, S. W.—*Mining and Metallurgi-cal Progress in the Southwest*. [Address delivered before the Chamber of Mines and Oil, Los Angeles, being on the pro-duction of ores and metals].—Mg. World July 1 1916; p 11; pp 2; 10c.

Mining Costs

Lawrie, W. W.; Smith, G. H.—*Con-crete Shaft Equipment at the Bantjes Consolidated Mines, South Africa*. [De-tails of construction, costs and labor are given].—Jnl. of Chem. Met. & Mg. Soc. of S. Afr. April 1916; p 202; pp 3½*; 85c.

McDonald, P. B.—*Mining Around Lovelock, Nevada*. [Costs and accounts of the silver properties in the district, with some information on their produc-tion is given. The principal companies are Rochester and Seven Troughs Coal-ition].—M. & S. P. July 1 1916; p 14; pp 2*; 20c.

— *Costs of Operating Electric Car Lamps*.—Coal Age July 1 1916; p 17; pp ¾; 20c.

MILL AND MILLING

Crushing, Grinding, Etc.

Lamb, M. R.—*Don Luis Charme's Tre-main Steam Stamp*. [Some details of worries which come to consignees of mining machinery in South America].—E. & M. J. July 1 1916; p 17; pp 2¾*; 25c.

Plummer, W. L.—*Successful Dry Placer Operations at Plomosa, Arizona*. [Speaks of early operations and the pres-ent methods of dry crushing and concen-trating. Tables using air instead of water are used].—Mg. World July 1 1916; p 1; pp 3*; 10c.

Scott, W. A.—*Operations of the Mag-ma Copper Co., Superior, Arizona*. [Gives a brief detailed description of the mine, crushing and concentration].—Mg. World July 1 1916; p 9; pp 1¼*; 10c.

— *Crushing and Grinding Ma-chinery*. [Various types are discussed and advantages of steel composition is mentioned].—E. & M. J. July 1 1916; p 60; pp 4¼; 25c.

Flotation

Anderson, R. J.—*Metallurgical Dis-posal of Flotation Concentrates*. [On methods and results obtained in the breaking up and dewatering of the froth. The concentrates are smelted both direct and briquetted].—Mg. World July 8 1916; p 57; pp 2½; 10c.

Canby, R. C.—*Some Notes on Flota-tion*. [A personal account of experience with flotation work during its early days].—E. & M. J. July 1 1916; p 29; pp 1¾; 25c.

Handy, R. S.—*Bunker Hill & Sullivan Milling Data*. [Flow sheets and draw-ings, with brief description of operations and detailed cost sheet are dealt with].—E. & M. J. July 1 1916; p 35; pp 2¼*; 25c.

Megraw, H. A.—*Apparatus Used in*

III. TECHNOLOGY

MINES AND MINING

Drilling and Boring

Jackson, C.—*Rock Excavation in Coal Mines*. [Five types of drills are de-

Flotation. [Describes the three principal types of machines as Minerals Separation, Callow and Woods machines].—E. & M. J. July 1 1916; p 5; pp 3½*; 25c.

Megraw, H. A.—*Use of Oils in Flotation.* [Discusses the qualities of several kinds of oils and deals also with the action of oils in making the minerals float].—E. & M. J. July 1 1916; p 50; pp 6¾; 25c.

Mueller, W. A.—*Froths Formed by Flotation Oils.* [Pine oil is mostly used. Experience in the use of several oils is given and the variations in different consignments is taken up].—E. & M. J. July 1 1916; p 31; pp 4¾*; 25c.

Smith, R. W.—*Flotation of Flour Gold.* [Gravity concentration failed with this lead-zinc-silver-gold ore. Flotation of slimes and treating the coarse portion by gravity concentration and electrostatic separation gave results].—E. & M. J. July 1 1916; p 25; pp 2¼*; 25c.

Smith, H. H.—*The Theory of Flotation.* [Treats on laboratory experiments on flotation phenomenon].—M. & S. P. July 1 1916; p 16; pp 3½*; 20c.

Concentration: Sorting, Sizing, Washing

Plummer, W. L.—*Successful Dry Placer Operations at Plomosa, Arizona.* [Speaks of early operations and the present methods of dry crushing and concentrating. Tables using air instead of water are used].—Mg. World July 1 1916; p 1; pp 3*; 10c.

Scott, W. A.—*Operations of the Magma Copper Co., Superior, Arizona.* [Gives a brief detailed description of the mine, crushing and concentration].—Mg. World July 1 1916; p 9; pp 1¼*; 10c.

Scott, W. A.—*The Old Dominion Copper Co's Operations, Arizona.* [Haulage, mine water and concentration problems are reviewed].—Mg. World July 8 1916; p 43; pp 2¾*; 10c.

Cyaniding

Gaehelein, P. W.—*Cyaniding Copper-Bearing Ores.* [On operations at the Baker Mines Co., Cornucopia, Ore.].—E. & M. J. July 25 1916; p 22; pp 1¼*; 25c.

MacDonald, B.—*Counter-Migration of Pulp and Solution in Cyanidation and Acid Leaching.* [Abst. from Met. & Chem. Engg. A detailed description of a general hypothetical case].—Mg. World July 1 1916; p 5; pp 1½; 10c.

O'Brien, C.—*Cyanidation at the Comacaran Mines, Salvador.* [Correspondence].—M. & S. P. July 1 1916; p 6; pp 1½; 20c.

Mill and Smelter Costs

Handy, R. S.—*Bunker Hill & Sullivan Milling Data.* [Flow sheets and drawings, with brief description of operations and detailed cost sheet are dealt with].—E. & M. J. July 1 1916; p 35; pp 2¼*; 25c.

McDonald, P. B.—*Mining Around Lovelock, Nevada.* [Costs and accounts of the silver properties in the district, with some information on their production is given. The principal companies are Rochester and Seven Troughs Coalition].—M. & S. P. July 1 1916; p 14; pp 2*; 20c.

—*Operating Costs at the Liberty Bell Mill.*—E. & M. J. July 1 1916; p 3; pp ½; 25c.

—*Stamp Milling at Alaska Treadwell.* [A detailed cost sheet of operations].—E. & M. J. July 1 1916; p 46; pp ½; 25c.

Mill Miscellany

Labbe, Charles.—*The Wrong Mill.* [Tells of experience with poorly designed mills].—E. & M. J. July 1 1916; p 23; pp 1; 25c.

Wiard, E. S.—*Choosing the Mill Site.* [A discussion of factors governing the selection of the site].—E. & M. J. July 1 1916; p 1; pp 3*; 25c.

METALLURGY

Refractories

West, John.—*Silica and Fireclay Materials.* [A paper read before the Manchester District Institution of Gas. Eng. Gives analyses of the composition of several bricks and describes the making of the same].—I. & C. Tr. Rev. June 16 1916; p 691; pp 1*; 35c.

Hydro-Metallurgy

MacDonald, B.—*Counter-Migration of Pulp and Solution in Cyanidation and Acid Leaching.* [Abst. from Met. & Chem. Engg. A detailed description of a general hypothetical case].—Mg. World July 1 1916; p 5; pp 1½; 10c.

POWER AND MACHINERY

Electricity

Jackson, C.—*Rock Excavation in Coal Mines.* [Five types of drills are described, including electric and compressed air drills, the latter getting its air from a portable electrically driven compressor].—Coal Age July 1 1916; p 32; pp 2¼*; 20c.

Musser, H. P.; Lamb, F. B.—*Practical Considerations Relative to Purchased Power.* [Gives curves and discussion comparing the advisability of purchased power over power generated at the mine].—Coal Age July 1 1916; p 15; pp 2*; 20c.

—*Costs of Operating Electric Cap Lamps.*—Coal Age July 1 1916; p 17; pp ¾; 20c.

Hydro-Electric

—*Electric Power in Southern Mines.* [Deals with hydroelectric installations at the iron mines surrounding Birmingham, Ala.].—I. Tr. Rev. June 29 1916; p 1413; pp 2*; 25c.

Compressed Air

Jackson, C.—*Rock Excavation in Coal Mines.* [Five types of drills are described, including electric and compressed air drills, the latter getting its air from a portable electrically driven compressor].—Coal Age July 1 1916; p 32; pp 2¼*; 20c.

Symons, S. W.—*Compressed-Air Coal Cutters in Mines.* [The drill is somewhat similar to the ordinary post rock drill].—Coal Age July 1 1916; p 28; pp 1¼*; 20c.

Combustion Engines

Knowles, C. R.—*The Use of Oil Engines for Pumping.* [A paper read before the Illinois section of the American Water Works Assn. The results of a number of tests on different kinds of fuel are given].—Canadian Eng. June 29 1916; p 676; pp 2¼; 35c.

Steam and Steam Engines

Lamb, M. R.—*Don Luis Charms's Tremain Steam Stamp.* [Some details of worries which come to consignees of mining machinery in South America].—E. & M. J. July 1 1916; p 17; pp 2¾*; 25c.

—*Blowoff Valves and Systems.* [On methods of installing and the selection of the most adaptable type for

particular uses].—Pract. Eng. July 1 1916; p 565; pp 3¾*; 20c.

—*Prices of Machinery for Mines.* [The average prices for mine equipment are plotted in curves for separate classes of machinery according to the size and capacity].—Coal Age July 1 1916; p 22; pp 3*; 20c.

IV. MISCELLANEOUS

Miscellaneous Costs

Musser, H. P.; Lamb, F. B.—*Practical Considerations Relative to Purchased Power.* [Gives curves and discussion comparing the advisability of purchased power over power generated at the mine].—Coal Age July 1 1916; p 15; pp 2*; 20c.

—*Prices of Machinery for Mines.* [The average prices for mine equipment are plotted in curves for separate classes of machinery, according to the size and capacity].—Coal Age July 1 1916; p 22; pp 3*; 20c.

Testing

Knowles, C. R.—*The Use of Oil Engines for Pumping.* [A paper read before the Illinois section of the American Water Works Assn. The results of a number of tests on different kinds of fuel are given].—Canadian Eng. June 29 1916; p 676; pp 2¼; 35c.

Smith, H. H.—*The Theory of Flotation.* [Treats on laboratory experiments on flotation phenomena].—M. & S. P. July 1 1916; p 16; pp 3½*; 20c.

Winmill, T. F.—*The Absorption of Oxygen by Coal.* [A number of tests and analyses along this line are given].—Colly Guard. June 16 1916; p 1135; pp 3¾; 35c.

Metallography

Cain, J. R.; Rawdon, H. S.—*Properties of Ladle Test Ingots.* [Extract of a paper read before the American Soc. for Testing Materials. The question is treated from a metallographic view].—I. Tr. Rev. June 29 1916; p 1419; pp 3*; 25c.

Law, Legislation, Taxation

—*Proposed Remodeled Mining Laws for China.* [An explanation of the fundamental principles on which they are based].—Far Eastern Rev. May 1916; p 466; pp 2½; 35c.

Conservation

Manning, V. H.—*The Conservation of Natural Gas.* [A paper read before the Natural Gas Assn.].—Natural Gas June 1916; p 225; pp 3½; 35c.

History

—*Gold Placers of La Paz District—Arizona.* [On the history and operation of the deposits in the district].—Mg. & Oil Bull. June 1916; p 160; pp 2*; 25c.

Societies

Higgins, W. C.—*Meeting of the Rocky Mountain Coal Mining Institute.* [The meeting was held June 14 and 15 at Salt Lake City, Utah].—S. L. Mg. Rev. June 30 1916; p 17; pp 4½*; 25c.

—*National Association of Colliery Managers, England.* [General annual meeting, 1916].—I. & C. Tr. Rev. June 16 1916; p 696; pp 2; 35c.

—*Natural Gas Association of America.* [Eleventh annual meeting at Pittsburgh, Pa.].—Natural Gas June 1916; p 218; pp 1¼; 35c.

Ore and Metal Markets; Prices-Current

New York, July 13, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended July 12 were as follows:

	New York.	London.
	Cts.	Pence.
July 6.....	63 $\frac{3}{4}$	30 $\frac{1}{4}$
7.....	62 $\frac{3}{4}$	29 15/16
8.....	62	29 $\frac{5}{8}$
10.....	60	28 $\frac{5}{8}$
11.....	60	28 $\frac{5}{8}$
12.....	60 $\frac{7}{8}$	29 $\frac{1}{2}$

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London	
	1916	1915	1915	1916	1915
	High.	Low.	Avg.	Avg.	Avg.
January.....	57 $\frac{1}{2}$	55 $\frac{1}{2}$	56.775	48.890	26.875
February.....	57	56 $\frac{1}{2}$	56.755	48.477	27.000
March.....	60 $\frac{3}{4}$	56 $\frac{1}{2}$	57.935	49.926	27.080
April.....	73 $\frac{1}{2}$	60 $\frac{7}{8}$	64.415	50.034	31.375
May.....	77 $\frac{1}{4}$	68 $\frac{3}{4}$	73	49.915	34.182
June.....	68 $\frac{3}{4}$	62 $\frac{3}{4}$	64.175	49.072	31.038
July.....	.....	.....	.....	47.519	22.950
August.....	.....	.....	.....	47.178	22.750
September.....	.....	.....	.....	48.68	23.600
October.....	.....	.....	.....	49.385	23.923
November.....	.....	.....	.....	51.713	24.640
December.....	.....	.....	.....	55.038	26.232
Year.....	.....	.....	.....	49.690	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Business in copper in the past few days has been of an unimportant character. In fact, the amount of metal sold has been so small that the market is wholly dormant. Prices have shown further slight recessions, but have not indicated any signs of weakness in the market. At London, on the other hand, the standard market has been falling sharply. Some copper authorities are beginning to give vent to utterances of warning. They point out that unless sales for forward delivery are equal to 75% of the future output the maintenance of prices will ultimately prove harmful in that copper instead of receding gradually will fall acutely, solely because of the efforts to sustain prices over a protracted period of inactivity. Other copper factors, however, are confident of the future of the metal. All signs point to another year of war. The reports of the belligerents betray no hope for an early peace and with another 12 months' heavy foreign consumption of copper, and, likewise, domestic absorption, it is contended that copper cannot only be sustained above the 25-ct. level, but will progress beyond the 30-ct. mark as soon as a general buying movement sets in. It is noteworthy that even the large copper producers are not resorting to over-optimism. They all recognize that inflation can easily displace the present firm situation and on every hand there are signs of careful nursing of the market.

Resellers lowered their prices to 26 cts. for spot electrolytic and 25 $\frac{1}{2}$ cts. for futures and in one or two instances prices $\frac{1}{4}$ ct. under these figures were noted. There are some second hands who still hold to 26 $\frac{1}{2}$ cts. for spot and 26 cts. for futures, however. Among the producers it is difficult to secure actual market quotations. The figures mentioned off-hand by the large sellers are not actual market values, but by means of inquiries directed among large consumers it has been established that important first hands are willing to sell September electrolytic at 28 $\frac{1}{2}$ cts., October at 28 $\frac{1}{4}$ cts., November at 28 cts. and December at 27 $\frac{3}{4}$ cts. One wiredrawer reported being offered a round lot for the fourth quarter at 26 cts. Casting copper for spot delivery is held at 24 $\frac{1}{2}$ cts. and futures at 24 cts. by second hands. One producer is not offering beyond September on expectations of an improved market by August. To a certain extent consumers are wholly favorable to the continuation of high prices. Wiredrawers, casting interests and brassmakers who bought copper above 25 cts. and delivery over the third quarter did so on the belief that the market would be sustained and that they would have no difficulty in selling their finished products at the high prices that high casting copper would command. Several

sheetmakers this week lowered their prices $\frac{1}{2}$ ct. to 37 cts., but others are still holding for 37 $\frac{1}{2}$ cts. Copper wire is firmly held at 32 cts. A slump in copper at this time would severely affect domestic manufacturers of copper products, as they could not support their prices with the basis of copper lower.

While standard copper at London has been volplaning, American electrolytic has only declined moderately. This appears to indicate the power of the English government to control the standard market and the ability of the American producer to ignore the standard fluctuations. Standard declined £12 in spot and £11 in futures last week, with electrolytic only £3 lower. At the opening of the current week standard dropped £7 in spot and futures, with electrolytic off £1.

Quotations for copper per pound at New York for the week ended July 12 were as follows:

	Lake.	Electrolytic.	Casting.
July 6.....	27 @27 $\frac{1}{4}$	28 @27 $\frac{1}{4}$	24 @24 $\frac{1}{2}$
7.....	26 $\frac{3}{4}$ @27	26 $\frac{3}{4}$ @27	24 @24 $\frac{1}{2}$
8.....	26 $\frac{3}{4}$ @27	26 $\frac{3}{4}$ @27	24 @24 $\frac{1}{2}$
10.....	26 $\frac{3}{4}$ @27	26 $\frac{3}{4}$ @27	24 @24 $\frac{1}{2}$
11.....	26 $\frac{3}{4}$ @27	26 $\frac{3}{4}$ @27	24 @24 $\frac{1}{2}$
12.....	26 $\frac{3}{4}$ @27	26 $\frac{3}{4}$ @27	24 @24 $\frac{1}{2}$

Note:—These quotations are based on the average of prices asked by first and second hands.

Quotations for copper per ton at London for the week ended July 12 were as follows:

	Spot.	Futures.	Electrolytic.
July 6.....	£97 0 0	£95 0 0	£130 0 0
7.....	91 0 0	89 0 0	129 0 0
8.....	91 0 0	89 0 0	129 0 0
10.....	84 10 0	82 10 0	128 0 0
11.....	88 0 0	86 0 0	128 0 0
12.....	93 0 0	91 0 0	125 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January.....	25.50	23.00	24.101	13.891
February.....	28.50	25.25	27.462	14.72
March.....	28.25	27.25	27.641	15.11
April.....	30.00	28.50	29.40	17.398
May.....	29.75	28.25	29.05	18.812
June.....	29.25	27.25	27.90	19.92
July.....	.....	.....	.....	19.423
August.....	.....	.....	.....	17.472
September.....	.....	.....	.....	17.758
October.....	.....	.....	.....	17.925
November.....	.....	.....	.....	18.856
December.....	.....	.....	.....	20.375
Year.....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January.....	25.50	23.00	24.101	13.707
February.....	28.50	25.25	27.462	14.572
March.....	28.25	27.25	27.410	14.96
April.....	30.50	28.25	29.65	17.057
May.....	29.75	28.00	28.967	18.601
June.....	29.25	27.25	27.90	19.173
July.....	.....	.....	.....	19.08
August.....	.....	.....	.....	17.222
September.....	.....	.....	.....	17.705
October.....	.....	.....	.....	17.859
November.....	.....	.....	.....	18.826
December.....	.....	.....	.....	20.348
Year.....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January.....	24.25	22.00	23.065	88.008	60.760
February.....	27.00	24.12 $\frac{1}{2}$	26.031	102.760	63.392
March.....	27.75	25.50	26.210	106.185	66.235
April.....	28.00	26.75	27.70	103.681	77.461
May.....	27.75	26.00	26.692	104.794	77.360
June.....	24.00	25.25	24.38	94.316	82.350
July.....	.....	.....	.....	.....	74.807
August.....	.....	.....	.....	.....	67.850
September.....	.....	.....	.....	.....	68.560
October.....	.....	.....	.....	.....	72.577
November.....	.....	.....	.....	.....	77.400
December.....	.....	.....	.....	.....	80.400
Year.....	.....	.....	.....	.....	.....

Tin.—Under the adverse influence of heavy stocks the spot tin market has been steadily receding, and futures, after holding firm for a while, have latterly become easy, principally on weakness abroad. The detailed statistics for the month of June were not entirely favorable to the metal and consumers have indicated their belief in lower prices by remaining out of the market. Spot tin declined to 38½ cts. for Straits and 37¼ cts. for Banka. These prices are about 1 ct. off from those prevailing at the beginning of July. New business has been sparse, orders developing only from the cheaper offers of sellers. The situation in the metal furnishes no incentive to buy. Large supplies are en route, adequate stocks are held here by sellers, while the large consumers hold from 2 to 3 months' requirements in store at their plants. Moreover, the apparent freedom in the movement of tin from the Straits via the United Kingdom has removed the baneful influence of the constant holding up of export permits. It is noteworthy to point out that while Straits spot is quoted at 38½ cts., sellers are asking 38 cts. for December delivery, the difference of ½ ct. between these two positions reflecting the weakness of the spot position and the firm attitude taken by sellers on futures. Straits tin for July delivery was held at 38¾ cts., with August held at 38¼ cts., September at 38½ cts. and October, November and December at 38 cts.

The detailed statistics showed the total visible supply on June 30 to be 19,363 tons, a decrease of only 249 tons in the month. Straits shipments totaled 6210 tons. Stocks at consuming ports at the end of June totaled 7124 tons, a gain of 365 tons over the stock on May 31.

Foreign markets last week were rather erratic, but at the opening of the current week the London market declined sharply, Singapore following on Tuesday with a sharp fall. The losses early last week were recovered by the close. On Monday Straits tin at London declined £3 to £171, and standard also suffered a drop of £3.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended July 12 were as follows:

	New York		London		Singapore
	Spot.	July.	Straits.	spot.	
July 6.....	39¼c	39c	£173 15 0	0	£176 0 0
7.....	39c	38¾c	174 0 0	0	176 0 0
8.....	39c	38¾c	174 0 0	0	176 0 0
10.....	38½c	38¾c	171 0 0	0	176 10 0
11.....	38½c	38¼c	169 15 0	0	173 0 0
12.....	38½c	38¾c	170 5 0	0	170 10 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July .....	.....	.....	.....	37.498
August .....	.....	.....	.....	34.386
September .....	.....	.....	.....	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—The trade had an unpleasant surprise last week when the American Smelting & Refining Co. announced a cut of \$10 a ton in its prices. It had been expected that if any change was made it would be upward, as a good business has been done in June and prospects were bright for active buying in July. It develops, however, that foreign buyers indicated that they would not be in the market this month, and in view of the quiet domestic business a price reduction was decided upon. The cut brought quotations down to 6.50 cts. New York and 6.42½ cts. St. Louis, and interests in the outside market began lowering prices below the so-called official, so that at this writing they stand 10 to 17½ points below the A. S. & R. Co. quotations. Independents are offering spot lead at 6.40 cts. New York and 6.25 cts. St. Louis. An unusual development was the offering of lead for delivery up to November by speculators, who asked 6.20 cts. for August and 6.15 cts. for September, October and November. The situation in lead is furnishing discussion. Present prices are only a few cents above normal levels and with another year of war it is pointed out that chances are good for another rise. Speculators are on the brink and from the present outlook

some large speculative buying may soon be done. The future offers are thought to be a prelude to a speculative movement. Producers may not, however, care to sell well ahead at the present low prices, owing to the uncertainty of the ore market. At London the lead market has declined moderately, receding 15s in spot and £1 in futures last week.

Quotations for lead per pound at New York and per ton at London for the week ended July 12 were as follows:

	New York		London	
	Indpls.	A. S. & R. Co.	Spot.	Futures.
July 6.....	6.45c	6.50c	£28 5 0	£27 5 0
7.....	6.45c	6.50c	28 0 0	27 0 0
8.....	6.45c	6.50c	28 0 0	27 0 0
10.....	6.40c	6.50c	28 0 0	27 0 0
11.....	6.45c	6.50c	28 0 0	26 10 0
12.....	6.45c	6.50c	28 0 0	26 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	6.20	5.50	5.926	5.730	31.92
February ...	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July .....	.....	.....	.....	5.738	.....
August .....	.....	.....	.....	4.750	22.150
September ..	.....	.....	.....	4.627	22.953
October .....	.....	.....	.....	4.612	23.932
November ..	.....	.....	.....	5.152	26.240
December ...	.....	.....	.....	5.346	23.884
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—The general decline and slump in the spelter market is having its effect on the prices of ore in the Missouri-Kansas-Oklahoma district, as was noted by a decline of \$2.50 during the week ended July 8. The better grades brought \$75, while the range went down to \$72. There were produced during the week 1,154,970 lbs. of concentrates, which brought the total production of concentrates for the year to 57,149,042 lbs. The values were respectively \$42,169 and \$2,535,897, all figures being based on the 80% metallic content.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July .....	.....	.....	.....	59.00
August .....	.....	.....	.....	47.50
September .....	.....	.....	.....	48.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—The dormant state of the week ended July 1 in the ore market in the Missouri-Kansas-Oklahoma district developed into a weak condition and prices during the week ended July 8 were down \$5 to \$80 per ton on a basis of 60% metallic content. This price ranged down to \$60 as during the previous week. There were produced 11,939,360 lbs. of concentrates valued at \$420,416 and the total for the year to that date was 374,245,554 lbs. valued at \$17,701,696.

Calamine.—A \$5 drop was noted in this class of zinc ore and sales were made at from \$40 to \$55, at which price the ore seemed to be in fair demand. Concentrates produced were placed at 64,010 lbs., valued at \$1440, which made the total for the year to date 18,875,280 lbs., valued at \$701,473.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.60	77.00	116.00
July .....	.....	.....	.....	111.00
August .....	.....	.....	.....	60.25
September ..	.....	.....	.....	76.75
October .....	.....	.....	.....	82.40
November ..	.....	.....	.....	92.50
December ..	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—For the first time since April, 1915, prices on spelter have gone below 10 cts., and with spot now offered at 9½ cts. New York and 9 cts. St. Louis, the receding movement shows no signs of having been arrested. The spot market is very weak and dull. Consumers are using high-priced spelter and have sufficient worries from this score. The present range of quotations makes the subject of futures an active one. Spelter for August delivery is held at 8.25 cts. and for September at 8 cts. St. Louis. On the basis of these values it is argued that spelter for the fourth quarter ought to be had at an average of 7 cts. As such a price would be only 1 ct. above the normal, consumers are showing a strong desire to buy. Producers on the other hand are limiting business and will not consider futures at all. They indicate that ore prices are uncertain and for them to sell heavily for the fourth quarter on the basis of present prices would be foolhardy. Consumers, however, are steadily pressing smelters for fourth quarter quotations. Violent declines at London have tended to accentuate the depression in spot here. Last week spot spelter dropped £17 and futures £14, opening the current week unchanged in spot at £44 and £1 lower in futures at £40.

Quotations for spelter per pound at New York and per ton at London for the week ended July 12 were as follows:

	New York	Spot.	London	Futures.
July 6.....	10¼c	£46 10 0	£43 10 0	
7.....	9½c	44 0 0	41 0 0	
8.....	9½c	44 0 0	41 0 0	
10.....	9¼c	44 0 0	40 0 0	
11.....	9½c	44 0 0	40 0 0	
12.....	9½c	45 0 0	41 0 0	

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1915	1916	1915	1916	1915
January	19.42½	17.30	18.801	6.519	89.840	80.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.45	98.103	48.942
May	17.50	15.75	15.98	15.325	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July				20.803		98.150
August				16.110		68.250
September				14.493		64.400
October				14.196		64.196
November				16.375		88.240
December				16.675		89.153
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Prices have advanced moderately on a continued active demand. Sellers are securing \$83 a flask for virgin spot, an advance of \$3 since our last report. An advance of £1 in quicksilver at London, making the price £17 15s, caused additional firmness here. Business is of good volume, but lacks the element of sensationalism that characterized the last upward movement when the price touched \$300 a flask. It appears that large sellers are closely controlling the metal and not allowing speculators to obtain any large amounts. There is still some quicksilver held by bankers, but it is now reported that these holdings are for the account of a large powder maker and will not be put on the market. Foreign demand continues of fair volume, with orders being received from Scandinavian neutrals.

Antimony.—This metal remains in the slough. Sellers are unable to attract any business, but have endeavored to hold up prices. Thus while Chinese and Japanese are asking 16½ cts. for spot, it would not be difficult to shade to 15 cts. The market is weak, dull and heavy, and it is known that Asiatic producers hold large stocks here and have considerable amounts afloat that are unsold.

Finished Copper, Brass and Other Products.—Makers of zinc sheets announced another reduction last week, putting the price down to \$17 per 100 lbs. Copper sheets have been lowered by some makers to 37 cts. Lead products are unchanged, but a reduction is looked for. Following prices are all f. o. b. mill:

Sheet zinc	.....	\$17.00@
Sheet aluminum, 1917 contract	.....	40.00@
Sheet aluminum, outside market, prompt shipment	.....	85.00@100.00

Copper wire	.....	32.00@	33.00
Sheet copper, hot rolled	.....	37.50@	
Sheet copper, cold rolled	.....	38.50@	
High brass sheet, wire and rods	.....	38.00@	39.50
Low brass sheet, wire and rods	.....	39.50@	42.00
Bronze sheet and wire	.....	40.00@	42.00
Bronze rods	.....	40.00@	42.00
Brazed brass tubing	.....	45.00@	46.50
Brazed bronze tubing	.....	46.00@	47.00
Seamless copper tubing	.....	44.00@	45.00
Seamless brass tubing	.....	43.00@	44.00
Seamless bronze tubing	.....	44.50@	
Full lead sheets	.....	9.25@	
Cut lead sheets	.....	9.50@	

PRICES-CURRENT.

Acids—Muriatic, 18 deg.	.....	3.00	to	3.25
Muriatic, 20 deg.	.....	3.25	to	3.50
Nitric, 36 deg.	.....	.07½	to	.08
Nitric, 40 deg.	.....	.08½	to	.08¾
Alcohol—U. S. P., gal. grain	.....	2.70	to	2.72
Denatured 183 proof, gal.	.....	2.68	to	2.70
Wood, 97 p. c.	.....	.70	to	.71
Alum—Powdered, lb.	.....	.05½	to	.08
Ground, lbs.	.....	.041	to	.07½
Ground, lbs.	.....	.041	to	.07¼
Ammonia—				
Muriate, white grain, lb.	.....	.08½	to	.08¾
Muriate, lump	.....	.17	to	.18
Arsenic—White, lb.	.....	.06¼	to	.06½
Red, lb.	.....	.55	to	.60
Barium Chloride—Ton	.....	110.00	to	115.00
Nitrate, kegs, lb.	.....	.15	to	.16
Bismuth—Metallic, lb.	.....	3.11	to	3.20
Subnitrate	.....	3.10	to	3.15
Bleaching Powder—				
Drums, 100 lbs.	.....	5.25	to	5.75
Borax—100 lbs., car lots	.....	7.50	to	8.00
Coke—Connellsville furnace	.....	2.50	to	2.75
Foundry	.....	3.00	to	3.50
Copperas—Spot, lb.	.....	1.50	to	2.00
Ferromanganese—Spot	.....	200.00	to	225.00
Last half	.....	175.00	to	190.00
Ferrosilicon, 50%	.....			55.00
Ferrotitanium, per lb.	.....	.08	to	.12½
Fuller's Earth, 100 lbs.	.....	.80	to	1.05
Glaucous Salts, bags	.....	.60	to	.70
Calced	.....			2.50
Iron Ore—				
Bessemer, old range, ton	.....	4.45		
Bessemer, Mesabi	.....	4.20		
Non-Bessemer, old range	.....	3.70		
Non-Bessemer, Mesabi	.....	3.55		
White crystals	.....	.15%	to	.15%
Broken, cakes	.....	.14%	to	.15
Powdered	.....	.17	to	.17½
Lead—Granulated, lb.	.....	.15	to	.15½
Brown sugar	.....	.13%	to	.14
Litharge, American, lb.	.....	.09	to	.09½
Mineral Lubricants—				
Black summer	.....	.13	to	.14
20 gr., 15 c. t.	.....	.14	to	.15
Cylinder, light, filtered, gal.	.....	.21	to	.26
Neutral, filtered, lemon, 20 gr.	.....	.37½	to	.38
Wood grade, 30 gr.	.....	.19½	to	.20
Paraffin—High viscosity	.....	.29½	to	.30
Naphtha (New York)—				
Gasoline, auto	.....	.32%	to	.33½
Benzine, 59 to 62°, gal.	.....	.29	to	.29½
Nickel Salt, double	.....	.07½	to	.08½
Single	.....	.10½	to	.11
Petroleum—				
Crude (jobbing), gal.	.....	.15	to	.18
Refined, bbl.	.....			.12
Platinum—Oz. ref.	.....	80.00	to	84.00
Potash Fertilizer Salts—				
Kainit, min. 16% actual potash	.....			32.00
Muriate, 80 to 85%, basis 80%, ton	.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%	.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash	.....	Nominal		32.00
Potassium—				
Bichromate	.....	.40	to	.42
Carbonate, cal. 96 to 98%	.....	1.55	to	1.57
Cyanide, bulk, per 100%	.....	.75	to	1.00
Chlorate	.....	.50	to	.52
Prussiate, yellow	.....	1.00	to	1.25
Prussiate, red	.....	4.00	to	4.25
Salt-peter—Crude, lb.	.....	.15	to	.15½
Refined	.....	.27	to	.29½
Soda—Ash, 58% (43% basis), bbl.	.....	1.25	to	1.50
Strontia Nitrate, casks, lb.	.....	.48	to	.50
Sulphur—				
Crude, ton	.....	23.50	to	29.00
Flowers, 100 lbs.	.....	2.50	to	2.70
Roll, 100 lbs.	.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.	.....	.13½	to	.14½
Crystals, hbls., lb.	.....	.30	to	.30½
Oxide, lb.	.....	.46	to	.48
Zinc Chloride	.....	.14	to	.20

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization			
					Paid In 1916	Total to date	Latest							Paid In 1916	Total to Date	Latest	
							Date	Amt.								Date	Amt.
Acacia, g.	Colo.	1,438,989	\$1	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,915	\$1	\$98,916	Sept. 1, '01	\$0.01				
Adams, s. l.	Colo.	80,000	10	775,000	Dec. 18, '09	.04	Golden Star, g.	Ariz.	400,000	5	120,000	Mar. 15, '10	.06				
Alhambra, c.	Mich.	200,000	25	4,650,000	Apr. 10, '16	.30	Gold' Corn. Fra., g.	Nev.	922,000	1	32,111	Oct. 15, '09	.10				
Alaska Goldfields.	Alaska	250,000	6	403,250	Jan. 10, '15	.15	Goldfield Con.	Nev.	3,553,148	1	28,999,831	Oct. 31, '16	.10				
Alaska Mexican, g.	Alaska	180,000	6	3,607,351	Nov. 28, '15	.10	Good Hope, g. s.	Colo.	500	100	941,250	Jan. 1, '03	.25				
Alaska Mines Sec.	U. S.	600,000	6	90,000	Nov. 1, '06	.01	Grand Central, g.	Utah	500,000	1	119,755	June 15, '16	.01				
Alaska Treadwell, g.	Alaska	200,000	25	15,780,000	May 29, '16	.50	Grand Sp. Anchor, z.	Nev.	550,000	1	1,545,200	Dec. 23, '15	.02				
Alaska United, g.	Alaska	180,200	6	2,045,270	Feb. 28, '16	.30	Grand Central, g.	Utah	600,000	1	1,545,200	Dec. 23, '15	.02				
Alhambra, c.	Mich.	100,000	25	350,000	Apr. 10, '16	1.60	Grand Gulch, c. a.	Nev.	239,845	2.50	11,992	June 1, '16	.03				
Alhambra, c.	Mont.	1,538,829	100	103,444,983	Aug. 30, '15	3.77	Oranite, g.	Alaska	430,000	1	17,200	May 10, '16	.02				
Am. Sm. & R. com	U. S.	600,000	100	1,500,000	30,833,333	June 1, '18	1.60	Owning, g.	Cal.	100,000	10	481,500	Feb. 1, '06	.25			
Am. Sm. & R. pf.	U. S.	600,000	100	1,750,000	56,646,356	June 1, '18	1.75	Hazel, g.	Cal.	900,000	1	1,114,000	Jan. 5, '15	.01			
Am. Sm. Sec. A pf.	U. S.	170,000	100	610,000	11,210,000	Apr. 1, '16	1.50	Hecla, s. l.	Idaho	1,000,000	0.25	4,405,000	June 20, '18	.15			
Am. Sm. Sec. B pf.	U. S.	300,000	100	750,000	16,260,000	Apr. 3, '16	1.25	Hercules	Idaho	1,000,000	1	12,200,000	June 16, '16	.20			
Am. Zinc, L. & S.	Mo.	193,120	25	2,414,000	3,622,827	June 10, '16	1.25	Hidden Treasure, g.	Cal.	30,000	10	457,452	Sept. 1, '00	.10			
Anacoula, c.	Mont.	2,331,250	60	8,993,750	171,251,771	May 20, '16	1.50	Holy Terror, g.	S. D.	600,000	1	172,000	Jan. 1, '00	.01			
Ann Laurie, g.	Utah	25,000	100	429,561	Apr. 22, '05	.50	Homestake, g.	S. D.	251,160	100	979,524	June 25, '16	.66				
Argonaut, g.	Cal.	200,000	5	70,000	1,644,000	Mar. 27, '16	.10	Hope Dev.	Cal.	600,000	1	5,000	Dec. 31, '15	.01			
Arizona, c.	Ariz.	100,000	25	629,550	30,220,434	Apr. 1, '18	.30	Horn Silver, l. s. z.	Utah	400,000	1	41,000	June 30, '16	.05			
Atlantic, c.	Mich.	84,819	6	990,000	Feb. 21, '05	.50	Imperial, c.	Ariz.	500,000	10	300,000	June 24, '07	.20				
Bagdad-Chase, g. pf.	Mont.	250,000	1	202,394	Jan. 1, '09	.10	Independ'ce Con., g.	Cal.	2,500,000	1	281,375	Apr. 1, '01	.04				
Bald Butte, g. s.	Mich.	100,000	25	1,364,648	Nov. 1, '07	.04	Inspiration Con.	Ariz.	920,687	20	1,149,859	May 1, '16	1.25				
Baltic, c.	Mont.	40,000	5	7,950,000	Dec. 31, '13	2.00	Inter'l Nickel, com.	U. S.	1,673,334	25	5,438,498	June 1, '16	2.00				
Barnes-Kinz, g.	Utah	1,000,000	0.10	60,000	June 1, '16	.07%	Inter'l Nickel, pf.	U. S.	89,126	100	267,378	May 2, '16	1.50				
Beck Tunnel Con.	Utah	400,000	1	940,000	Nov. 15, '07	.02	Intern'l Sm. & Ref.	U. S.	100,000	100	4,100,000	May 2, '14	2.00				
Big Four Expl.	Utah	225,689	5	60,000	June 15, '16	.06	Interstate-Callahan	Idaho	461,990	10	1,334,970	June 30, '16	1.50				
Bingham-N. Haven	Utah	120,000	1	980,493	Dec. 20, '15	.20	Iowa, g. s. l.	Colo.	1,666,667	1	270,167	Dec. 31, '15	.00%				
Board of Trade, z.	Wis.	998,296	5	78,000	Jan. 15, '11	.06	Iowa Tiger, g. s. l.	Colo.	3,000	1	25,179	Jan. 15, '16	.50				
Bonanza Dev.	Colo.	300,000	1	1,425,000	Oct. 28, '11	.20	Iron Blossom, l. s. g.	Utah	1,000,000	1	2,650,000	Apr. 15, '16	.10				
B. och (Reorganized)	Nev.	998,296	5	349,949	June 25, '16	.65	Iron Cap pf. c.	Ariz.	33,451	10	23,351	Dec. 31, '15	.17%				
Boss, k.	Nev.	100,000	1	40,850	Dec. 10, '14	.10	Iron Clad, g.	Colo.	1,000,000	1	50,000	Nov. 1, '06	.05				
Boston & Mont. Con.	Mont.	100,000	25	402,350	Oct. 1, '02	.75	Iron Silver	Colo.	500,000	20	5,050,000	Dec. 31, '15	.10				
Breese, l. s.	Cal.	200,000	25	63,225,000	May 15, '11	4.00	Isabella, g.	Colo.	2,250,000	1	742,500	Mar. 1, '13	.01				
Brunswick Con., g.	Cal.	300,000	1	220,000	Dec. 15, '13	.10	Isle Royale, c.	Mich.	160,000	25	150,000	Mar. 31, '13	1.00				
Bullion-B. & Champ	Utah	100,000	10	203,315	Sept. 15, '15	.06	Jamison, g.	Cal.	390,000	10	378,300	Jan. 1, '11	.02				
Bullwhacker, c.	Mont.	450,000	1	2,768,400	July 11, '08	.10	Jerry Johnson, g.	Colo.	2,600,000	10	187,500	Nov. 5, '14	.00%				
Bunker Hill Con.	Cal.	200,000	1	10,000	July 1, '07	.01	Jim Butler	Nev.	1,718,020	1	343,604	Feb. 2, '16	.10				
Bunker Hill & Sulf.	Idaho	327,000	10	851,000	June 4, '18	.02%	John O. & Spelter	Mo.	400,000	5	44,008	June 22, '16	.05%				
Butte All. Scott, c.	Mont.	75,000	10	17,590,500	June 1, '16	.40	Jumbo Est., g.	Nev.	1,550,000	1	43,898	June 30, '16	.05				
Butte Balaklava, c.	Mont.	250,000	15	1,054,119	Apr. 10, '16	.50	Kendall, g.	Mont.	500,000	5	1,555,000	Apr. 1, '16	.10				
Butte Coalition, c.	Mont.	1,000,000	15	125,000	Aug. 1, '10	.60	Kenefick Zinc	Mo.	200,000	1	60,000	June 30, '16	.10				
Butte & Superior, z.	Mont.	272,697	10	125,000	Dec. 1, '11	.25	Kennecott	Alas.	250,000	10	12,000,000	June 30, '16	1.50				
Caledonia, l. s. c.	Idaho	2,005,000	1	11,383,017	June 30, '16	.10	Kennedy, g.	Cal.	100,000	100	1,801,001	June 1, '00	.05				
Calumet & Ariz., c.	Ariz.	641,923	10	1,351,611	June 1, '16	.03	King of Ariz., g.	Ariz.	200,000	1	398,000	Aug. 2, '09	.12				
Calumet & Hecla, c.	Mich.	100,000	25	25,714,031	June 20, '16	2.00	Klar Placquet, z.	Wis.	20,000	1	157,600	Dec. 18, '12	.25				
Camp Bird, g.	Colo.	1,750,000	25	132,250,000	June 23, '16	15.00	Knob Hill, g.	Wash.	1,000,000	1	70,000	Aug. 1, '13	.00%				
Cardiff, l.	Utah	600,000	1	113,584	Jan. 1, '16	.17%	La Fortuna, g.	Ariz.	250,000	1	1,200,600	Oct. 1, '02	.01%				
Carlisle, g. s. c.	Utah	600,000	1	125,000	June 1, '16	.25	Lake View	Utah	500,000	.05	102,600	May 10, '16	.02%				
Cashier, g.	Colo.	900,000	1	26,160	Dec. 1, '06	.01	Last Dollar, g.	Colo.	1,500,000	1	180,000	Feb. 23, '03	.10				
Centennial Eureka	Utah	100,000	25	4,000,000	Apr. 25, '16	1.00	Liberty Bell, g.	Colo.	133,551	5	1,752,795	Jan. 31, '15	.06				
Center Creek, l. z.	Mo.	100,000	10	590,000	Apr. 1, '18	.25	Linden, g.	Cal.	102,255	1	331,179	June 1, '06	.06				
Central Eureka, g.	Cal.	100,000	1	739,159	Mar. 5, '06	.05	Lindner, z.	Wis.	1,020	10	11,200	Dec. 31, '16	3.00				
Century, g. s. l.	Utah	1,000,000	1	292,097	Feb. 15, '16	.05	Little Bell, s. l.	Utah	300,000	1	75,000	Apr. 22, '16	.06				
Champion, c.	Mich.	100,000	25	13,721,000	June 7, '16	6.40	Little Florence	Nev.	1,000,000	1	430,000	Jan. 1, '08	.03				
Chert Con.	Utah	882,950	1	419,212	May 15, '16	.05	Lost Packer	Idaho	150,000	1	37,500	Oct. 23, '13	.25				
Chino Copper C.	N. M.	869,950	5	9,742,929	June 30, '16	2.25	Lower Mammoth	Utah	1,000,000	1	67,000	Dec. 15, '15	.12				
C. K. & N. g.	Colo.	1,431,900	1	171,828	Nov. 1, '04	.01	MacNamara, g. s.	Nev.	734,576	1	46,800	Apr. 25, '05	.00				
Cliff, g.	Alaska	100,000	1	115,000	Feb. 5, '14	.06	Magma, c.	Ariz.	240,000	5.00	480,000	June 30, '16	.50				
Cliff, s. l.	Utah	300,000	10	90,000	Jan. 1, '13	.10	Mammoth, g. s. c.	Utah	400,000	10	2,390,000	Apr. 20, '16	.06				
Clinton, g. s.	Colo.	1,000	100	60,000	Dec. 1, '03	.30	Manhattan-Big 4	Nev.	762,400	1	30,248	Aug. 15, '11	.02				
Colo. G. Dredging	Colo.	200,000	10	425,000	Feb. 23, '16	1.00	Mary McKinley, g.	Colo.	1,309,252	1	1,169,306	July 28, '14	.02				
Colorado, s. l.	Utah	1,000,000	0.20	2,600,000	Mar. 15, '13	.03	May Day	Utah	800,000	0.25	284,000	May 26, '16	.02				
Columbus Con., l. s. c.	Utah	253,840	5	212,623	Oct. 14, '07	.20	Mary Murphy, g. s. l.	Colo.	370,000	5	93,106	May 1, '16	.07				
Combination, g.	Nev.	320,000	1	873,000	Dec. 1, '06	.15	Mexican, g. s.	Nev.	201,600	3	171,360	June 4, '14	.75				
Comstock-Phoenix	Nev.	785,000	1	60,000	Nov. 1, '11	.10	Miami, c.	Ariz.	747,114	5	7,454,442	May 15, '16	1.50				
Con. Mercur, g.	Utah	1,000,000	1	1,260,000	Dec. 1, '13	.10	Mine La Motte, l.	Mo.	300,000	10	300,000	Jan. 23, '04	.20				
Consolidated, z.	Colo.	2,500,000	1	350,000	Mar. 1, '02	.01	Modoc, g. s.	Colo.	500,000	1	475,000	Oct. 20, '11	.01				
Con. St. Goliard, z.	Cal.	100,000	10	11,430	Oct. 14, '08	.05	Mogollon, g. s.	N. M.	336,652	1	130,000	Aug. 1, '15	.10				
Continental, z.	Mo.	22,000	25	661,000	Dec. 30, '15	10.00	Mohawk, c.	Mich.	100,000	25	5,575,000	Feb. 1, '16	.00				
Copper																	

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah	600,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success	Ida.	1,500,000	\$1	\$300,000	\$1,080,000	June 23, '16	\$0.03
Pharmacist, g.	Colo.	1,500,000	1	.....	91,500	Feb. 1, '10	.00%	Superior & Pitts, c.	Ariz.	1,499,792	10	.....	10,318,568	Dec. 21, '15	.38
Phelps, Dodge & Co	U. S.	450,000	100	6,400,000	63,771,527	May 30, '15	5.00	Swansea, s. l.	Utah	100,000	5	.....	334,500	Apr. 23, '07	.06
Pioneer, g.	Alaska	1,000,000	1	.....	2,041,525	Oct. 7, '11	.03	Tamarack, c.	Idaho	2,000,000	25	80,000	9,420,000	July 23, '07	4.00
Pittsburg	Ida.	1,000,000	1	.....	20,000	July 15, '07	.02	Tamarack-Custer	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '15	.75
Pittsburg-Idaho, l.	Nev.	2,790,000	1	.....	249,104	July 15, '13	.04	Tennessee, c.	Cal.	100	100	.....	160,000	Jan. 3, '14	.....
Pitts Silver Peak	Wis.	600	60	.....	840,600	Dec. 1, '14	.02	Tighner	Colo.	310,000	5	.....	3,659,000	Dec. 31, '15	.24
Platteville, l. z.	Cal.	150,625	10	.....	179,500	June 15, '07	10.00	Tomboy, g. s.	Ariz.	909,555	1	.....	2,555,934	Sept. 5, '15	.01
Plumas Eureka, g.	Cal.	240,000	5	58,250	2,831,294	Apr. 8, '01	.06	Tom Reed, g.	Nev.	1,500,000	1	375,008	8,018,026	Apr. 1, '16	.12%
Plymouth Con.	Colo.	3,000,000	1	180,000	231,050	Apr. 10, '16	.24	Ton-Extension, g. s.	Nev.	1,272,501	1	190,888	1,178,084	Apr. 1, '16	.10
Portland, g.	Nev.	1,000,000	2	75,000	10,357,080	Apr. 20, '16	.03	Tonopah, g. s.	Nev.	1,000,000	1	300,000	13,300,000	Apr. 21, '15	.15
Prince Con., s. l.	Nev.	100,000	10	.....	375,000	July 31, '07	.20	Tonopah Midway, g.	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.05%
Quartzette, g. s.	Cal.	43,000	100	.....	1,931,411	Apr. 8, '03	.60	Tremis	Cal.	300,000	2.50	.....	234,000	Apr. 28, '15	.02
Quicksilver, pf.	Wash.	1,500,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,100,000	Oct. 30, '12	3.00
Quilp, g.	Mich.	110,000	25	770,000	22,547,500	June 30, '15	4.00	Tuolumne, c.	Mont.	600,000	1	.....	495,525	Apr. 15, '13	.10
Quincy, C.	Ariz.	1,571,279	10	1,571,279	6,144,406	June 30, '15	.50	Uncle Sam Con. s.	Utah	800,000	1	.....	470,000	Sept. 20, '11	.05
Ray Con., c.	Mont.	300,000	6	.....	72,000	Oct. 9, '04	.01	Union, g.	Colo.	1,250,000	1	.....	444,241	Jan. 27, '03	.02
Red Bird, g. s. c. l.	Mont.	100,000	10	.....	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	.....	167,070	Nov. 15, '15	.10
Red Metal, c.	Nev.	1,000,000	1	.....	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	50,000	100	.....	1,500,000	Apr. 15, '07	3.00
Red Top, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	.....	6,125,000	Aug. 6, '07	1.75
Republic, g.	Nev.	54,000	1	.....	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	.....	211,527	Oct. 15, '07	.50
Richmond, g. s. l.	Nev.	300,000	1	.....	152,500	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Rocco Home, l. z.	Mo.	4,900	100	.....	109,848	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Rochester Id. & L.	Nev.	889,018	1	.....	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	759,000	3,335,000	June 30, '15	19.00
Round Mountain, g.	Utah	1,000,000	5	.....	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	50,000	100	.....	11,000,000	Sept. 23, '10	5.00
Sacramento, g.	Mo.	1,464,798	10	704,733	10,972,531	June 30, '16	.25	United Verde, c.	Ariz.	300,000	10	1,395,000	37,822,000	June 3, '15	1.50
Salt Lake, g.	Mich.	160,000	25	1,440,000	6,240,000	June 28, '15	2.00	U. S. Red & R. com.	Colo.	59,188	100	.....	414,078	Oct. 9, '03	1.00
Schoenbr. Wal. n. z. l.	Mo.	10,000	10	.....	90,000	Sept. 20, '11	.20	U. S. Red & R. pf.	Colo.	39,458	100	.....	1,775,936	Oct. 9, '03	1.00
Schoenbr. Wal. n. z. l.	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '15	.02	U. S. R. & M. com	USMx	351,115	50	614,451	7,239,830	Apr. 15, '16	1.00
Schoenbr. Wal. n. z. l.	Nev.	1,443,077	1	35,078	252,532	Apr. 1, '15	.02%	U. S. R. & M. pf.	USMx	456,350	50	859,112	17,654,810	Apr. 15, '16	.57%
Seven Tro. Ch. g. s.	Ariz.	300,000	10	.....	750,000	Jan. 30, '13	.50	Utah, c. s.	Utah	1,624,490	10	8,934,895	41,555,592	June 30, '16	3.00
Shannon, c.	Ariz.	350,000	10	787,500	3,752,500	Apr. 20, '16	1.25	Utah, s. l. (Fish Sps)	Utah	93,000	10	.....	293,720	Oct. 21, '10	.02%
Shattuck-Ariz., c.	Nev.	108,000	1	.....	68,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	528,200	5	132,050	198,075	Apr. 1, '16	.12%
Silver Hill, g. s.	Utah	1,250,000	5	375,000	13,958,885	Apr. 1, '16	.15	Utah Con., c.	Utah	300,000	5	450,000	9,600,000	June 26, '15	.75
*Silver King Coal N.	Utah	637,582	1	63,758	878,515	Apr. 22, '15	.10	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00
Silver King Con.	N. Y.	10,000	100	.....	250,000	June 16, '10	2.00	Victoria, g. s. l.	Utah	250,000	1	.....	207,600	Apr. 23, '10	.04
Silver Mines Expl.	Utah	745,389	1	.....	872,105	June 20, '11	.04	Victor Con., g.	Colo.	1,500,000	1	90,000	3,362,500	Apr. 25, '15	.03
Sioux Cons., l. s. c.	Cal.	1,000,000	5	.....	365,000	Oct. 2, '14	.01	Wasp No. 2, g.	S. D.	500,000	1	100,000	49,466	May 15, '16	.02%
Skidoo, g.	Colo.	.....	1	.....	2,235,000	Nov. 22, '06	.03	Wellington, l. z.	Colo.	10,000,000	1	200,000	850,000	May 15, '16	.02
Smuggler, s. l. z.	Idaho	1,500,000	1	.....	1,169,510	Oct. 10, '13	.01%	West End Con.	Nev.	1,785,485	1	.....	636,545	Jan. 15, '16	.05
Snowstorm, c.	N. M.	372,342	6	37,734	177,205	June 1, '16	.05	West Hill, c.	Wis.	20,000	1	8,000	40,000	June 23, '16	.20
Socorro, g.	Cal.	299,981	1	125,940	1,367,774	June 15, '16	.07	White Knob, g. pf.	Cal.	200,000	10	40,000	170,000	May 29, '16	.10
South Eureka, g.	Utah	300,000	1	.....	237,500	Apr. 3, '04	.01%	Wilbert	Ida.	1,000,000	1	20,000	30,000	May 1, '16	.01
Sp. Swansea, g. s. l.	S. D.	1,500,000	1	.....	165,600	Jan. 7, '06	.01	Wolverjoe, c.	Mich.	60,000	25	350,000	8,760,000	Apr. 1, '16	5.00
Spearfish, g.	Cal.	178,394	10	.....	5,274,408	Nov. 17, '13	.25	Wolverjoe & Ariz. c	Ariz.	118,574	15	.....	53,403	.....	.25
Standard Con., g. s.	Ariz.	425,000	1	.....	69,600	Sept. 8, '05	.50	Work, g.	Colo.	1,500,000	1	.....	1,597,685	Apr. 31, '12	.02
Standard, c.	Idaho	1,238,362	1	.....	2,043,297	Dec. 5, '11	.05	Yak.	Colo.	1,000,000	1	120,000	2,127,685	June 30, '16	.07
Stewart, l. z.	Colo.	2,000,000	1	.....	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	.....	167,500	Feb. 1, '13	.01
Stratton's Crip. Ck.	Colo.	1,000,000	5	.....	6,028,588	Dec. 23, '05	.12	Yellow Aster, g.	Cal.	100,000	10	13,000	1,155,789	June 6, '16	.02
Stratton's Ind.	Colo.	1,000,000	30	160,000	691,250	Jan. 21, '15	.15	Yellow Pine.	Cal.	1,000,000	1	500,000	1,393,000	June 25, '15	.15
Str'n's Ind. (new) g.	Colo.	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	.....	102,583	July 15, '14	.10
Strong, g.															

Corrected to July 1, 1916

*Includes dividends paid by Silver King Mfg. Co. to 1907—\$10,675.00

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1915	Total to Date	Latest Date	Amt.					Paid in 1915	Total to Date	Latest Date	Amt.
Ajuchitan.....	Mex...	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrilas.....	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00
Amistad y Concordia g.s	Mex...	9,600	50	.....	429,358	July 15, '08	1.28	Le Roi No. 2, g.....	B. C....	120,000	25	36,450	1,661,650	Mar. 15, '16	\$0.30
Amparo, s. g.....	Mex...	2,000,000	1	200,000	2,132,176	May 10, '15	.05	Lucky Tiger.....	Mex...	715,337	10	207,448	3,470,839	June 20, '16	.03
Bartolo de Medina Mill	Mex...	2,000	25	.....	103,591	Aug. 1, '07	.60	McKinley-Darragh-Sav.	Ont....	2,247,692	1	134,861	4,742,530	Apr. 1, '16	.03
Batopilas, s.....	Mex...	445,283	20	.....	55,870	Dec. 31, '07	.12%	Mexican, l. pf.....	Mex...	12,500	100	.....	1,018,750	May 1, '12	.30
Beaver Con., s.....	Ont...	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.....	Mex...	240,000	10	.....	660,000	Mar. 10, '08	.25
Boleo, g.....	Mex...	120,000	20	.....	721,871	May 8, '11	.60	Mexico Mines of El Oro	Mex...	150,000	5	.....	4,475,500	June 25, '14	.96
British Columbia, c.	B. C....	591,709	5	.....	615,399	Jan. 6, '13	.15	Minas Pedrazini.....	Mex...	1,000,000	1	.....	497,500	Jan. 23, '11	.06%
Buenos Tierra.....	Mex...	330,000	5	.....	160,380	Jan. 30, '15	.24	Mines Co. of Am.....	Mex...	900,000	10	.....	4,984,600	July 25, '13	.12%
Bufalo, Ont.....	Ont...	1,000,000	1	.....	2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can....	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%
Canadian Goldfields	Can....	800,000	0.10	.....	237,099	July 15, '14	.01%	Montezuma, l. pf.....	Mex...	5,000	100	.....	402,500	Nov. 15, '12	3.50
Cananea Central, c.	Mex...	600,000	10	.....	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex...	500,000	1	.....	100,000	July 20, '09	.04
Cariboo-Cobalt.....	Ont...	1,000,000	1	.....	295,000	Sept. 1, '15	.09	Mother Lode.....	B. C....	1,250,000	1	137,500	137,500	Jan. 3, '16	.11
Cariboo-McKinney, g.	B. C....	1,250,000	1	.....	55,250	Dec. 1, '09	.00%	Nalca, s. l.....	Mex...	100	300	.....	3,190,000	Oct. 11, '09	\$2.53
City of Cobalt.....	Ont...	4,751,500	1	.....	138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A....	200,000	10	140,000	3,890,000	Apr. 28, '16	.50
Cobalt Central, s.....	Ont...	3,000,000	1	.....	192,845	Aug. 24, '09	.01	Nipissing, s.....	Ont....	1,200,000	5	600,000	14,040,000	Apr. 20, '15	.25
Cobalt Lake, s.....	Ont...	3,000,000	1	.....	465,000	May 29, '14	.02%	North Star, s. l.....	B. C....	1,300,000	1	.....	635,000	Feb. 1, '10	.60
Cobalt Silver Queen	Ont...	1,500,000	1	.....	315,000	Dec. 1, '08	.03	Paloma, g.....	Mex...	3,000	.....	.....	99,600	Dec. 1, '12	6.00
Cobalt Townsite, s.	Ont...	199,282	5	.....	1,042,259	Aug. 20, '14	.24	Panuco.....	Mex...	10,000	.....	.....	7,465,000	Nov. 4, '09	5.00
Coniagas, s.....	Ont...	800,000	5	200,000	8,040,000	Feb. 6, '15	.25	Peneles, s. g.....	Mex...	120,000	20	.....	6,451,867	Sept. 30, '13	1.25
Con. Mg. & Sm., g. s. c.	B. C....	65,560	100	.....	2,470,246	Apr. 1, '15	2.50	Peregriana, pf.....	Mex...	10,000	100	.....	328,656	Sept. 1, 1910	.30
Crown Reserve, s.....	Ont...	1,999,957	1	.....	6,102,408	July 15, '15	.03	Peterson Lake.....	Ont....	2,401,820	1	42,032	294,224	Mar. 1, '16	.01%
Dolores.....	Mex...	400,000	5	.....	1,374,865	July 24, '11	.22%	Pinguico, pf.....	Mex...	20,000	100	.....	750,000	Apr. 15, '13	3.00
Dome Mines, s.....	Ont...	400,000	10	400,000	800,000	Sept. 1, '15	.50	Porpucpine Crown.....	Ont...	2,000,000	1	120,000	540,000	Apr. 2, '16	.03
Dos Estrellas, (El Oro)	Mex...	300,000	0.50	.....	15,405,000	Sept. 1, '15	.05	San Jacinto, (El Oro)	Mex...	6,000	.....	.....	953,360	Apr. 1, '08	1.00
El Oro, g. s.....	Mex...	3,500,000	1	.....	210,000	Apr. 30, '14	.01	Rambler-Cariboo.....	B. C....	15,500	100	.....	475,500	Mar. 1, '16	.02
El Rayo, g. s.....	Mex...	1,147,500	5	.....	9,135,842	July 11, '13	.24	Rea Mines, Leasing	Ont....	200,000	1	.....	12,750	Feb. 20, '15	.06%
El Triunfo, c.....	Mex...	250,020	2	.....	140,410	Apr. 24, '11	.16	Right of Way.....	Ont....	1,685,500	1	16,855	560,514	June 15, '08	.00%
Esperanza, s. g.....	Mex...	2,000,000	1	.....	20,000	Aug. 28, '11	.01	Rio Piata.....	Mex...	374,518	5	.....	345,744	Feb. 1, '13	.05
Granby, s. g.....	Mex...	450,000	5	.....	12,521,250	Dec. 31, '15	.10	San Francisco Mill	Mex...	5,000	25	.....	445,086	Oct. 15, '08	1.00
Oranby Con., c. g. s.	B. C....	149,985	100	449,956	6,050,341	May 1, '16	1.50	San Rafael.....	Mex...	2,400	25	.....	6,798,260	Jan. 11, '12	2.00
Greene-Cananea, c.	Mex...	474,411	100	1,458,627	1,694,432	May 29, '16	2.00	San Toy, s. l.....	Mex...	6,000,000	1.00	.....	540,000	July 24, '13	.01
Greene Con., c.....	Mex...	1,500,000	1	1,500,000	11,590,000	Apr. 25, '15	.10	Santa Gertrudis, Hdgo.	Mex...	1,500,000	5	.....	2,455,272	Nov. 17, '15	.24
Greene Gold-Silver, pf.	Mex...	300,000	10	.....	194,871	Mar. 25, '07	.04	Sa. Gertr. y Guadalupe, g.s	Mex...	60,000	.....	.....	3,960,000	Mar. 27, '09	1.00
Guanaquato Con.....	Mex...	640,000	5	.....	600,000	Oct. 8, '06	.07%	Sta. Maria del Par.....	Mex...	9,600	12 1/2	.....	5,606,000	Jan. 2, '13	.60
Guanaquato Dev., pf.	Mex...	10,000	100	.....	274,356	Jan. 1, '11	.80	Seneca-Superior.....	Ont....	475,834	1	335,219	1,316,431	June 15, '16	.30
Ouanaghelm Exploiat.	Mex...	833,732	25	10,713.456	34,032,780	Apr. 3, '16	11.85	Soledad, s. l.....	Mex...	960	20	.....	4,439,840	Oct. 17, '11	.80
Haleybury, s.....	Ont...	60,000	1	.....	50,000	Apr. 5, '11	.50	Sorpesa, g. s.....	Mex...	19,200	20	.....	3,979,240	Jan. 6, '11	34.00
Hedley.....	B. C....	120,000	10	120,000	1,943,520	June 30, '15	.80	Standard, s. l.....	B. C....	2,000,000	1	300,000	2,100,000	June 10, '16	.02%
Hinds Con., g. s. l.	Mex...	5,000,000	1	.....	83,000	Feb. 27, '01	.02	Temiscam'g & Hud. Bay	Ont....	7,761	1	.....	1,940,250	Nov. 10, '11	3.00
Hollinger.....	Mex...	600,000	10	720,000	4,890,000	June 15, '15	.40	Temiskaming, s.....	Ont...	2,600,000	.....	.....	1,423,156	Dec. 31 '15	.03
Juana, c.....	Mex...	10,000	100	.....	975,000	Feb. 25, '11	.60	Temiskam., c.....	Mex...	100	.....	.....	3,960,000	Jan. 1, '09	1.00
Kerr Lake, s.....	Ont...	600,000	5	300,000	6,420,000	June 1, '16	.25	Trough-Oakes.....	Ont...	531,500	5	137,575	199,312	Apr. 3, '16	.12
La Rianca.....	Mex...	140,000	20	.....	2,775,700	Mar. 31, '13	.30	Truethway, s.....	Ont...	1,000,000	.....	.....	1,061,988	July 15, '14	.05
La Republica, s.....	Mex...	400,000	5	.....	110,000	Aug. 15, '11	.05	Wetlaufer-Lorrain, s.	Ont...	1,416,590	1	.....	656,386	Oct. 20, '13	.05
La Rose Con., s.....	Ont...	1,498,827	5	149,862	5,636,982	Apr. 20, '16	.05	Yukon, c.....	Y. T....	3,500,000	5	525,000	8,108,110	June 30, '16	.07

Electric Arc Welding Finds Many Uses in Mines and Mills

By J. A. SEEDE.*

Electric arc welding is rapidly finding many uses in machine shops, steel works and in mines. With the severe usage characteristic of the service in mines and smelters, the arc welding equipment should find many uses, and undoubtedly will form a very useful part of shop equipments in the near future.

All commercial arc welding is done with either carbon or metallic electrodes, taking power from constant

kinds of work, especially non-ferrous welding, require the use of fluxes.

In all classes of welding the test of the work is its quality, and the operator is largely responsible for the successful production of good welds. The generating equipment should be of ample capacity to maintain a

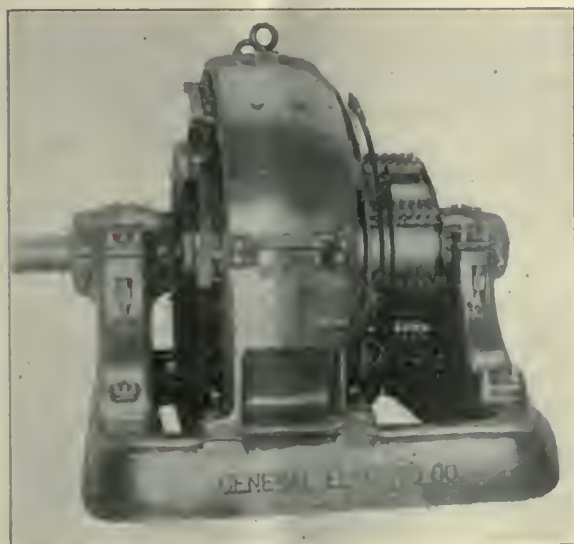


FIG. 1. PORTABLE ARC WELDING EQUIPMENT.

current or constant voltage equipments. With carbon electrodes all kinds of work can be done, from the lightest up to work taking 1000 amps. or more, the latter referring principally to cutting, as it is very seldom that more than 500 amps. can be used for even the heaviest welding. The metallic electrode welding may vary from 30 amps., or even lighter, up to 200 amps. for the heaviest work. The consensus of opinion seems to be that the best grade of work can be done with bare electrodes without fluxes, but there are many advocates of the use of fluxes, who state that many

*Of Power and Engineering Department of General Electric Co.

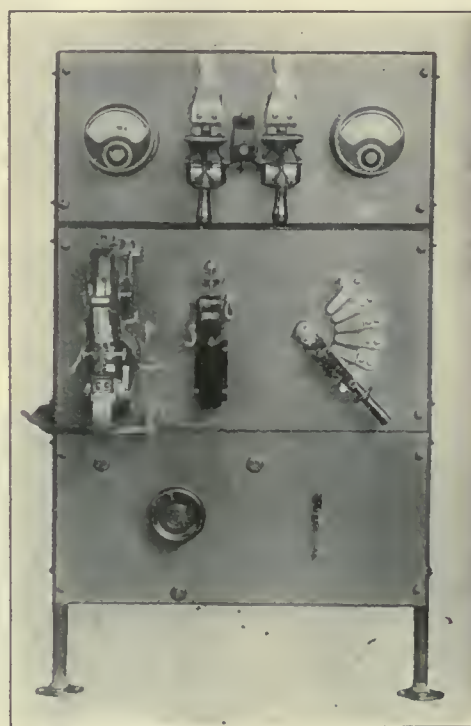


FIG. 2. ARC WELDING GENERATOR PANEL.

steady voltage under the severe service imposed by this work, and so designed as to be free from sparking and overheating during severe overloads. The quality of the electrodes also affects the work directly, and in general the electrodes should be of smooth texture, free from irregularities of all kinds and of uniform chemical composition.

An up-to-date arc welding equipment consists of a compound-wound, direct-current generator designed

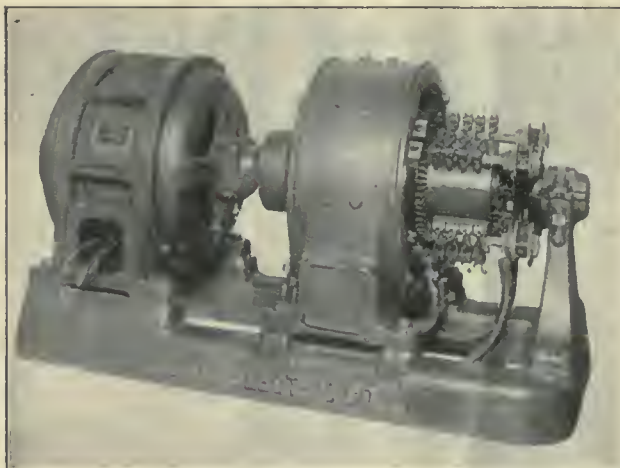


FIG. 3. ARC WELDING SET, CONSISTING OF GENERATOR DRIVEN BY INDUCTION MOTOR.

to operate at some constant voltage from 60 to 75 volts, and arranged for any standard method of driving. The main control panel is usually provided with a welding circuit of full capacity of the equipment in addition to the customary field rheostats, instruments, etc., and each auxiliary welding panel is provided with a simple equipment consisting of control rheostats and automatic device for protecting the generator and the work in case of short circuit due to accident or carelessness on the part of the operator.

Equipments have been standardized by the General Electric Co. in capacities of 200, 300 and 400 amps. for portable work, and in capacities of 200, 300, 400,



FIG. 4. BROKEN TAPS REMOVED BY ARC WELDING EQUIPMENT.

500, 600, 800, 1000 and 1250 amps. for stationary work. While the small sizes are generally designed for one operator only, they can be used for more operators if the work is of a sufficiently light character, in which case the number of operators can be increased up to the capacity of the equipment, and this latter condition holds good for all capacities. In this connection it is interesting to note that for certain classes of work there seems to be a definite movement toward

installing large numbers of single operator equipments, instead of using large machines and a number of auxiliary panels. This movement seems to be based on the high cost of necessary heavy wiring work where leads must be carried long distances, and where only light work is to be done it is obviously advantageous to allow each operator to have full control of the volts

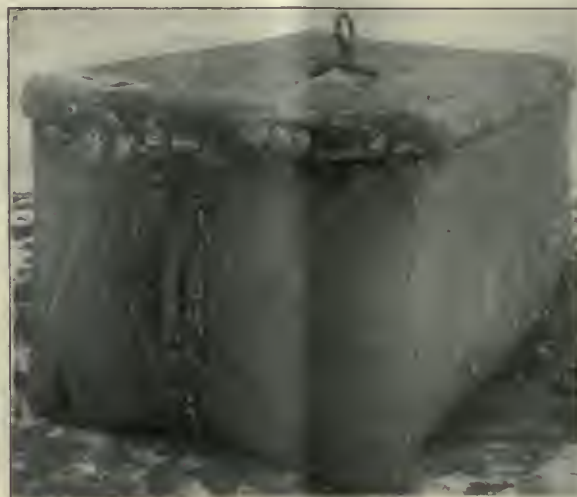


FIG. 5. ANNEALING BOX WITH HOLE WELDED IN CORNER, RIVETS BUILT UP AND PLATES WELDED AND FILLED IN AT JOINTS.

and amperes for his particular work. One of the disadvantages of having a large number of small machines is encountered where heavy welding or heavy cutting is to be done, in which case the single high-capacity equipment is much superior.

With the constant voltage equipment a series rheostat is provided to vary the current supplied the arc, and this variation is accomplished by cutting in and out various parts of the rheostat by means of a dial switch. In many installations no automatic protection is provided, but it is believed that the slightly increased complexity caused by adding this device is well worth the added investment on account of the insurance against error. Mistakes are inevitable, and there is a considerable loss of efficiency when it is necessary for the operator to walk even a short distance to restore



FIG. 6. GEAR CASE SUSPENSION LUG WELDED AND READY FOR USE.

the circuits to normal operating conditions, and the loss is considerably greater if several peaks should come at one time, in which case the entire circuit might be shut down for an appreciable period.

With a good automatic equipment the circuit will be broken as soon as the operator exceeds the current for which the equipment is set and the circuit will stay open as long as the operator holds the electrode on



FIG. 7. BROKEN GEAR CASE SUSPENSION LUG.

the work. As soon as the circuit is broken a small relay returns the circuits to normal operating condition without loss of time or inconvenience to other operators. If desired, a preventive resistance can be inserted in the line instead of breaking the circuit, and this resistance can be put in series with the arc before striking in order to prevent the initial rush or current sometimes taken by an inexperienced operator.

The relays and contractors above referred to are clearly shown in Figs. 1 and 2, the first showing the arrangement of the portable equipment. These are designed to stand up under the severe service met with in ordinary shop work and, as evident, makes a very compact arrangement.

In Figs. 2 and 3 are shown the control panel and motor generator set respectively for the 500-amp. equipment, this arrangement being characteristic of the stationary outfits.

One source of extreme trouble in many shops is the breaking of taps in the work, which frequently results in scrapping the part affected. With the arc



FIG. 9. SMALL SECTION OF LOCOMOTIVE FLUE SHEET, TUBES WELDED.

welding equipment it is a simple matter to remove these taps, and the total time will vary from 4 to 10 minutes, depending upon the size of the tap and location of the break. Such taps removed by welding up to and through a nut are shown in Fig. 4. When the break is below a certain distance from the surface of the work it is advisable to weld through a piece of pipe which is placed in the hole before starting the weld, and by such means 1-in. taps broken off 2 ins. below the surface have been removed without injury to the thread.

The life of a compound kettle at one time was determined by the appearance of a depression in the bottom plate, which would bag and then burn out, after which the kettle was scrapped. The kettles are now removed from their settings, the bottom plate partly cut out, and we obtain practically a new kettle by welding in a plate from stock that is kept for this special purpose.

The annealing of laminations for electrical machines must be done out of contact with the air and the containers are subjected to the severest kind of treatment, which results in their depreciating very



FIG. 10. STEEL ROLL WOBBLER WORN AND REPAIRED BY ARC WELDING.



FIG. 8. SMALL SECTION OF LOCOMOTIVE FLUE SHEET, TUBES IN PLACE AND READY FOR WELDING.

rapidly. In Fig. 5 we have one of these boxes which had the plates sprung apart at the joint on account of the rivet heads being burned off and a hole burned in the corner, all of which was easily repaired soon after the operator started work.

It is well known that street car equipments meet with hard usage, and in Fig. 6 we see a gear case sus-

pension lug, practically as good as new, after being welded in position after the condition shown in Fig. 7.

In the heavier work of steam railroading we meet one of the most important applications of arc welding, and one of which is meeting with the best of success. This is the welding of tubes in locomotive flue sheets, and in Figs. 8 and 9 we have a section of a standard locomotive flue sheet with the tubes ready for welding, and after welding, respectively.

In the still heavier work around steel mills there are many places where the arc welding equipments will return enormous dividends every year.

When a steel roll wobbler is worn, as shown in Fig. 11, it is dangerous and of little value, except as scrap, and it is interesting to see how the worn parts can be built up by arc welding, and at what a saving in labor and material the wobbler can be made practically as good as when manufactured.

It is obviously impossible to illustrate even a small percentage of the many things that can be done by arc welding, and these few examples are presented more as an indication of what has been done, rather than as an attempt to list all the possibilities of these equipments. Also these examples indicate what can be done in repair work, and practically nothing has been shown of the possibilities in regard to primary manufacture, where many of these equipments are operating very successfully in welding all kinds of steel shapes for various manufacturing purposes. The speed and safety of these equipments as compared to other types of welding equipments is especially notable, and it is doubtful if there are any other applications of electricity that are more useful and interesting than this.

June Iron Ore Record Shipments.

June iron-ore shipments from the Lake Superior region were 9,507,578 gross tons, the record month in the history of lake ore carrying. They exceeded those for May by 1,057,996 tons, then the record month, and were 58.32% greater than those for June, 1915. The comparative shipments by ports for May and for the season were as follows in gross tons:

	June, 1915.	June, 1916.	To July 1, 1915.	To July 1, 1916.
Escanaba	720,264	1,159,424	1,248,830	2,602,824
Marquette	363,637	539,327	547,002	1,154,140
Ashland	604,127	1,101,370	1,161,792	2,204,263
Superior	926,536	1,945,234	1,777,600	3,878,915
Duluth	2,146,501	3,116,665	4,295,811	6,325,990
Two Harbors.....	1,244,026	1,645,556	2,490,248	3,449,435
Total	6,005,091	9,507,576	11,521,283	19,615,567
Increase, 1916		3,502,485		8,094,284

The increase to July 1, this year, is 70.26%, which reveals the rate that is making for a record season's shipments. The Duluth and Superior percentage of the total to July 1, this year, was 52.01%, against 52.70% last year. The Escanaba proportion this year is 13.27%, as compared with 10.86% last year.

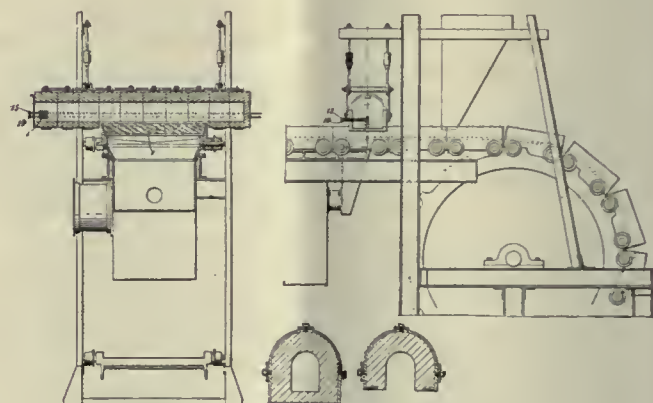
It is better to take pains to prevent an accident than to suffer pains as the result of one.—*Anode.*

Sinter Which Uses Crude Oil.

Gasoline and similar hydro-carbons have commonly been used for igniting ore, by-products or concentrates, in order to burn away the sulphates and other combustibles. The present high price of such fuel adds considerably to the expense of the process, making somewhat more noticeable a patent (U. S. 1,179,390) recently issued to John F. Austin of Monterey, Mex., and which has been assigned to the American Smelting & Refining Co. This new type of sintering machine permits the use of crude oil as fuel. Moreover, the operation is practically independent of the amount of moisture in the ore, which may be treated when it is quite wet.

The device is here shown, in side elevation, and end elevation partly in cross-section. A train of moving palets carries the ore (F) beneath the sintering device, which is suspended from the upper framework by vertical rods provided with springs. The latter is free from the jar of the moving palets.

The sintering device proper embodies a series of inverted archlike sections made of refractory material. These are so suspended and fastened together as to



CROSS-SECTION OF SINTER USING CRUDE OIL.

form a sort of inverted trough, with the open side just above the traveling ore palets. The end sections of this trough are shaped like the one shown at the left in the detail view, their ends being closed by plates.

These end sections, therefore, form closed mixing and volatilizing chambers, the liquid fuel and air being fed in under pressure at 14 and 15 to the burner (J).

Tremendous heat is generated by the burner, and the flame produced is forced downward upon the ore along the open portion of the inverted trough, being helped by the exhaust through the wind box (H).

The combustible sulphates are ignited directly beneath the sintering device, and a sufficient temperature produced so that they continue to burn, helped by the downward exhaust, even after they have passed from beneath the sinter, and until all the combustible has been burned away.

The Flotation of Oxidized Ores

By O. C. RALSTON and GLEN L. ALLEN.*

As concentration of natural sulphide ores by the flotation process has met with such success attempts have recently been made to apply the process to the flotation of ores other than natural sulphides, and it has been thought best to publish a summary of the results so far obtained from the experimental work on oxidized ores at the Salt Lake station of the Bureau, in co-operation with the Department of Metallurgical Research of the University of Utah.

This paper is only an advance summary of the experiments on the flotation of oxidized ores. More complete details as regards the flotation of carbonate ores of lead will be given by the writers in a paper on that subject later.

Most of the experimental work in the laboratory has been with the oxidized ores of lead. Only minor attention has been given to the oxidized ores of zinc and of copper for the following reasons. Little success has been had with the zinc ores; many others are engaged in testing copper ores, so that there was no pressing necessity of experimentation with copper ores by the Bureau although an attempt is being made to co-ordinate the work of those who are willing to co-operate to that extent.

Sulphidizing and Flotation of Oxidized Ores.

Flotation of oxidized minerals depends upon a preliminary "sulphidizing" by any method that will convert at least the surface of the mineral particles to a sulphide of the metal. This step is followed by flotation of the "artificial" sulphide, which results in a concentration of the metallic values in the low-grade oxidized ore being treated.

The methods of sulphidizing that have been investigated are as follows: (1) by the use of hydrogen sulphide on either the dry or the wet crushed ore, (2) by the use of solutions of the various sulphides and sulphy-compounds of sodium, (3) by the use of solutions of the various sulphides and sulphy-compounds of calcium, (4) by the use of sulphur vapor, (5) by the use of a sulphureted oil, (6) with colloidal sulphur.

It has been found that treatment by some of these methods will form a film of sulphide over the surface of the particles of such minerals as lead carbonate or copper carbonate, whereas in other cases the mineral particles are sulphidized to the core. Other methods failed to give any results.

Carbonate of Lead Ores.

All of the above methods of sulphidizing have been tested on a great number of carbonate-of-lead ores. Some of these ores contained silver and some

lead as the principal metal. A number of the ores have been successfully concentrated, and others refuse to yield to concentration by flotation. In general, a high alumina content (acid soluble) in an ore seems to prevent the application of sulphidizing and flotation. The purpose is to give the main features of the flotation of oxidized ores of lead, as well as other ores.

In sulphidizing with hydrogen sulphide gas, as applied to the lead carbonate ores, it was found that the best method of applying the gas to a dry powdered ore was in a tumbling barrel with the gas inlet in the end. Sulphidizing in a glass bottle showed that the ore blackened quickly after the application of the hydrogen sulphide gas. On attempting to float out lead sulphide from the ore as soon as it had blackened it was found that a low extraction of lead was obtained and likewise a low-grade concentrate, unless the pulp was previously acidified with sulphuric acid. By acidifying the pulp, cleaner concentrates were floated, but the extractions of lead remained low. Only by prolonged treatment with hydrogen sulphide gas could the extraction of the lead be raised to commercial grade. With a number of ores 8 hours' treatment gave an extraction of over 80% of the lead.

The use of hydrogen sulphide was considered for the reason that it can be generated quite cheaply. With iron matte available at \$5 to \$10 per ton, and sulphuric acid at from \$5 to \$10 per ton, the cost of the hydrogen sulphide resulting, including labor, etc., is between \$30 and \$50 per ton. If this gas in combining with the metal in the ore produces only a superficial film of sulphide, and does not penetrate to the center of the particles, it might be possible to make a ton of the gas sulphidize many tons of ore.

Unfortunately hydrogen sulphide attacks the metallic particles of the ore with such avidity that by the time the latter are sulphidized sufficiently to permit of good extraction by flotation, they have also been sulphidized to the core, and practically a chemical equivalent of hydrogen sulphide, to the lead in the ore, has been absorbed. Even coarse pieces of ore in a bottle absorb the gas with evolution of heat, and on breaking open the pieces, the black coloration is seen to have traveled deeply into the particles.

Owing to the fact that the value of the lead concentrates obtained is very low as compared to the amount of hydrogen sulphide necessary to sulphidize it, this process is not regarded as commercially practicable.

Application of hydrogen sulphide to the ground ore suspended in water does not seem to be subject to the same difficulty. True "filming" of the parti-

*Of Bureau of Mines.

cles with a film of lead sulphide seems to take place, and the extractions possible after a short treatment with the gas are satisfactory. The speed of travel of molecules of hydrogen sulphide gas, as compared with the speed of travel of the same molecules in solution affords an explanation of the difference in the action of the gas when applied to dry pulverized ore as compared to its action when applied to pulp suspended with water.

The best results on lead carbonate ores have been obtained when sulphides of sodium were used for the sulphidizing agent. The sodium sulphide must necessarily be introduced in solution and seems to cause true filming. The sulphides of sodium considered commercially applicable are the normal sulphide of sodium, Na_2S ; sodium polysulphides, Na_2S_4 and Na_2S_5 , and the sulphydrate of sodium, NaSH . Of these, the latter, the sulphydrate, seems to be very effective, as is evidenced by the quicker blackening of the pulp, and the deeper, blacker color formed. The normal sulphide is almost as effective; the polysulphides seem to be the least active. Different ores require 10 minutes to 24 hours of contact with the solutions of sodium sulphide used, depending on the properties of the ore and on the strength of the solution of sodium sulphide. Amounts of sodium sulphide varying from 10 to 20 lbs. per ton of ore are usually sufficient, and should be applied to pulp containing about one ton of water per ton of ore, in order that the solution may be as strong as possible during the sulphidizing stage of the process. After a good black color has developed, and the color has ceased to increase in blackness, the pulp is diluted with water to a 3:1 or 4:1 mixture and floated in either mechanically agitated or pneumatic machines. The market for sodium sulphide is limited and it should be obtainable at considerably less than 2 cts. per pound.

The polysulphide of calcium, obtained by boiling powdered sulphur with slacked lime, seems to be satisfactory for ores that yield easily to sulphidizing, but is sluggish in its action, as compared to the sulphides of sodium. The normal sulphide of calcium is only slightly soluble and hence its use was discontinued as a possible sulphidizing agent. The sulphydrate of calcium is the most active of these reagents, but has not been tested to any extent in this work, and there is doubt as to whether it would be commercially feasible to prepare such a compound.

Sulphidizing with sulphur vapor has been tried with little success, for the reason that it must be applied at a temperature above the boiling point of sulphur in order to prevent condensation of the sulphur. This means that the ore must be heated to a temperature above 445°C . There seems to be no difficulty in obtaining elemental sulphur vapor commercially, as pyrite will give up half of its sulphur content when heated in a closed space, and sulphur dioxide gas can be reduced to elemental sulphur by

passing it through a heated ozone in the presence of a reducing agent. As lead itself is easily reduced from its carbonate form, the temperature might as well be raised to the point where the lead can be liquated out, a reducing atmosphere being used instead of a sulphidizing atmosphere.

The use of a sulphureted flotation oil, in which loosely combined sulphur is available for combination with carbonates of lead or other metals, and the rest of the oil is then available for "oiling" the artificial sulphide, has given very little encouragement in the tests conducted by the Bureau:

Finally, colloidal sulphur, mentioned as a possible method of sulphidizing, does not seem to combine with lead carbonate at all. It floats as a white lining of the air bubbles in the flotation machine, and brings up very little lead with it.

Usually the precious metals contained in a lead carbonate ore accompany the lead. The writers have noticed that the silver extraction will lag behind the lead extraction when the ore is sulphidized with sodium sulphide, and that the reverse has usually been true when hydrogen sulphide was used.

The importance of sulphidizing flotation is due to the fact that there are many deposits of lead carbonate ore in all of the western states, and many of these ores have been milled with varying success. Frequently the lead carbonate can be satisfactorily concentrated by gravity methods, but often it is found that the particles of lead carbonate go into the slimes and are lost. Tailings containing 5 to 10% of lead are common. The object of this investigation is to determine whether sulphidizing flotation could not be applied to the treatment of the deposits of lead carbonate above mentioned, to prevent the waste that now takes place when these ores are treated by gravity concentration processes, and render amenable to treatment carbonate ores that are too low grade to be treated by present methods.

A flotation plant to apply sulphidizing and flotation to an ore containing lead, silver and gold is being constructed by the Prince Con. Mining Co., at Pioche, Nev., for the treatment of two tailings dumps from former pan-amalgamation and cyanide operations in that vicinity. This plant is expected to be in operation this month.

Oxidized Copper Ores.

Many attempts have been made, both by large operating companies and by other experimenters, to float the carbonate and other oxidized minerals of copper. For that reason the testing of such ores by the writers has been limited.

Hydrogen sulphide seems to be by far the best medium for sulphidizing oxidized copper ores previous to flotation. When applied to the dry ore, the writers found the same conditions as those mentioned for lead; the particles are sulphidized to the center, which requires an excessive amount of hydrogen sul-

phide. Applied to the wet pulp, the hydrogen sulphide seems to cause true filming. The writers' work has yielded black concentrates, but they are informed by Mr. Callow, of the General Engineering Co., that the company has been able to reduce the amount of sulphur used to a point where the froth is green with slightly coated malachite. He states that as little as $\frac{1}{2}$ lb. of sulphur per ton of ore is giving good extractions in the plant of the Magma Copper Co., at Magma, Ariz., where his company has put in the first successful installation of this kind.

Sodium sulphide has been tested by a number of the larger companies who have some oxidized copper minerals in their sulphide ores. The amount of oxidized copper in such ores is usually a fraction of 1%, so that 2 or 3 lbs. of sodium sulphide per ton of ore are all that is necessary. This is usually added to the machines during flotation, or to the mixing tanks before flotation. The writers' experience is that if some little time of preliminary contact is allowed before flotation is attempted, better sulphidizing of the material will result.

Calcium polysulphide has been used for some time in a number of the large copper concentrating mills with indifferent success, and seems to be detrimental in some instances. On the ores tested by the writers fair results were obtained if the calcium polysulphide was allowed to act until the ore had become well blackened.

It is stated that sulphur vapor was tested at one of the large plants for flotation of oxidized forms of copper and gave better results than any other method of sulphidizing. Of course this method has the disadvantage of having to be applied to dried, heated and finely divided ore.

Sulphureted oils are being used at a number of plants to supplement other methods of sulphidizing and considerable secrecy is observed as to the technical details of this work.

So far as the writers know, colloidal sulphur does not assist in the flotation of oxidized forms of copper. Neither has the silicate of copper been successfully floated by sulphidizing flotation. It will blacken when sulphidized, but resists flotations. Possibly it still presents a silicate surface, rather than a sulphide surface to the flotation elements. For this reason a number of the large copper companies are seriously contemplating leaching the oxidized copper ores, rather than lose what silicate of copper may be present.

Repeated attempts to float the natural sulphides along with sulphidized minerals have failed, as the sulphidizing agents cause trouble with the flotation of the natural sulphides. By careful adjustment this difficulty has been solved in one plant, though the details are not available.

Oxidized Zinc Minerals.

Attempts to float the oxidized particles of zinc

from their ores, both before and after sulphidizing by most of the above methods, have met with no success whatever in the laboratory experiments of the writers. They are informed that some headway was made with the problem by Prof. Traphagen, at the Colorado School of Mines, but that the sulphide film seemed to come off too easily. However, poor results were obtained, whatever the cause.

The writers' experience has been that most of the carbonate ores of zinc contain important amounts of the silicate, and this may be one reason for the non-success of this work, for the same reasons that copper silicate will not float.

Direct flotation of oxidized minerals of the kind mentioned, so far as known, has not been successfully accomplished. In all of the successful work witnessed by the writers there has been some form of alteration of the oxide to the sulphide. A number of parties claim to be successful in the flotation of copper carbonates without sulphidizing, and others in the flotation of scheelite, fluorite, and magnetite. The authors were unable to verify these statements.

Results of Tests.

Some of the best results and some average results which have been obtained in the work at the Utah Station, are given in the table following.

RESULTS OF SULPHIDIZING AND FLOTATION OF OXIDIZED ORES.

No.	Source of ore.	Metal content, ore.		Metal content, concentrates.		Extraction.	
		Lead.	Silver.	Lead.	Silver.	Lead.	Silver.
		%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.
1.	Daly Judge mine, Utah.	16.1	20.6	33.6	41.5	83	80
2.	May Day mine, Utah..	4.2	2.36	24.6	9.6	80	55
3.	May Day mine, Utah..	4.5	2.8	28.4	12.04	86	64
4.	May Day mine, Utah..	4.5	2.8	26.1	11.5	73	48

LEAD ORE.

	Lead, %.	Lead, %.	Lead, %.
5. Wilbert Mill dump, Idaho.....	5.77	23.2	54
6. Scranton mine, Utah	8.74	65.0	88

LEAD-SILVER-GOLD ORE.

	Sil-			Sil-			Sil-		
	Lead.	ver.	Gold.	Lead.	ver.	Gold.	Lead.	ver.	Gold.
	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.
7. Shattuck mine, Ariz.,	15.42	12.88	0.05	48.3	45.2	0.128	88	89	70

COPPER-SILVER-GOLD ORE.

	Cop-			Cop-			Cop-		
	per.	ver.	Gold.	per.	ver.	Gold.	per.	ver.	Gold.
	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.	%. ozs.
8. Grand Central mine, Utah.	0.60	4.80	0.22	4.75	32.9	1.28	67	75	73

ZINC ORE.

	Zinc, %.	Zinc, %.	Zinc, %.
9. Honorine mine, Utah	23.45	27.2	NH

METHOD OF SULPHIDIZING.

1. Two hours' treatment with H_2S gas on dry ore.
2. Four hours' treatment with H_2S gas on dry ore.
3. Eighteen hours' treatment with 1% solution of Na_2S , 20 lbs. per ton of ore.
4. Three hours' treatment with 0.8% solution of CaS , 16 lbs. per ton of ore.
5. Four hours' treatment with 1% solution of Na_2S , 20 lbs. per ton of ore.
6. One-half hour's treatment with 6% solution of Na_2S , 12 lbs. per ton of ore.
7. One-half hour's treatment with 0.75% solution of Na_2S , 15 lbs. per ton of ore.

8. Short-time treatment with hot 1% solution of Na_2S , 20 lbs. per ton of ore.
 9. Na_2S or H_2S in various amounts.

Patents on Sulphidizing and Flotation Processes.

A list of patents dealing with methods of sulphidizing and flotation follows:

- U. S. Patent 807,501. Dec. 19, 1905. A. Schwarz.
 U. S. Patent 1,094,760. April 28, 1914. J. T. Terry.
 U. S. Patent 1,098,668. June 2, 1914. H. B. Hovland and G. B. Frankforter.
 U. S. Patent 1,140,865. May 25, 1915. R. F. Bacon.
 U. S. Patent 1,140,866. May 25, 1915. R. F. Bacon.
 U. S. Patent 1,159,942. Nov. 9, 1915. H. B. Hovland.
 U. S. Patent 1,180,816. April 25, 1916. R. F. Bacon.
 British Patent 26,019.* Nov. 10, 1909. H. L. Sulman and H. F. K. Picard.

*Provisional specifications 28,612, Sulman and Picard, applied for Dec. 7, 1909, and 29,616, applied for Dec. 17, 1909, are incorporated in British Patent 26,019.)

Methods of Mining and Milling Feldspar in the United States.

The methods of mining feldspar are very simple. The excavations are nearly all open pits, most of them of rather irregular form, the valueless portions of the pegmatite being avoided wherever possible. In quarries where the pegmatite masses are rather flat lying and are overlain by a roof or worthless rock, short tunnels have been driven from the open pits.

In the Northwestern States, according to a Survey report, the pegmatite is usually firm and undecomposed, even in the surface of outcrops, and it is necessary to sink drill holes and blast out most of the material. In Pennsylvania, Maryland, and farther south, most of the pegmatite is much decayed at the surface, and in the upper part of the deposits it can be readily excavated with picks, shovels, and crowbars.

The material used for making pottery is hand picked at the quarries to remove the more micaceous and quartzose parts and those carrying colored minerals.

The methods used for grinding feldspar for pottery and enamel ware are similar in a general way in all the Eastern States. Some spar is first burned in kilns, which serves to fracture it and thus facilitate grinding. Most feldspar, however, is fed just as it comes from the quarry into chaser mills. The material from the chasers is screened, the tailings being returned for recrushing and the fines going to the tube mills for fine grinding. For use in pottery it is so ground, as screen tests on commercial pottery spar have shown, that 99.3 to 99.8% passes through a 100-mesh screen and 96.7 to 98.2% through a 200-mesh screen. Some feldspar prepared for use in abrasive soaps is even more thoroughly ground to reduce it to extreme uniform fineness. For making glass and enameled ware, a tested sample of ground feldspar showed 94% passing through a 100-mesh screen and 74% through a 200-mesh screen. Mills for grinding feldspar for poultry grit and roofing employ jaw or rotary crushers and steel rolls; the crushed product is graded by screening.

The principal use of feldspar is in the manufacture of pottery, chinaware, porcelain, enamel ware, and enamel brick and tile. It is used in both the body and the glaze of the various grades of ceramic products. In the body it constitutes from 10 to 35%, its value there being due to the fact that it melts during firing at a temperature below the fusing points of the other ingredients and forms a firm bond between the particles of clay and quartz. In glazes the percentage of feldspar used is higher than in the body and runs from 30 to 50%. Other uses of feldspar, which do not require the high grade demanded by the pottery trade, are in the manufacture of emery and corundum wheels, where it serves as a binder; in the manufacture of opalescent glass; as a poultry grit; as a constituent of roofing material; and for surfacing concrete work. Small quantities of the purest grades of potash feldspar are used in the manufacture of artificial teeth. For this purpose it brings the highest price—\$6 to \$8 a barrel of 350 lbs. It is also used in the manufacture of scouring soaps and window wash.

The use of ground feldspar as a fertilizer has been proposed, but the results of extensive tests by the United States Department of Agriculture prove that only under special conditions is such use of value. Attempts to extract from the feldspar its content of potash are still in an experimental stage. A number of patents have been taken out on processes of extraction of potash from feldspar and other potash silicates. These are summarized in the report on potash salts. Other experiments are directed toward the treatment of feldspar or other potash silicate rock in such a manner as to make its potash content readily soluble, and then to use the treated feldspar as a fertilizer or as an ingredient of complete fertilizers. It is reported that some of the larger manufacturers of fertilizer have so used feldspar during 1915; no definite information has been obtained from them.

Anniversary Celebration of Calumet & Hecla Co.

The fiftieth anniversary of the Calumet & Hecla Mining Co. was a unique affair in the annals of mining. The feature of the celebration was a parade participated in by nearly all the employees of the company, numbering in the neighborhood of 5000, marching eight abreast, with five bands.

The speakers included Gov. Ferris of Michigan; Major Henry L. Higginson and President Aggasiz. Gold and silver medals were presented to the older employees, Timothy O'Shea being the recipient of a gold medal for having to his credit 50 years of continuous service.

The affair was in charge of Manager McNaughton.

Copper exports from Atlantic ports for the week ending July 13 were 10,485 tons; since July 1 they were 13,732 tons; a year ago, 6,288 tons.

Mining Operations at Johnson, Arizona

By W. A. SCOTT.

The property of Peabody Con. Copper Co. consists of 5 patented and 8 unpatented claims extending 2000 ft. along the strike of the ore belt. Operations on the Peabody have progressed most of the time for 20 years. The work is now under the management of W. T. Eberhardt, who is shipping about 300 tons per month to the El Paso smelter. In grade these ores vary, ranging from 4 to 6% copper, besides which are some shipments of sorted ore running from 13 to 35%. Portions of old dumps, which accumulated years ago, have been shipped; these sampled $2\frac{1}{2}$ to 3% copper. Generally, the ores, besides copper, contain 5% iron, 15 to 20% lime, and 55% insolubles; they likewise carry about $\frac{1}{2}$ oz. of silver to every 1% copper. The ore occurs in a contact vein between

up largely of Kentucky stockholders, their operations here being under the management of J. T. Tong. The group of 125 acres covers 3000 ft. on the ore belt, which strikes northwest-southeast. The main working, vertical shaft was sunk in the hanging wall country, 600 ft. from the vein apex. It is expected to cut the vein on its dip at about 550 ft. Sinking was stopped temporarily at 450 ft., where considerable volume of water came in. A 200-hp. boiler, a 1000-cu. ft. Sullivan air compressor, and a 75-hp. hoist are being put in position. As soon as they are ready to operate the Cameron pump on the 300-ft. level will be started, and sinking will be resumed as soon as the shaft is clear of water. The old inclined shaft, having a depth of 415 ft. on the 30° dip of the vein,



KEYSTONE COPPER MINING CO.

lime and diabase, and in several replacement veins, all within a 100-ft. belt. The gangue comprises garnetized lime and quartz. The ore is a carbonate from surface to a depth of 200 ft., although this varies some on different parts of the group. The incline shafts, by which the ore is opened to a depth of 200 ft., have penetrated the sulphides to some extent. The company contemplates putting in a heavier hoist and an 8-drill air compressor, with the view to going deeper with exploration work.

The Black Prince Copper Co. of Denver, has a steam plant and a first-motion hoist, a Sullivan air compressor, and has a 2-compartment, 900-ft. shaft, from which lateral development is being carried on. Some shipments of high-grade copper carbonate ore are being made. W. C. Bartlett is in charge of the work.

The Arizona-Michigan Development Co. is made

has shown the presence of carbonate ore down to 100 ft. depth, and sulphides below that level. With the resumption of work in the vertical shaft, a 250-ft. crosscut will be driven from its 300-ft. station to the vein, connecting with the old workings. The grades of the shipping ores, both carbonates and sulphides, run evenly, being $4\frac{1}{2}$ to 5% copper, accompanied by about $\frac{1}{2}$ oz. silver. The ore shipments to the Copper Queen smelter, Douglas, which for some time have amounted to a car per day, are to be doubled. Ores running less than $3\frac{1}{2}$ % copper will not stand shipment. As there are large bodies of $2\frac{1}{2}$ to 3% ore here, the building of a concentrating mill is one of the probable undertakings in the near future.

The Johnson Copper Development Co. is opening a property, with J. T. Tong in charge. The main features of this work consist of a 250-ft. vertical shaft, and a 500-ft. drift from the 250-ft. station; and a



PEABODY CON. COPPER CO.



JOHNSON COPPER DEVELOPMENT CO.



ARIZONA-MICHIGAN DEVELOPMENT CO.



BLACK PRINCE COPPER CO.



PRIMOS CHEMICAL CO.'S PROPERTY.



DRAPER CO.'S TUNGSTEN OPERATIONS.



HUBBARD TUNGSTEN MINES USING FRESNO SCRAPER.



HUBBARD TUNGSTEN MINES USING MEXICAN ROCKER.

500-ft. winze from the level of the drift. The purpose of this is to explore for sulphide ore. The entire work discloses large bodies of low-grade carbonates near the surface and some sulphides at a depth of 400 ft. Some shipments have been made. Heavier equipment will be provided, consisting of a semi-Deisel oil engine, a hoist and air compressor.

The Keystone Copper Co., made up of Pennsylvania stockholders, has equipped and is developing a group of 16 claims lying in the southwest section of the Johnson district. The president and general manager is W. W. Miller, the superintendent in charge being U. R. Miller. The group contains several veins at contacts between lime and quartzite, all of which dip about 45° to the northeast. The development is being carried on through a 400-ft. shaft near one of the contact veins. Levels have been started from each 100-ft. station, and a considerable tonnage of ore has been blocked out between the 300 and 400 levels, of milling grade. At the 200 level a drift was run 200 ft., and a 30-ft. crosscut from this drift was all in sulphide ore, running 2 to 2½% copper. The ore body between the 200 and 400 levels, which was cut vertically and laterally, assayed 1.9 to 6% copper. May shipments sampled 3.60 ozs. silver and 17.47% copper at a Douglas smelter. It contained 21% lime, 12% iron and 25% silica. The shipments for March, April and May amounted to 16 cars. The intention is to continue sinking, to reach water level or lower, and further develop the sulphide ore bodies. Plans now being considered contemplate the building of a concentration plant, of 200 tons' capacity, to be equipped with tables and flotation machines. The cropping of iron gossan all over this group is very conspicuous.

The Cobriza Mines Development Co., a leasing concern, is operating the mine of United Mines Co., and shipping 5000 tons of ore per month to El Paso. This company also operates under lease the Johnson, Dragoon & Northern railroad, a 10-mile standard-gauge line, extending from Dragoon station, on the So. Pacific, to Johnson district. The Cobriza company is controlled by the Goodrich-Lockhart Co., New York, W. H. Galligan being superintendent of the operations at Johnson. Halsted Lindsley, New York, is consulting engineer for the company. The ore shipped samples 4 to 6% copper, and 3 to 5 ozs. silver, and is mostly a sulphide. The operations are through an incline shaft, but plans are considered for sinking a vertical shaft which would cut the ore body at 600 ft. About 4 years ago when the property was being operated by the United Mines Co. direct, a smelting plant was erected on the ground, which could not run profitably, because certain necessary fluxing ores were not available.

It will be seen, from foregoing that Johnson district has a considerable payroll, and that the ores being mined are of sufficient grade to stand shipment to smelters at Douglas and El Paso. In every mine,

however, the operations result in developing and leaving large bodies of ores of milling grade, which eventually will be concentrated. Some plans already are being made for mills, and it seems probable that Johnson will become principally a milling camp later on.

The Tungsten District.

Primos Chemical Co.'s operations in the Wolfram district, 5 miles from Johnson, Arizona, are under direction of Owen T. Smith. Tungsten ore is being mined and concentrated at the rate of 30 tons per day. The mill, which is equipped with jigs and tables, turns out a concentrate that runs 60% tungsten, and which is sacked and shipped to Clifton, Pa. The ore consists of both tungsten placer gravel and white quartz. The former is scraped up from a gravel wash deposit in the little valleys, and the latter is mined in the low hills.

J. R. Hubbard and associates are mining and milling in a similar manner in the same district. They have 300 acres in that locality, comprising low granite hills containing narrow veins of tungsten-bearing white quartz and intervening gravel wash beds containing tungsten. The mill is being operated mostly on the placer material. The overburden is removed by scrapers, and the placer material, containing hubnerite, is then hauled to the mill. These nuggets average 67% tungstic acid. At the mill the material is washed down through coarse and fine revolving screens, the coarse being concentrated by Hartz jigs, the middling by Richards pulsator jigs, and the fines to Wilfley tables. About 50 tons per day are handled in this way. The jig concentrates are said to run 74% tungsten; and the table product about 57%. Some scheelite ore is obtained in the quartz veins. H. W. Larson has leased an area of the decomposed wash from the surrounding hills, and is arranging to place a movable dredge, on wheels, on the property to take up the tungsten placers to bedrock in placers where it is 15 to 18 ft. in depth.

P. M. Sebring, in this locality, sold bench land and granite hills, containing tungsten placers and quartz to the Draper Co. of Chicago, and this company has built a plant for concentrating the placer dirt and ore.

Foreign Visible Copper Supply.

Copper visible supply in England, France and afloat thereto decreased 1014 tons from July 1 to July 15, being 14,362 tons on latter date. Recent figures of visible supply compare:

	1916.	1915.	1914.	1913.	1912.
January 1.....	20,064	30,309	21,034	40,380	57,283
February 1.....	17,646	30,002	16,865	38,228	55,570
March 1.....	16,734	29,252	18,559	36,176	51,507
April 1.....	12,201	23,883	17,923	32,291	50,175
May 1.....	16,046	26,314	20,360	30,467	49,771
June 1.....	15,310	28,917	24,352	29,634	44,618
July 1.....	15,376	32,868	25,698	28,172	41,623
August 1.....		35,063	26,739	28,374	45,026
September 1.....		34,064	27,933	26,536	45,666
October 1.....		28,933	29,671	22,583	44,238
November 1.....		24,835	31,443	21,380	43,330
December 1.....		20,895	30,626	21,514	40,746

Production of Graphite in 1915.

As usual, the greater part of the crystalline graphite produced in the United States in 1915 came from New York, Pennsylvania, and Alabama. The production of these states, according to a Survey report, was all of the variety known in the trade as "flake" graphite, which occurs as small flakes forming 5 to 10%, by weight, of crystalline schists, from which it is separated by more or less complicated milling processes. In addition, a small quantity of crystalline graphite, resembling in a general way the Ceylon graphite, was produced in Montana. As a result of increased production in all the states, but particularly in Alabama, the quantity of crystalline graphite produced in 1915 exceeded that for any previous year. The number of producers of crystalline graphite were four in Alabama, one in Montana, three in New York, and two in Pennsylvania.

Amorphous graphite mined in this country is used locally for foundry facings and paint pigments. Its production was not stimulated by the war and was considerably below that for 1914. There were three producers, located in Nevada, Rhode Island, and Wisconsin.

The imports of graphite into the United States in 1915 exceeded in value, though not in quantity, those for any previous year. The increase in value was due to the prevailing high prices and to the small quantity of low-grade graphite imported.

The imports credited to England and France in the table probably represent, respectively, Ceylon and Madagascar graphite. No graphite mined in England or France is known to have come into this country in 1915, but the embargoes placed, late in 1914, on Ceylon and Madagascar graphites prohibited their shipment to any but British and French ports. From these ports some of the graphite was reshipped to the United States.

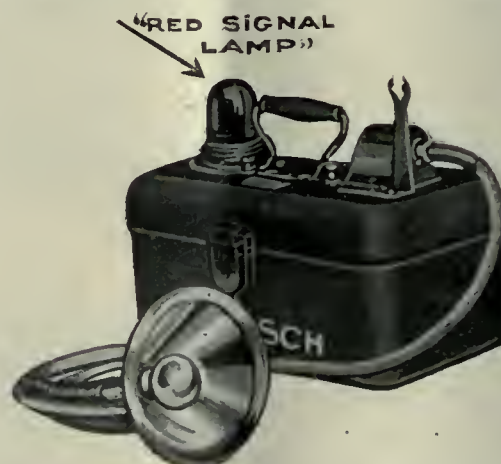
Graphite in large quantities is manufactured by the Acheson Graphite Co., at Niagara Falls, N. Y., which utilizes electric power generated at the Falls. In 1915 a large new building was erected exclusively for the manufacture of "Gredag," a mixture of grease and graphite used for lubrication. In March, 1916, a new furnace house was in process of erection. When this is completed the company will have four furnace houses in Niagara Falls, N. Y., and one in Niagara Falls, Canada, accommodating in all about 40 furnaces.

The demand for graphite electrodes greatly increased during the year on account of the remarkable growth in certain electrochemical industries. The extent of this growth is indicated by the statement that during 1915 the number of electric steel furnaces in operation in this country increased 78%. It is interesting to note that the graphite electrodes made at Niagara Falls range in size from a diameter of one-sixteenth of an inch to a diameter of 12 ins. and a length of 77 ins.

The bulk graphite produced by this company in 1915 was reported as 2542 short tons, valued at \$99,633. This represents only the graphite which would come into competition with natural graphite and does not include certain graphitized products that do not compete with natural graphite. This material, most of which is made either from anthracite or from petroleum coke, comes from the furnace in an earthy, incoherent condition, and is utilized mainly in lubricants and paints, and for foundry facings, boiler-scale preventives, and battery fillers.

Portable Electric Lamp Outfit.

The Hirsh portable electric lamp outfits are well known throughout the country. This concern has lately brought out a light with high candle power, especially suitable for shaft sinking and mine work in general. They are made in two sizes: 6 volts, having three cells, large reflector, 20 to 25 candle power, weighing 10 lbs. complete. The 10-volt outfit



HIRSH PORTABLE ELECTRIC LAMP.

weighs 26 lbs., has five large cells with large brilliant reflector and powerful nitrogen lamp, giving 35 to 40 candle power.

These outfits can be carried as hand lamps or with long detachable cords, and will throw a strong light, 200 ft. or more. The batteries are easily and quickly recharged, maintaining a low cost.

The war's effect on Argentina's consumption of iron is demonstrated by that country's imports of pig iron and steel for 1915 of only 203,805 metric tons. This is more than 50% less than the imports in 1914—433,924 tons—and only one-third of those in 1913, which were 680,709 tons. Argentina imported only 2708 tons of pig iron and sheet iron last year, against 92,628 tons in 1914 and 186,576 tons in 1913. Steel-rail imports fell from 156,592 tons and 84,936 tons, in 1913 and 1914 respectively to 13,391 tons in 1915.

The total value of the abrasive materials consumed in the United States in 1915 was \$4,451,616. Imports totaled 540,783.

Motor Truck Operation at Mammoth Collins Mine, Shultz, Arizona

By WILBERT G. McBRIDE.*

Two Alco 3½-ton motor trucks were used by Young Bros. while operating at the Mammoth Collins mine at Shultz, Ariz. One was equipped with an oil tank holding 1075 gals. and was used for the transportation of "tops." The other was fitted with a stake body and used to carry machinery, wood, rails, pipe and all classes of miscellaneous supplies. The bodies were made of oak with maple flooring and were attached to the frame of the chassis by U-bolts, to avoid drilling the main members of the frame.

Most of the hauling was done from Tucson, a distance of 47½ miles. During the first 3 months part of the road was in very bad condition and the tire cost was excessive. After this part was repaired the road was in fair condition, but never good. There were no excessive grades or bad sand, but wagon ruts, too narrow for the truck wheels and of a different gage, caused heavy tire loss; while chuck holes, sharp curves and stones, both imbedded and loose, were objectionable features. During wet weather the trucks could not get sufficient traction to climb some of the hills and were likely to stick in the mud in certain places, so that no attempt was made to run them unless they were on the road when the rain started. This lost time amounted to about 5% of the total, but whenever possible it was utilized in making minor repairs.

The price of gasoline was from 17 to 21 cts. per gallon. Rubber tires were used throughout. Drivers were paid \$4.50 to \$5 per shift, and a return trip to Tucson was counted as two shifts, even when made in one day. Drivers were provided with a room in Tucson and were paid for all time lost due to causes beyond their control. Trucks were loaded one way only.

Speedometers were placed on both trucks, but the excessive vibration soon caused them to fail. For this reason, and because no account was taken of the distance covered in picking up a miscellaneous load or in other minor ways, the mileage given is under the actual distance traveled. Some of the weights had to be estimated, but care was taken to have the number of ton-miles low rather than high, to avoid underestimating the costs. The cost of hauling from Tucson to the mines was \$12 per ton with the trucks, while the best possible team price was \$15. Teams made one return trip a week, while the truck regularly made one in 2 days and could always, and many times did, do it in one day. The loss of time due to wet weather would be about half as much with teams as with trucks.

The table of detailed costs given below covered the period from Aug. 21, 1913, to Aug. 15, 1914, the only

time in which the trucks were continuously employed. From Aug. 15, 1914, to March 30, 1916, the trucks were used intermittently, but the figures for this period have been excluded as not being representative. If included, they would somewhat lower the cost per ton-mile. Just prior to the close of the period covered by the cost figures the trucks were overhauled and put in good condition; new rear wheels were put on and new tires secured. The cost of all this was charged to operation. Allowance for extra tires on hand would reduce the cost per ton-mile approximately ¾ ct., leaving a net cost of about 25 cts. With loads on the return trip this cost per ton-mile would be lowered at least 40%.

MOTOR TRUCK OPERATING DATA.

Total distance traveled by trucks.....	23,000 miles
Total work done by trucks.....	42,700 ton-miles
Average distance covered per gallon of gasoline	4.5 miles
Average distance covered per gallon of lubricating oil.....	128 miles
Average speed, loaded.....	7 miles per hour
Average speed, light.....	7.8 miles per hour

DETAILS OF COSTS.

	Total cost.	Per cent of total.	Per truck-mile.	Per ton-mile.
Wages of drivers.....	\$ 2,623.32	23.91	\$0.1141	\$0.0614
Wages of helpers.....	286.50	2.62	0.0125	0.0067
Repairs, labor	581.74	5.30	0.0253	0.0136
Repairs, lost time.....	156.15	1.42	0.0068	0.0037
Oils, grease and waste....	379.17	3.46	0.0165	0.0089
Gasoline	1,610.49	14.68	0.0700	0.0377
Tires	2,445.75	22.30	0.1063	0.0573
New parts	515.08	4.69	0.0224	0.0121
Miscellaneous supplies....	348.82	3.18	0.0152	0.0082
Incidental expense	226.21	2.06	0.0098	0.0053
Depreciation	1,796.80	16.38	0.0781	0.0421
Total	\$10,970.03	100.00	\$0.4770	\$0.2570

The advantages of the motor truck over the team and wagon are many—increased speed, ability to work 24 hours per day when necessary, and lower cost on long hauls—but its adoption by the mining industry has been slow. Where trucks are used around mines they are usually driven by cheap, inexperienced men, the upkeep and repairs being turned over to the regular mine mechanics. It would be equally good practice to employ a timber framer to make a dining room table. If there are enough motor vehicles at the mine, the master mechanic probably turns the work over to one or two men, who in time become indifferent auto-mechanics, but in the meantime the cost of maintenance soars and often the trucks are condemned. The aim of the makers of all motor vehicles is to secure the maximum of strength and power with a minimum of weight and size. To do this, high-speed engines, the best of materials and the finest of workmanship are employed and parts are reduced to the least possible weight consistent with strength and durability. This is just the reverse of the ordinary American mechanical practice in which reliability is secured by slow speed and large size, the amount of material used and

*Consulting Engineer; Proc. A. I. M. E.

the space occupied being minor considerations. It is therefore unreasonable to expect the mechanic trained in one school to understand immediately and adapt himself to the ways of the other. It must also be remembered that no other machine is given the hard use and necessary abuse that a motor truck receives. The road vibration alone will loosen nuts and rivets which, if not attended to in time, will cause serious trouble. Where only one or two trucks are used, the drivers should be competent mechanics and should be held responsible for the maintenance of their machines. Where several are used, they should be under the direct supervision of a thorough truck mechanic who is held responsible for operation and given entire control of the drivers and repair work. His constant care will detect and remedy many incipient defects and prevent expensive and annoying breakdowns. With the exception of the time required for periodic overhauling, he should be able to keep the trucks in almost continuous service. This will make possible the employment of cheaper drivers without undue damage being done to the machines.

Motor trucks should not be installed without careful consideration of the roads to be traveled. The difference between the cost of motor truck and team hauling is largely controlled by the quality of the road, and on really bad roads the motor truck is decidedly the more expensive. Many roads are fatal to truck haulage, and considerable experience is required to decide this question without an actual test of some duration. Excessive grades are to be avoided, especially long ones. The ordinary truck will pull over a 20% grade with ease, but will give great trouble on a long one of half that rise unless special cooling arrangements are made. Grades greatly increase the tire and gasoline consumption and decrease the life of the machine. Rocky roads, particularly when the rocks are sharp or loose, are very hard on tires. Deep sand is difficult to cross, and for this class of road the caterpillar tractor and the 4-wheel-drive truck have distinct advantages. Trucks which drive on the rear wheels only cannot operate in heavy sand. Narrow or rutted roads are objectionable for the larger-sized trucks because they throw all the weight on one of the rear dual tires from time to time, and this overloading is injurious to the rubber. Fairly deep streams can be crossed, but mud is an absolute barrier except to the caterpillar type of tractor. Few dirt roads will stand up under a 7-ton truck, but those of 4 tons or under do less damage than the ordinary freight wagon.

Unfortunately, most trucks are not designed to suit mining conditions. At the Shultz we found it necessary to cut down the gear ratio, increase the size of the wheels and tires and add bumper or auxiliary springs. Had the grades been steeper it would have been necessary to increase the cooling capacity.

For long hauls the motor tractor will probably replace the motor truck. It will operate at a lower cost because the load will be carried on iron tires, and, as the table of detailed costs shows, the rubber tires ac-

count for 22.3% of the total. Tractors travel more slowly than motor trucks, but the tonnage hauled in a trip is much greater. They are also easier on roads, as the load is distributed over several trailers. By using extra trailers, loading and unloading can be done while the tractor is on the road.

The make of a truck is not as important as the care it receives. Almost any standard make will do good work if given careful attention, but none will be satisfactory if not well cared for. Economy should not be sought in the lubricants used; the best oil is none too good for a motor truck. Overloading should be scrupulously avoided. A truck may be made to carry many times its rated load without breaking down, but the damage is none the less real because not immediately apparent. High speed, particularly if the road is rough, should be avoided, since it subjects the machine to excessive strains and vibration. Most trucks are now equipped with speed governors, but these are easily tampered with and must be carefully watched. When they are not used the drivers should be carefully instructed as to the speed limits and compelled to respect them.

Distillate and "tops" are now successfully used on trucks, by the application of a special carburetor. Their use should effect a material saving in the gasoline cost, which now amounts to almost 15% of the total. "Tops" usually sell for 30 to 35% and distillate for 50 to 60% of the price of gasoline. With a properly designed carburetor, the available power in the lower-grade fuel will be about the same as in the gasoline, but the carbon deposition will probably be somewhat greater.

To Erect New Zinc Plant.

The United States Smelting & Refining Co. will spend \$350,000 for an electrolytic zinc plant at the subsidiary Mammoth Copper Co. works at Kennett, Cal. The site of the new zinc plant is 1 mile above the copper smelter. The purpose of the new plant will be at first to recover zinc and refined copper and other metals from the flue dust of the copper smelter. There are 65,000 tons of accumulated flue dust. Subsequently it is intended to treat here the zinc ores now shipped to Kansas. It is not generally known that the Mammoth properties contain important ore bodies as well as copper. About 3,500 tons of zinc ore are run over picking belts monthly and 700 to 800 tons of hand-picked product, running 40 to 41% zinc have been shipped to the company's Kansas smelters each month for a year past. The United States Smelting & Refining Co. has recently purchased the Stowell group of copper claims for \$90,000.

Chilean exports of bar copper in 1915 were 45,022 tons, against 25,795 tons of bar copper and 15,987 tons of copper ingots in 1914. In January, 1915, the price was \$287 per ton; in June, \$410.60 per ton, and in December, \$418.5 per ton.

Efficiency in Electrolytic Extraction

In the electrolytic sulphate process for the extraction of copper, three serious conditions have to be met: the insoluble anode; electrode inefficiency, and fouling of the electrolyte. Not the least of these is the fouling, which causes short-circuiting deposits, increases the resistance of the electrolyte and other evils.

William E. Greenwalt of Denver, Colo., has patented a process of extraction of metals (No. 1,179,522) which is said to overcome these objections to a considerable degree.

Without going into all the fundamental chemistry involved in the sulphate process, a brief description of the working of the new apparatus will indicate to those familiar with this branch of the art the features which tend toward greater efficiency.

Referring to the illustration, in the leaching vat or agitator the ore is treated, say, with a sulphuric acid solution for the extraction of the copper. After the copper has been dissolved, the copper sulphate solution is filtered into storage tank 2. The residue is then washed, and the wash water filtered into storage tank 3. Tank 2 now contains the rich copper sulphate solution, preferably neutralized or nearly so by the ore, and tank 3 contains the resulting wash water charged more or less with cupric sulphate.

In scrubbing tower 4 is applied sulphur dioxide or other reagent to the copper sulphate solution, and 5 is a scrubbing tower for the application of sulphur dioxide or other reagent to the wash water.

The electrolyzer consists essentially of a cathode tank 31 containing the catholyte and the cathode 12. An anode bell 9 suspended within the cathode tank has a diaphragm covering the lower portion and containing the anolyte and the anodes. The anode bell may be adjusted vertically and oscillated.

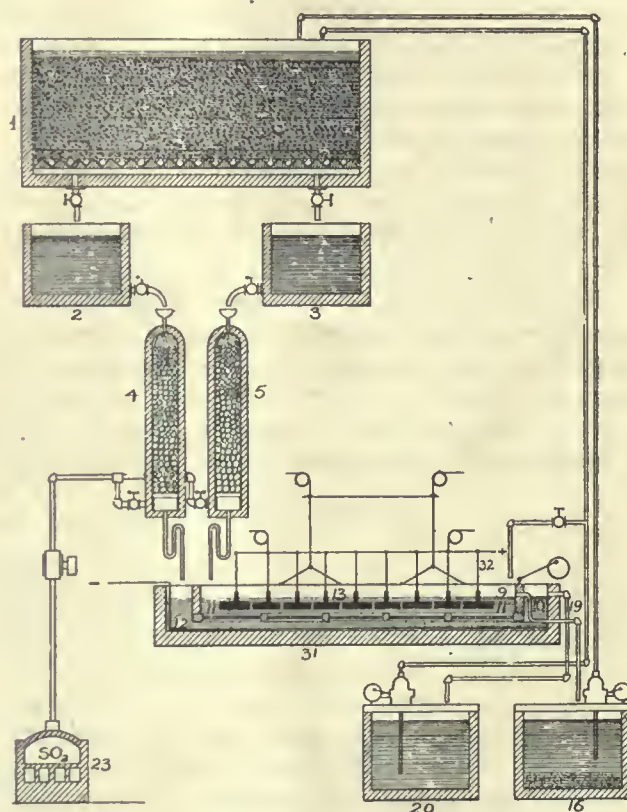
The anolyte is exhausted from the electrolyzer through the duct 10, and the catholyte through the duct 19.

A sulphur dioxide generator 23 communicates with the scrubbing towers. The gas is exhausted from the generator and forced into the towers.

The bottom of the tower 4 communicates with the cathode compartment of the electrolyzer, while the bottom of tower 5 communicates with the anode compartment, through trap pipes. The cupric sulphate solution coming in contact with the sulphur dioxide, all salts are reduced to their lowest valencies with the simultaneous regeneration of a certain amount of free acid, and the solution charged with the gas. It then flows into the cathode compartment of the electrolyzer. Similarly the wash water, after being charged with sulphur dioxide, flows into the anode compartment of the electrolyzer. The current is then turned on and the anode bell started to oscil-

late. Copper is deposited on the cathode and sulphuric acid regenerated at the anode, while at the same time a certain amount of oxygen is released, most of which escapes, but a very small amount peroxidizes the lead anodes. This peroxid, due to the oscillation of the anode bell, is detached about as rapidly as formed and expelled from the electrolyzer with the anode solution, through the pipe or duct 10 into the tank 16, where the suspended peroxid is allowed to settle out of the anode solution. The clear regenerated anode solution, now freed from the peroxid, is pumped back to the leaching vat, where it acts on the copper in the ore.

The cathode solution is gradually deprived of its



GREENWALT SYSTEM ELECTROLYTIC EXTRACTION.

copper, and owing to the oscillating anode bell and diaphragm, it may be closely extracted, and deposited in a regular condition to any thickness desired. If the cathode solution is quite impure, a dense diaphragm is used in connection with a low current density. In this way practically all the copper in the catholyte may be deposited on the cathode and all the combined acid transferred to the anode. The catholyte, when impure, may be wasted without tangible loss, either of metal or acid.

If, however, the catholyte is not sufficiently impure to in any way interfere with the operation of the process, a dense diaphragm is not necessary, and

if a small amount of diffusion occurs it will do no harm.

Under these conditions it will not be necessary to attempt close extraction of the copper from the catholyte, and when it is reduced to about 1%, for example, it is flowed into tank 20 from whence it may be pumped back to the ore, or before pumping it back to the ore, it may first be passed through the anode compartment of the electrolyzer to be augmented in acid. In any case, after being again applied to the ore, it may be used as the catholyte, if rich in copper, or the anolyte, if it is desired to increase its copper content before electrolyzing to deposit the copper.

The sulphur dioxid in the catholyte serves two purposes: it reduces the harmful ferric salt to the harmless ferrous salt, and should any ferric salt diffuse through the diaphragm it would be immediately reduced to the ferrous condition. The oscillating bell and diaphragm greatly helps this reaction.

After enough peroxid of lead has accumulated in tank 16 to warrant its reduction, it is taken out, washed, dried, mixed with carbon, and again reduced to metallic lead, and again cast into anodes to pass through another cycle. In this way a certain amount of anode lead may last indefinitely, and pass through an indefinite number of cycles.

It is evident that the impurities in the solution may be limited to the amounts found to do no appreciable harm, and this limit is best ascertained by direct experiment.

Combined Sintering and Smelting Apparatus.

In several patents (1,169,069-139-384, Jan. 18 and 25, 1916) granted to Arthur S. Dwight of New York city, apparatus is shown for the combined and continuous treatment of ore by first sintering into a rigid cake and then smelting in a reverberatory furnace. The sintering apparatus is of the type commonly known as the Dwight-Lloyd, consisting of a series of grate-bottomed pallets receiving a charge of ore to be sintered, and successively carrying the charge under an igniting mechanism and over a chamber from which air is being exhausted, with the result that the sulphurous material burns and causes the entire mass to agglomerate into a porous, rigid cake. In the present invention this cake is continuously discharged into a smelting furnace, whereby the heat of the sinter is economized in the smelting operation. The smelting furnace is of the reverberatory type, with fuel-oil or other burners so disposed that their flame will impinge on the entering sinter and fluxes and cause them to separate into matte or metal and slag in the usual manner.

The United States produced 20,555 short tons of soapstone in 1915 valued at \$490,385. Nearly all of this came from Virginia.

Chromium as a Self-Hardening Factor in Steel.

Discussing chromium steel before the annual meeting of the Iron and Steel Institute in London, England, May 4, 1916, in a paper, "Initial Temperature and Critical Cooling Velocities of a Chromium Steel," Prof. C. A. Edwards (Manchester University), J. N. Greenwood and H. Kikkawa stated that it is well known that the element chromium is widely used in the metallurgy of the so-called special steels. In most instances, however, another specially added element is also present, and this fact often makes it difficult to determine the exact function of the chromium and its influence on the physical properties of the steel when subjected to varying heat treatment. Although chromium is more commonly used with tungsten, nickel or manganese, etc., there can be no doubt that it plays a very important role. The object of the paper, the authors say, is to draw attention to a long series of experiments which clearly illustrate how remarkably sensitive our particular chromium steel is to what are really very slight variations of treatment. The steel used in the experiments had the following composition:

	Per cent.
Carbon	0.63
Silicon	0.07
Manganese	0.17
Chromium	6.15

The authors offer the following conclusions derived from their experiments:

1. The evidence contained in the present paper confirms the contention that chromium imparts the property of self-hardening to steel.
2. This property of self-hardening is governed by the rate of cooling.
3. The critical cooling velocities which produce hardening vary with the initial temperature, being much slower as the temperature is raised. The extent of this variation has been determined for a wide range of temperature.
4. The appearance of self-hardening coincides with the presence of large quantities of martensite and a diminution in the magnitude of the carbide thermal change.
5. The maximum hardness was obtained when the thermal transformation had been entirely prevented, and when this was accomplished the steel was purely martensitic in structure.
6. While, with the chromium steel which has been used, the cooling rates which produce hardening are extremely slow as compared with those which are obtained in the hardening of carbon steels by quenching, the two operations are fundamentally the same. In other words, a given rate of cooling which might be regarded as slow for carbon steels really constitutes quenching in the case of some special alloy steels.

June copper exports from Atlantic ports totaled 38,373 tons, against 16,976 a year ago.

Herman Screening Tube Mill.

The Herman screening tube mill is illustrated herewith. It was invented and patented by John Herman, Los Angeles, who has arranged with the Braun Corporation, that city, for its manufacture and sale. The mill is made in several sizes, the one shown herein being a 3-ft. diameter and a length of 1 ft. Others are built having the same diameter and a length of 2½ ft. The periphery is made up of slotted bars, through which the discharge is made. The entire slotted outside surface is covered by a screen of any mesh desired. In the pulverizing process either pebbles or iron balls are used. The main feature of



HERMAN SCREENING TUBE MILL.

the mill is in screening out the fine material as fast as it is reduced to the proper mesh. The slots are so shaped that any material which has not passed through the screen falls back to be recrushed. The bars can be used until almost worn out, and a set can be replaced in a 20-ton mill at a cost of \$40. The bars are estimated to last 6 months with the use of pebbles and 2 months with the use of iron balls. The screens fit tightly against the mill exterior, being firmly held by iron bands. Granular material can be screened as fine as 80 mesh, and other material from 40 to 80 mesh, according to its nature. The mill of 3-ft. diameter and 1-ft. longitudinal section requires 1½ hp., and has a capacity of 8 tons per 24 hours, using a 40-mesh screen; or 16 tons capacity with a 10-mesh screen. A mill of 3-ft. diameter and 2½ ft. long requires 4 hp. and has a capacity of 20 tons with a 40-mesh screen, and 40 tons if a 10-mesh screen is used.

Dome Lake Cyanide Mill Making Close Saving.

The cyanide annex at the Dome Lake mine, South Porcupine, Ontario, is just now attracting general attention from metallurgists, and will likely completely revolutionize the scientific treatment of ores throughout the Porcupine camp. Engineers who have examined this system of filtration in connection with the Koering drums so express themselves, and too much credit cannot be given Managing Director Sher-

rill for his untiring efforts in the best interests of the Dome Lake, as well as for his courage in being the first to "try out" the newly discovered treatment which at this particular time meant so much to the ultimate success of this company.

During 1915 milling operations at Dome Lake averaged below 40 tons per day, with a gold extraction below 80%, and ore values running low. In spite of these factors mine operations at the end of 1915 showed a profit. The milling plant is now handling 80 tons per day, with gold extraction averaging better than 95% and ore values per ton at least \$3 higher.

Assays taken from the tails last week showed values of only 40 cts. to the ton remaining. This is identical with the Hollinger tailings values lost and speaks well for the efficiency of the new cyanide plant. This is quite a contrast to the conditions previously obtaining, before the construction of the new cyanide plant, when during 1915 in the 11,727 tons of ore treated, \$21,454.36 was lost in the tailings, equal to a loss of \$1.83 per ton, a saving of \$1.43 per ton. The assays taken are not considered entirely conclusive but were made from tailings taken promiscuously from the dump and should be an approximate average.

Alunite in British Columbia.

Deposits of alunite have recently been discovered on Vancouver Island in British Columbia, according to Commerce Reports. The analysis of the alunite-bearing rock shows a lower potash content than the high-grade deposits in Utah. Following are analyses of three samples taken from different places in the deposit:

Vancouver Alunite.	No. 1.	No. 2.	No. 3.
Silica	52.00	55.65	44.40
Alumina	19.95	16.30	21.80
Sulphuric acid	16.00	15.10	21.40
Oxide of iron	2.05	2.15	.70
Potash	5.60	4.30	4.50
Water, etc.	4.40	6.50	7.20
Total	100.00	100.00	100.00

The results of the above analyses might be compared with three typical analyses of the alunite from Marysville, Utah:

Utah. Alunite.	18.	19.	Dana.
Alumina (Al ₂ O ₃)	37.18	34.40	37.0
Ferric oxide (Fe ₂ O ₃)	Trace	Trace	.....
Sulphuric trioxide (SO ₃)	38.34	36.54	38.6
Phosphorus pentoxide (P ₂ O ₅) .....	.58	.50	.....
Potassium oxide (K ₂ O)	10.46	9.71	11.4
Sodium oxide (Na ₂ O) .....	.33	.56	.....
Water (H ₂ O plus)	12.90	13.08	13.0
Water (H ₂ O minus) .....	.09	.11	.....
Silica (SiO ₂) .....	.22	5.28	.....
	100.10	100.18	100.00

There is a possibility that more extended investigations of these deposits may bring to light a higher grade of rock. This possibly is shown by the fact that a small sunken island some little distance from the mainland contains rock of a much higher potash content than any of the samples above enumerated from Vancouver, all of which were collected at a short distance from the coast and on the hillsides.

Raw alunite has already been largely used directly as a fertilizer with manifest advantage. The roasted

mineral, however, gave double the yield in increasing the crops when experimental comparisons were carried out on similar tracts of land.

The Tungsten-Molybdenum System.

The tungsten molybdenum system is discussed by Dr. Frank A. Fahrenwald of Cleveland, Ohio, in a paper to be presented at the Arizona meeting of the American Institute of Mining Engineers in September. The results of an investigation of alloys of these two elements, in which methods were employed that avoided the usual difficulties accompanying high-temperature alloy investigations, are summarized as follows:

1. By compressing the mixed reduced powders of tungsten and molybdenum into briquets and then heating with an electric current in an atmosphere of hydrogen, alloys of this series were prepared varying in composition from 100 per cent tungsten to 100 per cent molybdenum.

2. The solidus curve for the series was located by means of optical pyrometer temperature measurements and checked by comparing the fusing current with a standardized wattage-temperature curve.

3. The equilibrium diagram for this series shows no critical points, appearing as resistance fluctuations, corresponding to a separation of a new phase. Its construction has been based upon this fact and upon results of microscopical analysis.

4. Curves for hardness and for equiaxing temperatures are smoothly convex, being typical of an uninterrupted series of solid solutions (mixed crystals).

5. As a result of thermal and microscopical analysis, the metals tungsten and molybdenum are reported to be completely isomorphous.

6. All alloys of this series are malleable and ductile under proper conditions.

New Russian Manganese Ore District.

A new Russian district producing manganese ore is attracting attention, according to M. Stromberg of Moscow, Russia, editor of the Journal of the Russian-American Chamber of Commerce. It is the Gaisinsk district, in the province of Podolia, near Hosheratovo. The natural supply, a pyrolusite, is apparently large, and its distance from Odessa by rail is 221 miles. Up to the present mining has been on a small scale, not exceeding 450 tons, which has gone to southern metallurgical works.

The principal district of Russia producing manganese ore, the Caucasus, yielded in the decade from 1904 to 1913 an average of 600,378 tons per year, or about 75% of the yearly Russian output. The Nikopol district, second in importance, averaged 195,010 tons per year, or 24% of the total. The other districts, the Ural and western Siberia, averaged only 21,487 and 152 tons, respectively, in 1912. Russia ranks first in

manganese ore production, supplying 37% of the world's total output in the decade from 1903 to 1912, against 20% from British India and 12% from Brazil. In the decade from 1904 to 1913 the annual exports of manganese ore from the Caucasus averaged 680,730 tons, of which 640,825 tons (93.97%) was exported and 39,900 tons supplied to southern Russia.

Advantages of Stronger Detonators.

The Bureau of Mines recommends the use of nothing weaker than No. 6 detonators (blasting caps and electric caps), which recommendation together with reports from the various powder companies regarding unsatisfactory results obtained by users of explosives when detonators weaker than No. 6 are used, led the Institute of Manufacturers of Explosives (which is composed of practically all the powder manufacturers) to ask manufacturers of detonators to make nothing weaker than No. 6. Practically all high explosives manufactured today are of the relatively less sensitive type (and consequently safer), but as it is therefore necessary to use a powerful detonator (not weaker than No. 6) to ensure complete detonation, it should be self-evident that weak detonators reduce the blasting efficiency of the explosives and increase blasting costs. The United States government recommends stronger detonators; the Institute of Manufacturers of Explosives recommends stronger detonators; the powder manufacturers recommend stronger detonators. Think this over.

Kollberg-Kraut Flotation Machine.

U. S. patent (1,170,665) has been issued to F. B. Kollberg and M. Kraut of Bisbee, Ariz., covering a flotation machine comprising a long rectangular agitating chamber, in which a drum, provided with a series of longitudinal riffles on its face, rotates at a suitable speed. The ore and water are fed into the agitating chamber at such a rate as to keep the drum only slightly submerged in the pulp. Oil is added through oil supply pipes. The revolving drum picks up a thin layer of pulp, which is thrown off tangentially by centrifugal force in the form of fine spray, thus receiving excellent aeration, and is discharged through a suitable opening into a separating chamber or spitzkasten, where the froth is separated from the gangue. Additional aeration of the pulp is secured from air that enters the interior of the drum and is forced into the pulp through perforations in the face of the drum.

Many mines lose thousands of dollars in wasting time and power, as well as much valuable tonnage, by being too niggardly in the matter of level bosses or under-foremen. While the conditions of many big mines must be studied individually, it is a self-evident fact that sub-foremen will save time, power, materials and over-head expense, and increase the tonnage.

What the Mining Companies are Doing

Goldfield Con., Nevada.

During April the total production of the company was 30,400 tons, from which resulted net realization of \$60,041.42. Operating costs were as follows:

Mining.	Per ton ore handled.	Per ton total ore.
Stoping	\$ 2.50	.....
Development	13.77	.....
Total mining	\$ 2.90	\$2.77
Shipping expense .....	.....	.....
Leasing expense .....	.....	.....
Dumping moving .....	.38	.....
Transportation .....	.06	.06
Milling	1.71	1.71
Marketing .....	.03	.03
General expense .....	.39	.39
Bullion tax .....	.04	.04
Filter royalty .....	.05	.05
Surface .....	.04	.04
Total operating costs .....	.....	\$5.11
Miscellaneous: .....	.....	.....
Earnings .....	.....	\$1.01
Net operating costs .....	.....	\$4.10
Construction	\$0.84	.84
Net costs .....	.....	\$4.94

Granby Con., B. C.

Estimates of the earnings of the Granby Con. Mining, Smelting & Power Co., with mines in Alaska and different parts of British Columbia, together with smelters at Anyox and Grand Forks, B. C., based on preliminary figures, fix the profits of the corporation for the fiscal year ended June 30, 1916, at approximately \$5,500,000, or \$36.67 a share on the outstanding capitalization of 149,985 shares at \$100 each. The net profits in May were in excess of \$800,000, and for the 11 months ended May 31 they are estimated at \$4,500,000.

Granby's operations in the last year have shown results far exceeding the hopes entertained for the property by its most optimistic friends. The new smelter at Anyox has given, and continues to give, an excellent account of itself, and the plant is now on an operating basis where economies planned for it demonstrate their worth.

Development work has been carried on at the Hidden Creek mine and it is understood new tonnage will have been added to ore reserves by the time the next annual report appears. At the Midas mine in Alaska much development also has been accomplished, and shipments of ore from that property to Anyox will constitute a factor in Granby's production this summer.

From present indications Granby closed its fiscal year with a production close to 63,000,000 lbs. of copper. The May output, totaling 4,727,929 lbs., was the largest ever turned out by the company. Of this amount 3,383,230 lbs. were contributed by the Hidden Creek smelter, while the Grand Forks plant turned out 1,344,699 lbs. Actual production in the 11 months up to May 31 was 53,717,551 lbs. Granby's earnings, based on copper delivered at the highest prices, were at one time at the rate of \$50 per share.

Alaska Gold Mines.

The June report of the company shows 161,800 tons of ore milled, of an assay value of \$1.06 a ton, against an assay value of \$1.40 in May. The per cent of extraction is given as 79.25, as compared with an extraction of 82.85% in May; the loss in tailings per ton was 22 cts., compared with 24 cts. in May.

In explaining the June report General Manager Thane has the following to say:

"In connection with the monthly return herewith I would say that starting the early part of the month with low heads we had a continual improvement in them up to the end of the month, but the average grade for all of June is low because none of the better grade of ore which came from the 5th, 6th and 7th levels east of the shaft actually got into the mill until the 17th of the month, due to the fact that the bins

were filled with ore of the lower heads from the preceding month.

"As I wired in May, the indications were that No. 2 stope east of the fifth would be finished early in June so that we could draw a heavy tonnage from the same; but as the mining continued in the back of the stope the east body continued to open out and there is at least 100,000 more tons now in sight of high-grade in these stopes than we originally expected to get. During the month of May this stope had to be kept full in order to reach back to the drills, and mining has had to be conducted during June very slowly and carefully in this section of the mine.

"We are unable to draw as large a tonnage yet as we would like from this section.

"While the conditions of the new stopes on the sixth and seventh east are improving steadily, they were not in shape during the month of June to deliver any tonnage to offset the amount we were unable to draw as above described from the fifth level. During the month of July we should draw a larger tonnage from the sixth level and a fair amount of tonnage from the fifth level east and anticipate an average heading.

"Last Monday we milled 8700 tons in 24 hours, which is our second largest run so far."

Nipissing Mines Co., Ontario.

During the first half of this year Nipissing shipped slightly more than 3,000,000 ozs. of silver. This included, however, the metal secured in treating high-grade custom material. The company's own yield for the full year is expected to run close to the 1915 output of 4,000,000 ozs.

Operations up to end of May show as follows:

	Gross production.	Net.	Shipments.
January	\$169,800	\$103,600	\$147,000
February	171,800	104,600	309,000
March	170,000	105,500	322,100
April	167,400	101,800	447,500
May	291,900	218,800	420,900
June .....	.....	.....	*200,000

*Estimated.

The production figures indicate the company's own mining operations while shipments include custom products as well.

Two dividends of \$300,000 each, totaling \$600,000, were paid during the first 6 months, while another of like amount will be paid shortly from the half year's profits. Including the July disbursement there will have been paid out in dividends by the Nipissing Co. in its ten years' life a total of \$14,340,000.

Anaconda-Inspiration Absorption.

It is generally believed that plans are under way for the absorption of the Inspiration Con. Copper Co. by the Anaconda Co. The basis of exchange will probably be one and one-half shares of Inspiration for one of Anaconda. Anaconda Copper Co. already owns approximately 150,000 shares of Inspiration valued on basis of present market prices at about \$8,000,000. It has been known for some time past that interests closely identified with Anaconda group of properties have been buyers of Inspiration shares. It is believed buying of Inspiration has been more on account of its eventual absorption by Anaconda than the \$2 quarterly dividend.

Designed and constructed to handle 800 tons of ore daily, each of the 18 sections of the Inspiration mill has been putting through 900 tons per day. This has had the effect of raising the total tonnage treated from 14,000 to 16,000 tons daily.

It was the official belief early in the year that Inspiration would show an average production of 10,000,000 lbs. of copper monthly. A yield of 11,000,000 lbs. per month does not now appear improbable when all conditions are favorable.

Preliminary estimates place the June output at 10,500,000

lbs. of copper. The average cost during the first half of the current year was about 8½ cts. For the final 6 months of 1916 the cost will be somewhat increased by higher wages, although the increase will be offset to a great extent should the expected higher production materialize.

Champion Copper Co., Michigan.

The Champion Copper Co., incorporated under the laws of Michigan, has filed with the Massachusetts secretary of state a statement of its financial condition, dated March 31, 1916, as follows:

Assets—	1916.	1915.
Real estate	\$1,035,500	\$1,035,500
Stock of Michigan Smelting Co.	110,000	110,000
Copper and supplies	1,534,972	1,811,729
Cash and debts receivable	1,029,374	88,084
Construction	2,903,818	2,903,818
Total	\$6,613,665	\$5,949,131
Liabilities—		
Capital stock	\$2,500,000	\$2,500,000
Accounts payable	100,763	95,201
Surplus	4,012,902	3,353,930
Total	\$6,613,665	\$5,949,131

Inspiration Con. Co.

Inspiration Con. Co.'s operating profits for the first half of 1916 will approximate \$8,750,000. Assuming all bonds converted, these earnings would have been equivalent to \$7.30 a share, on 1,182,755 shares. There was disbursed to stockholders one dividend of \$1.25 in the half year, while from the 6 months' profits a second dividend of \$2 a share will be paid on July 31.

Practically all of the Inspiration bonds have been converted, there being outstanding now but \$32,700. Interest on the debentures, which were called in at 105, has ceased as of July 1, while interest on the first mortgage bonds will cease on Sept. 1. The process of converting the bonds into stock has worked out as follows:

	Total issues.	Converted.	Out-standing.
First mortgage	\$ 6,000,000	\$ 5,973,500	\$26,500
Debentures	4,500,000	4,493,800	6,200
Total	\$10,500,000	\$10,467,300	\$32,700

It is understood that Inspiration received an average price of about 25 cts. a pound for its copper during the 6 months ended June 30. This was produced at a cost of close to 8½ cts. a pound, leaving a margin of profit of 16½ cts. a pound. The half year's production approximated 53,000,000 lbs. of copper, estimating the June yield at 10,000,000 lbs.

Inspiration has just completed its first full 12 months of production. On June 29, 1915, the first unit of the mill went into operation. The company produced in the year 73,000,000 lbs. of copper at cost of less than 9 cts. a pound.

Miscellaneous Company Notes.

Estimated production of Goldfield Con. for June was \$185,000; net earnings were \$40,000. Net earnings were \$50,693 in May.

J. L. Bruce, manager for the Butte & Superior Co., has been elected a director of the company succeeding the late C. L. F. Robinson.

Anaconda Copper Co. interests say they are not to take over mineral concessions and copper mines of Taganyika Concessions, Ltd., in Belgian Congo and Rhodesia.

Greene-Cananea Copper Co. officials say the situation is unchanged in Cananea, Mexico. Mines are running at 50% capacity. Extra efforts are being made to operate property at full capacity.

Peterson Lake directors will report to their shareholders as to the financial position of the company as follows: One year ago, as of April 30, your company had \$142,687.50 cash in bank, whereas this year the statement will show \$202,859.56 cash in bank. While the royalties received are \$10,000 down, the cash in bank is increased \$60,172.06, and such is recorded after paying the regular quarterly dividends during this

period. Accounts payable at the end of the fiscal year of 1915 were \$7,103.94, whereas this year this item is reduced to \$2,249.34. The above increased profits remain after 20% has been written off on depreciation of plant.

Miami Copper Co. produced 4,516,395 lbs. of copper in June as compared with 4,600,000 in May; Old Dominion produced 3,843,000 in June and 3,405,000 in May; Braden produced 2,258,000 in June and 3,882,000 in May.

Kennecott Copper Co. has acquired the entire \$10,000,000 first mortgage 6% 10-year convertible bonds and the mortgage will now be satisfied. These bonds were issued June 1, 1915, on the entire properties of the Kennecott Mines Co. and Beatson Copper Co., which properties were acquired by the Kennecott Copper Co. The latter's stockholders expect an extra dividend disbursement at the director's meeting in September.

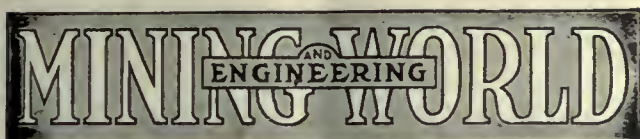
President Seligman of the Butte Copper & Zinc Co. states that Anaconda Copper Mining Co. has exercised its option in full on 100,000 shares of owners' stock of Butte Copper & Zinc Co. under agreement of July 8, 1915. Option matured on July 8, 1916, and the money was paid over. Mr. Seligman further states that Anaconda Co. is energetically prosecuting work of development on eighth level, both east and west, and is driving the crosscut tunnel to cut the company's vein at a depth of 1600 ft. as rapidly as possible.

In the 5 months that Shannon Copper Co. has operated this year net has amounted to \$320,000. In other words, Shannon has in the past 4 months earned about \$1 per share, with production in but 1 month up to normal. On present price of copper and an output of 1,000,000 lbs. per month earnings are better than \$4 per share. Shannon came into June with net working capital in excess of \$750,000, or say a working balance of well over \$500,000 after allowing for the retirement of the \$190,000 outstanding bonds of the Shannon-Arizona railway.

The 40,000 shares of new stock planned to be put out by the American Zinc, Lead & Smelting Co. at \$50 per share are not to be issued, other financing arrangements having been made. The cost of the Granby Con. was \$8,000,000. The vendors take \$2,000,000 of new Granby bonds in part payment. The balance will be financed out of American Zinc cash, \$4,000,000 of which comes back to it through profits on Granby Co. contracts. In brief, it may be stated that on Jan. 1 next American Zinc will have the Granby property paid for, and \$5,000,000 of net quick assets besides, assuming that it does not sell another pound of spelter in the meantime and carries its unsold production at actual cost.

North Butte Copper Co. produced in June 2,096,326 lbs. of copper, 90,713 ozs. silver and 143 ozs. gold. If the June rate of production can be maintained it will mean that the company is once more established on a basis of close to 25,000,000 lbs. of copper per annum. This would naturally lead to some reduction in costs from the level of 12 cts. established in the March 31 quarter. Eleven cents per pound might be all that could reasonably be expected under present wage scale, but even then on a 25,000,000-lb. production the company could earn \$3,500,000 per annum on 25-ct. copper, or at the rate of over \$8 per share on 430,000 shares. This would be a distinct improvement over the first quarter of this year when earnings were at the rate of but \$4.44 per share per annum.

At the present time the U. S. Smelting Co.'s Pachuca and Real del Monte properties in Mexico are running on practically the same schedule as had been attained immediately prior to the crisis between the United States government and the Carranza authorities. The Pachuca mines were closed for a day or two, but not long enough to force any appreciable curtailment of output. The company's American employees are all out of Mexico, but the English have remained, and these in conjunction with native labor have made possible the continuance of operations at these two important properties. It is probably safe to say that Mexican operations are now well above 70% of normal. In the 6 months ended June 30 Pachuca and Real del Monte earned from \$1,250,000 to \$1,400,000 net, or say 20% of total earnings of United States Smelting.



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*Illustrated.

A New Metal Exchange.

The course of values in the foreign metal markets during the past fortnight, furnishes proof positive that the bear raid on copper and spelter values is in full swing, according to the Daily Metal Reporter. Standard copper has declined £31 in the last 30 days; electrolytic has been reduced £17 in that period; spelter has dropped from £70 to £45.

The metals selected for the bear drive because of the principal source of their origin, suffice to show at whom this pulling down of prices is aimed.

If further proof were needed at whom these bear tactics are directed, it is evidenced by the skilful manipulation of the London standard market which concerns a grade of copper that is industrially virtually useless, being qualitatively incomparably inferior to our casting, but prices for which have been juggled with no other object than to force a lowering of the price in American electrolytic copper.

This bear drive is aimed at us, the principal producers of these metals for which England, so long as she needed them for military purposes, was glad to pay our price.

England, as well as her allies, and, for that matter, her foes still need these metals. They will need them more so after the war for the reconstruction of that which has been destroyed.

But the foreign metal buyers are once more in a normal frame of mind and are not losing sight of any stratagem by which they can regain their before-the-war grip on the American metal market.

England and Germany will need tremendously large supplies of these metals after the war, but, if permitted to once more control the market, they will hammer values to bankruptcy levels before covering their (no matter how urgent) requirements. This has been done time and time again.

Do American manufacturers of articles into the making of which these metals enter, want their European competitors to be placed in a position where, because of market control through manipulation, the latter can obtain raw materials of American origin at ridiculously low prices and thus keep American manufacturers out of the world's markets, their cheap labor giving them the preponderance of competitive power?

There is only one way to avoid this calamity from becoming an accomplished fact.

The only remedy lies in having an American metal exchange on which there will be unrestricted, legitimate trading in all metals, so that prices for metals mined, smelted, and refined in the United States may and will be determined by Americans for Americans. Then, and only then, will the foreign buyer be obliged to pay our price for our metals.

We produce the bulk of the world's wheat and cotton supplies and, thank God, production, price and marketing through the Chicago Board of Trade, and

New York and New Orleans Cotton Exchanges, respectively, are controlled by Americans for the benefit of the American producer, the American trader, the American manufacturer and the American consumer. But, while we produce most of the world's copper and spelter, they are controlled by foreign interests through the London and Berlin metal exchanges for the benefit of England and Germany and to the detriment of American miners, refiners, manufacturers and consumers.

Who are the powers behind the New York Metal Exchange and why should they cater to foreign interests in so servile a fashion that this institution has become nothing short of a farce?

Its officials not only admit its fictitious character, but some of them even go so far as to say that they don't want it to be anything but a farce. Their sinister motives need no further elucidation at this time.

If the New York Metal Exchange cannot free itself of these influences and step forth as a real metal exchange which, by reason of its being the mart for American sellers and American as well as foreign buyers of metals, will be as representative, there is only one alternative left.

This alternative is: To establish a new metal exchange.

The Future of Copper.

All possible copper construction in this country must be postponed in order to admit the necessary supplies for the warring nations to go forward is the opinion of an eastern authority on the copper metal industry.

If the war continues well into next year there will be such an accumulation of postponed work in the United States as will sustain the copper market at high prices—say around 20 cts.—for many months after the close of the war.

Credit and copper production are the two things that cannot be pushed. The limitations in each of these fields may be something of a handicap in prolonging the war. The production of steel and spelter and lead can be pushed upward. The possible production of copper is very nearly at the maximum.

There has been less than a 20% expansion in production since the opening of the war and there is not another 20% expansion in sight, however long the war may continue. Inspiration, Kennecott and Utah have made the greatest increase in output and if their increased production had been put upon the market in normal times it would have had a considerable influence upon the price. The hope of the future for any increase in the production of copper is entirely with South America. Both North and South America are now producing about 180,000,000 lbs. per month, and not 200,000,000 lbs., as has been estimated in some newspaper quarters. The production around the first of this year was at the rate of 165,000,000 lbs. per month.

For the few years preceding the war the production of the entire world vibrated around these figures; a monthly production of from 165,000,000 to 185,000,000 lbs. per month, and more than two-thirds of the supply came from America.

Now in the entire world's supply of copper, the American production cannot be far from 80%, and to North and South America alone must Europe look after the war, for its reconstruction from the copper supply.

Previous to the war no country in the world equaled Germany as a manufacturer and exporter of copper wares and she was the largest importer of American copper.

In connection with the outlook for further foreign buying, it is said by well informed metal men that agents of the allied governments are still "nibbling" for a large amount of copper for which they are willing to pay 25 cts. a pound. So far producers have steadfastly refused to shade prices to any such level, and it is not thought likely that they will under present conditions.

From present indications the Lake Superior iron-ore movement will total for the year close to 55,000,000 tons. That is, unless strikes or other factors interfere to any serious extent. During May 8,449,580 tons were shipped, and 9,507,576 in June. From Jan. 1 to July 1, 19,615,567 were shipped, as compared with 11,520,283 tons during the same period in 1915. Up to the present time labor troubles have not interfered to any extent with shipments.

The copper market the past week was dull and lifeless. There is little spot in sight. Inquiries for both domestic and foreign are for the last quarter copper, but these inquiries are reported to be of little consequence. Italy and France have been inquiring for copper for the last quarter, but transactions have gone no farther than the inquiry stage. Copper for October, November, December delivery is quoted 24 cts. a pound.

The Utah Copper Co. is certainly in an enviable position. It does not owe a dollar and at the end of June had net quick assets of over \$20,000,000, of which \$10,000,000 was cash and \$10,000,000 copper in process. In June the company broke all of its production records by producing over 18,000,000 lbs. of copper, approximately 2,000,000 lbs. in excess of any previous month. The company's output is well sold ahead.

The closing of a portion of the markets in Europe is responsible largely for the shipments of zinc to this country from countries that never before marketed this product in the United States. Among those countries which are shipping to this country are Guatemala, French Africa, Costa Rica, Peru, Colombia, China, Italy, Spain and Australia.

PERSONAL.

F. L. Sizer, mining engineer, San Francisco, has been on professional work in Arizona.

T. L. Welp is now superintendent of the Gold Reed Mining & Milling Co., Oatman, Ariz.

M. L. Fuller of the Associated Geological Engineers has started for Cuba to conduct expert investigations.

R. W. Schultz, formerly with the Mond Nickel Co., Nickelton, Ont., is now with the Minerals Separation, Ltd.

M. W. Lee, Duluth, Minn., president of the Marsh Mining Co., has returned to his home from Spokane, Wash.

V. M. Archibald, chief engineer of the Canadian Con. Co., has returned to Trail, B. C., by way of Northport, Wash.

Robert H. Jeffrey, London, England, has been appointed general manager of the Mazapil Copper Co., Saltillo, Coahuila, Mexico.

T. H. Gill, mining engineer at the Champion mine, Nevada City, Cal., is now with the California Accident Commission.

Nelson Stratton, shift boss at the Superior Copper Co.'s property, has been made mining captain at the Lake mine, Michigan.

J. Weaver Loper, president of the Metals Recovery Co., Inc., Spokane, Wash., is in Victoria, B. C., on business for his company.

George Faunce, Jr., Carnegie, Pa., has accepted a position on the engineering staff of the Hercules Mining Co., Wallace, Idaho.

Dr. William B. Phillips has resigned as president of the Colorado School of Mines to look after his extensive kaolin interests in Texas.

Prof. C. K. Leith of the geological department of the University of Wisconsin has been in the Lake Superior copper country during the past week.

Leffler Palmer, mining engineer, Salt Lake City, Utah, has returned from Butte, Mont. He has been on professional work in the Deep Creek-Ferber district.

Charles E. Knox, Berkeley, Cal., president of the Montana, Tonopah and Mizpah Extension companies, has been in Tonopah, Nev., inspecting the properties.

Frederick G. Clapp of the Associated Geological Engineers is in Wyoming, from where he will go to certain Kansas and Oklahoma fields before his return to New York.

Thomas F. Keeley, Chicago, treasurer of the Goldhunter Mining Co., Mullan, Idaho, is in Spokane, Wash., accompanied by J. R. McCormick, Minneapolis, secretary of the company.

A. Van Zwaluwenburg, formerly associated with Walter Harvey Weed in the preparation of the Copper Handbook, has taken a position as chemist for the Nipissing Mines, Ltd., Cobalt, Ont.

Smith Curtis, former British Columbia minister of mines, has been in Montreal, Que., endeavoring to arrange for the opening of a zinc smelter in British Columbia. He is now in Spokane, Wash.

Harold F. McCracken, assistant archaeologist of the Ohio State University and representative of the Museum of Natural History, New York, has left on an exploring trip from McCarthy, Alaska. He intends gathering information for a book and will take about a year for the trip.

Gilbert Rigg, formerly in charge of research work for the New Jersey Zinc Co., is now consulting metallurgist with the Broken Hill Associated Smelters Proprietary Co., Ltd., Port Pirie, Australia.

Edmund Juessen, E. M., San Francisco, is directing development work on the property of the Reward Arizona Mining Co., south of Casa Grande, Ariz., where copper and zinc ores are exposed.

George W. Fraser, smelter superintendent for the Arizona Copper Co., Clifton, Ariz., has left to accept a position as smelter superintendent of the American Copper Syndicate, Ltd.'s, plant at Aroa, Venezuela.

Joseph H. White, sanitary engineer, U. S. Bureau of Mines, has accepted a position with the Braden Copper Co., Chile. He will have charge of sanitary and welfare work at the South American camps of the company.

NEW PUBLICATIONS.

Triangulation in Arizona and New Mexico. By R. B. Marshall. Washington, D. C., U. S. Geological Survey. Bulletin 644 B; pp. 12.

Detailed information is given for the location of government triangulation stations which have been established in the states. Azimuths and distances with respect to stations are given to aid in computations and location on topographic surveys.

Coal Mine Fatalities in the United States, 1870-1914. By Albert H. Fay. Washington, D. C., U. S. Bureau of Mines. Bulletin 115; pp. 370. For sale by Mining World Co. 50 cts.

Besides giving minute and detailed information on coal mine accidents in tabulated form and as discussion for the various years, districts and states, statistics on coal production, labor and mining methods are briefly reviewed with respect to the state and calendar year in which they occur.

Lead and Zinc Deposits in Ontario and in Eastern Canada. By W. L. Uglow. Ontario Bureau of Mines, Toronto, Ont. Annual Report; Vol. XXV; Part II; pp. 56; illustrated.

Separate descriptions are given of the different mines, prospects and deposits located in the area covered by the report. These descriptions are again subdivided according to the nature of the deposits and the probable genesis. The genesis of the deposits is taken up as due to igneous after-action with both high and intermediate temperatures and independent of igneous after-action. Under the latter, deposits with calcite-barite-fluorite-galenite veins; and gash-vein impregnations into Paleozoic limestone are described. Besides geology of deposits, the duties and bounties offered by the province for lead and zinc ores produced in the province are considered, with figures on production of the same.

Petroleum Withdrawals and Restorations Affecting the Public Domain. By Max W. Ball. Washington, D. C., U. S. Geological Survey. Bulletin 623; pp. 427. For sale by Mining World Co. \$1.20.

The bulletin contains copies of orders of withdrawal, restoration, modification and classification, and of the more important correspondence leading to changes of policy regarding these. An index to the orders, township by township; a short statement of the purpose of the withdrawal policy and a review of the history of the withdrawal are given. There is also a chapter on oil-land law, giving the statutes and decisions, judicial and departmental, which may be of interest to the operator on public lands. Maps showing the areas withdrawn are given for Arizona, California, Colorado, Louisiana, Montana, North Dakota, Utah and Wyoming, where withdrawals were outstanding on Jan. 15, 1916. No maps are given of Oregon or New Mexico, since all lands in these states have been restored and there is none of Alaska where withdrawal includes all oil-bearing land.

Progress Made in the Manufacturing Industries

Ingersoll-Rand Co.'s Spanish Catalog.

The Ingersoll-Rand Co., 11 Broadway, New York, has issued a catalog in Spanish under the title "Productos de la Ingersoll-Rand." This is attractively and substantially bound and contains 124 pages replete with illustrations, descriptive matter and tabulated data. The catalog covers completely the company's line of air and gas compressors, vacuum



pumps, reciprocating and centrifugal water pumps, rock drilling, metal and coal mining, prospecting and quarrying machinery and pneumatic tools for machine and boiler shop and foundry work. In short, this catalog is a complete reference book which should be of great service to Spanish speaking users of pneumatic machinery.

TRADE PUBLICATIONS.

Oil Filters. Richardson-Phenix Co., Milwaukee, Wis. Bulletin No. 5; illustrated.

These filters for rejuvenating old oil are built in capacities varying from 35 gals. per day to 50,000 gals. per hour. Special applications of the filter in the field where a 22,500-gal. capacity is required are shown. The filters are made in both portable and stationary types and in most cases illustrations and drawings are shown.

Steel Pulleys. Medart Pulley Co., St. Louis, Mo. Folder; illustrated.

The pulleys considered are specially designed for heavy duty work underground, at the smelter, or any place in the surface plant where heavy lifting is necessary. They are made with either single or double arms in the split and solid types. Views of the pulley are shown and followed with a description of the pulley's construction.

Engine Indicators. Trill Indicator Co., Corry, Pa. Booklet; pp. 56; illustrated.

Many reproductions of indicator cards are shown and the defects designated by them are discussed and compared with diagrams shown from engines which are operating correctly. The different types of indicators are discussed and notes are given on the proper springs to be used for various pressures. In this connection instructions are given on the proper methods of interpreting the diagram. Details are given on the construction of both enclosed and outside spring types. Here the function of each part of the indicator is also given.

INDUSTRIAL AND TRADE NOTES.

V. A. Stout, Balboa building, San Francisco, has taken the agency of Smith Engineering Co., Milwaukee, to sell the Telsmith gyratory crusher.

Colorado Iron Works Co., Denver, Colo., announces that L. G. E. Bignell has joined its sales organization. Mr. Bignell has had wide experience gained during his several years' service as sales engineer for the Mine and Smelter Supply Co. at El Paso, Texas, and sales manager for the Denver Engineering Works Co. of Denver.

The Metals Recovery Co. of Spokane, Wash., is installing two 50-ton Bookwalter-Dorland concentrators at two mines near Helena, Mont., for the Montana Metals Recovery Co. One machine will operate on a copper carbonate property, the other on a gold mine. This same company has installed one of its 50-ton machines on the Saskatchewan river, near Edmonton, Alberta, and results from this machine are expected soon.

The third number of "Roebbling Wire Rope," the technical wire rope bulletin of the John A. Roebbling's Sons Co., Trenton, N. J., has been issued. It contains information on aerial wire rope conveyors (continued), the right and wrong way to measure wire rope, the oldest suspension bridge in America, the Roebbling galvanized drop-forged wire rope clip, wire rope practice, incline planes, Roebbling wire rope slings and ready reference tables.

The P. M. Power Co., Chicago, has issued a booklet in which the question of powdered fuel is brought to light. It is not for general circulation but is rather loaned out by the company to those directly interested in the question treated on. The title of the publication is "Authentic Data in Relation to Powdered Coal Engineering & Equipment Co.'s System of Fuel Economy and Abatement." The question is discussed in an attempt to bring out that powdered coal is a most economic fuel and eliminates waste made by other fuels.

PATENTS RELATING TO MINING.

Mine-Car Wheel. Carl Clausen, Bisbee, Ariz. (1,190,111; filed April 19, 1916.)

Rock Crusher. Frank B. McCabe, Lewiston, Pa. (1,189,594; filed Sept. 11, 1915.)

Coal-Drilling Machine. Dan Armenti, Cleveland, Ohio. (1,189,901; filed Sept. 4, 1915.)

Crushing Machine. John D. Ochterbeck, Clayton, Mo. (1,189,471; filed Jan. 12, 1914.)

Dumping Car. Albert C. Murphy, New York, N. Y. (1,189,283; filed Oct. 17, 1914.)

Amalgamator. Percy A. Robbins, Timmins, Ontario, Canada. -(1,190,012; filed Oct. 10, 1914.)

Excavating Cableway Apparatus. Thomas Spencer Miller, South Orange, N. J. (1,189,605; filed June 4, 1914.)

Metallurgy. Henry Swift Kimball, St. Louis, Mo., assignor to American Zinc Lead & Smelting Co., Boston, Mass. (1,189,830; filed Feb. 4, 1914.)

Apparatus for-and Process of Casting Ingots of Metals and Alloys. Pierre Henri Gaston Durville, Paris, France. (1,189,548; filed Nov. 10, 1913.)

Production of Aluminates from Alunite. Paul R. Hershman and Raymond D. Cooke, Chicago, Ill., assignors to Mineral Products Corporation, New York, N. Y. (1,189,254; filed March 21, 1916.)

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Anchorage.

O. Hansen is now prospecting placer ground and quartz veins at the head of Bird creek.

Work is progressing under Supt. Young on the Lewis River lease of the Bernard interests. Ben Bernard, president of the American Dredge & Construction Co., is now on the ground and it is said more development work is to be started. Young is operating a gasoline drill on the lower end of the canyon and the property is showing up well. He says A. Chittick is shoveling in on Discovery and is taking out an ounce a day. Tom Sutter and partners have a good showing above Discovery, where they turned the river.

Valdez.

Spearsted and Johnson have been working the Millionaire group on Mineral creek and have recently made a good strike. At the end of a 225-ft. tunnel the vein on the Hercules claim was cut at 175 ft. below surface. At this point the vein is 6 ft. wide and carries good values. Ore crushed in a mortar and panned yielded results that are satisfactory to the owners, it is said. A mill has been secured and is now near the mouth of the tunnel ready to be installed. It is of 12 tons' capacity and will be replaced by a larger one as soon as conditions warrant. A concentrating table will also be sent up to the mine and the plant will be in operation before Aug. 1.

Cordova.

Word was brought in by James Galen that Mike Sullivan has made a strike of quartz-bearing copper at Mile 99 station on the Copper River railroad.

A bridge gang is at Mile 52 on Placer river. A crew of 12 men are engaged fixing the road and a clear way to Mile 71 will soon be accomplished. The ice in tunnel No. 1 has been nearly all taken out, only 8 ft. of it remaining.

Knik.

F. B. Cannon, this city, and W. J. Conroy, Anchorage, have started work on their quartz claims on Archangel in the Willow Creek district. There are two groups of claims. Manager Ward is tunneling on the Webfoot group and the property is showing up favorable. The ledge has been stripped for 800 ft., showing values as high as \$50. As this property is near the Mable, Talkeetna and other proven quartz mines, early results are very possible.

The Gold Bullion mine is under a 2-year lease to a Montreal, Canada, syndicate, the Willow Creek Mining Co., under Supt. McAllan. It is employing 70 men at present, and the mine will not close down until Oct. 15. This plant is the farthest north cyanide plant in the world and is of 45-ton capacity. They are running 12 stamps this summer. McAllan says this season's cleanup will pass previous records.

ARIZONA.

Jerome.

Unwatering the shaft sunk by former owner—Haynes Copper—on the property of the Jerome Victor Extension Copper Co. is being accomplished at the rate of about 100 ft. per week. As soon as the workings are entirely freed from water the management will put on three shifts and develop the mine. Operations are in charge of George W. Salisbury, who for a number of years was a member of the engineering staff of the United Verde property, adjoining on the west.

Salisbury brings to the development of the latter the knowledge of the ore depositions of the Verde district gained during his service in the United Verde. The plant of machinery installed by the Haynes people is being utilized for present needs, but later will be superseded by a modern and more efficient one.

Six hundred thousand tons of ore is blocked out on the 1400 level of the United Verde Extension mine. A careful sampling of this large tonnage shows that it averaged about 16% copper. It has been developed by about 2000 ft. of lateral work and by two upraises of 100 ft. each. A winze is being sunk near the center of this body, the objective being a depth of 200 ft. The management has in view the sinking of a new double-compartment shaft to be used exclusively for hoisting ore. Upon completion of this shaft and of the winze before referred to, the shaft on the company's Edith claim will be sunk to the sulphide ore area. Approximately 7000 tons of ore carrying an average of 20% copper is being shipped to smelter each month. The net profits therefrom for several months past have been about \$350,000 per month. The company has cash on hand totaling \$793,882.72, and has due it from ore shipments approximately \$1,000,000, making a grand total of \$1,793,882.72. Despite this large reserve, it has been decided to accumulate an even larger surplus for the purpose of developing the mine and building a smelter. Quarterly dividends of 50 cts. per share will, however, not be affected by this decision.

Save for minor details the deal is practically closed whereby G. W. Hull transfers his mining holdings in the Verde District to the Clark interests. One million dollars is said to be the amount involved, and in consideration therefor Hull turns over his individual holdings and likewise his controlling interests in the Hull Copper, Con. King, Columbia and Cleopatra Mining companies. Deeds have already been issued transferring Hull's individual holdings to the Clarks, and passing to them of his controlling interests in the companies mentioned is said to be assured.

Prescott.

A contract has been let for sinking the main workings shaft on the C. B. S. property an additional 100 ft. This property is located in the Copper Basin district, where are also located the Commercial mine, shipping 100 tons of copper oxides daily, the Loma Prieta, showing 70 ft. of chalcopyrite in its shaft, the Schuber Copper, the Copper Hill, and the McNulty and McBride holdings, all of which appear to be in line for production. Copper Basin is directly tributary to Prescott and is considered to be the most promising copper ore section in Yavapai county, aside from the Verde district. R. M. Martin, owner of the C. B. S., is said to have one of the best copper ore showings in the Basin, and this opinion has been strengthened by disclosures in the old workings which were recently cleaned out and placed in working order.

Ray.

After consultation with General Manager Adams of the Ray Hercules Copper Co. in New York the directors have decided to build a 1000-ton plant. The buildings to be constructed will be large enough to accommodate equipment for a 2000-ton plant. The mill as now contemplated will cost about \$300,000. For possibly 2 years the management does not expect it to be in operation. The Callow flotation process will be installed. Ore taken from 2 drill holes has resulted in a satisfactory recovery. The extraction from one hole averaged better than 91%, while about 88% was recovered in the other. The company has been shipping carbonate ores, the proceeds from which have materially aided in paying for development. While the property could ship 50 tons daily, the smelters will take but 30 tons. A three-compartment

ment shaft has been sunk 300 ft. and crosscutting will start when the 500 level has been reached. Development work has resulted in a material increase in ore reserves, 3,400,000 tons reported September, 1915.

Miami.

The Inspiration Needles Copper Co. has laid 4800 ft. of 2-in. water pipe which is connected with the pumping plant of the Miami Southwestern and which will furnish an adequate water supply to the two churn drills now on the ground. Drilling has been resumed and work will be rushed day and night in drilling and running the main tunnel. It is the present intention of the company to keep on adding drills until the number reaches seven. All lumber and material are now on the ground for the erection of mess and boarding houses, blacksmith shop, assay office and the general offices of the company.

Ajo.

The Ajo Con. Copper Co. is developing the eastern extension of the new Cornelia ore zone. James Phillips Jr., New York, is president; Walter M. Briggs is vice president. The property is under the management of James P. Gaskill, who has been directing the work of three diamond drills on the group during the last year. Drill holes have been sunk 200 to 750 ft. On the western part of the property the ore deposit is exposed at the surface, but farther eastward it dips about 50° and is covered by conglomerate and rhyolite. This ore

which means the camp is starting right. It is an easy matter to see and determine that the chances for a big and prosperous camp in and around Parker are very good. Any one familiar with mining can not see where failure has any chance to creep in. There is also strong talk of a good size plant for reducing the ore going in at Parker, which would mean a big saving over ordinary smelting. The parties owning and controlling this process were on the ground while the writer was there and was well pleased with conditions in general. The chances are a plant of good size will be in active operation in the near future.

CALIFORNIA.

Alleghany.

A ball-mill having a capacity of 100 tons per day is being installed at the Irelan mine and will operate in conjunction with the stamp mill at present in commission. The Irelan has been developing splendidly in the past 6 months and a good tonnage of profitable ore is blocked out. Specimen ore has been extracted recently. A. Copps is superintendent.

Under the direction of Supt. Wagner an extensive amount of new work is proceeding at the El Dorado group



AJO CON. PROPERTY, ARIZONA.

body is being explored on its dip by drill holes. At the greater depth of ore, as found on its dip, it is composed of chalcopryite and bornite. The ores near the surface are of high grade, and consist of oxides and carbonates of copper. The sulphides, found at greater depth, assay about 1.75% copper. The property is developed by three shafts and 5000 ft. of lateral work. Fred Osborn is assistant in directing this work.

Parker.

*Parker is on the Arizona side of the Colorado river on a branch of the Santa Fe road, running from Cadiz to Phoenix. A fine steel bridge crosses the Colorado river at Parker, which is 1500 ft. in length. The Colorado river cuts the mineralized zone at this point, part of it being in San Bernardino county, California, and part in Yuma county, Arizona. I find both sides of the river carries practically the same mineral formation and as far as I could see from my inspection the ore encountered carries principally gold and copper. I found good properties on both sides of the river, and car loads of ore are being shipped daily from Parker to the different smelters. The ore that is being shipped is high grade, some of it running over \$100 in car lots. This section is just coming to the front and the time is not far distant when both sides of the river will have big producing mines and a large tonnage of good pay ore will be shipped daily. Reliable parties are already interested in that section,

of 3 claims on Kanaka creek. Arrangements have been made for the installation of an electric motor and 8-drill compressor. The company owns extensive water rights. The vein is developing well, seams of rich quartz frequently occurring with the milling product; 30 men are employed.

Driving of the Red Star tunnel is proceeding steadily at the Tightner mine and the work is entering interesting territory. The Red Star vein yielded much specimen ore in the old workings of the Red Star mine and is expected to produce well at depth. In the main Tightner workings ore of milling grade continues to be exposed. The 10-stamp mill is running steadily.

Yreka.

The main ledge of the Old Flag mine, in the Humbug district, has been intersected in the lower tunnel. It is 9 ins. wide near point of discovery and is gradually broadening out. The quartz is of specimen character. It is planned to purchase hoisting equipment and to sink a shaft to open the vein to advantage. Capt. I. T. C. Nash, of Berkeley, is managing owner.

The Victory Gold Mines Co. has installed a 50-ton concentrating plant at its property in the Salmon River district, purchased a motor truck for transportation of ore from mine to mill, and is erecting a 300-ft. tramway from the main tunnel to the loading bins. Lateral work has uncovered a

3-ft. ledge of good ore for upward of 270 ft. and sinking on the vein will soon start. The Victory is the extension of the Advance mine, long famous for its specimen quartz. John Nefrony is manager.

Colfax.

Salt Lake people, represented locally by H. J. Dykes, have bonded the Adventure gold mine in the Iowa Hill district and are erecting a 5-stamp mill. Developments consist principally of tunnel work, and the ore assays around \$15. The Adventure is owned by R. L. Turner of Colfax.

Lincoln.

Operations have been resumed at the Algo copper mine and equipment installed. Considerable ore of excellent grade has been exposed in the upper workings and under the new management the property is expected to soon become a good shipper. B. C. Musher and H. P. Sartain of Lincoln are the chief owners.

Heroult.

The Noble Electric Steel Co. has acquired a manganese property near Lowrey, west of Red Bluff, and is shipping 50 tons per day to the electric smelter at this place. The ore is stated to be high-grade and the deposit appears to be quite extensive, the ore body being fully 75 ft. wide. Developments are proceeding with a force of 50 men. Friction with the owner of the Bear Canyon manganese mine, near Clipper Mills, has temporarily resulted in suspension of shipments from that point.

Amador City.

The new mill at the Treasure mine went into commission last week on good ore from the lower levels. The company recently sunk a shaft and prosecuted much deep work with satisfactory results. Sufficient ore is exposed to insure a long period of production, and developments are augmenting the visible reserves. J. H. Bell is superintendent.

Nevada City.

Nevada people, under the management of W. H. Tuttle, are unwatering the Texas mine in Willow valley, preliminary to extensive operations. Retimbering of the shaft and tunnel has been completed and active mining will start in a few weeks. Together with the Texas the adjoining Niagara and Durbin properties will be energetically worked.

It is reported mining is about to begin at the Murchie mine, taken under option recently by New York people. The Murchie has yielded well in the past but has not been worked to any extent in recent years. The size and character of veins are similar to those found in the Champion group.

Washington.

Shipments of chrome ore are being made to eastern mills from the Red Ledge gold mine at this place. The chrome is found in small deposits and is stated to be of high quality. Production of gold is going on steadily, the 6-ft. vein recently encountered developing well. A number of properties in the Grass Valley, Nevada City and Washington districts are benefiting from the demand for manganese, tungsten, and chrome, small quantities of these minerals being often found with the gold-quartz deposits.

Forks of Salmon.

The present season is proving an unusually long one for the hydraulic and placer miners. Snow is still piled in the hills and sufficient water is available at many points to facilitate operations by the leading companies well into August. The Forks of Salmon, Michigan Salmon, and other companies are recording a highly prosperous year.

Angels Camp.

Sinking from the 2700 level of the Utica mine is proceeding steadily and the shaft is expected to encounter the junction of the Gold Cliff and Utica veins within a few hundred feet. The mill at the Gold Cliff is crushing about 6000 tons per month, and a good tonnage is also coming from the Cross workings. Some specimen ore continues to be extracted from the vein recently tapped on the 1800 level of the Gold Cliff.

Porterville.

A new deposit of rich ore has been opened on the property of the Magnesite Mining Co., north of Porterville. The ore body is 14 ft. wide with streaks of the material assaying over 95% magnesite. R. A. Smith is superintendent. The

Rex Plaster Co. of Los Angeles has purchased 160 acres of magnesite ground near here and is arranging for steady shipments to Los Angeles. Several other companies are very active and an immense amount of new territory has been brought within the productive zone in the past half-year. About 700 men are employed by the companies operating in this district.

Redding.

One of the new directors and a leading stockholder in Afterthought Mining Co. is expected to come here from the east in July, and he is reported as stating that the company has been financed and that the mine will be equipped and put on a producing basis as rapidly as men and money can accomplish it.

Mokelumne Hill.

The International Investment Syndicate, Los Angeles, is building a 50-ton mill for crushing ore and recovering gold by plate amalgamation and vanner concentration. Plans have been drawn by Otto Wartenmeier, M. E., Los Angeles. Electric power will be used.

COLORADO.

Cripple Creek.

On the 12th carpenters started the work of enlarging the bins at the Dillon shaft of the Granite Gold Mining Co. The present capacity, recently completed, is 200 tons, and this is to be increased to 350. With this addition the output will be increased from 70 tons daily to 100. The ore now being shipped from the shoot under development at the 1400 level is holding well in value. It is expected the shoot will shortly be proven continuous at the 1600 level, where a cross-cut is being carried to the shoot.

Tom Tibbetts is operating the Puzzle claim and soon expects to have the property in shape for production. Operating through the Ophelia tunnel, he is drifting on a well-defined vein measuring 3 ft. wide and carrying a streak from 10 ins. to 1 ft. wide. It carries values in gold, silver and lead. Tests of the quartz showing galena have given returns of better than 1 oz. gold, 10 ozs. silver and 12% lead, a total value in excess of \$30. This ore is going into the bins and a shipment will shortly be ready.

Work has again been resumed in the Roosevelt tunnel, and the present flow from the portal of 13,500 gpm. will probably be increased. For the past 6 weeks the force has been engaged in cutting the station at the tunnel level, where it connects with the Elkton Con. Co.'s main shaft, that is where they are raising to connect with the shaft. They are cutting out other stations at the tunnel level, one for a stable for mules and the other for the ventilating fan. The heading of the tunnel is now in the Ramona claim, located northwest of the Elkton, and will shortly pass into the Crank lode mining claim to the north.

The Reed mill at the Dante property is now running smoothly. It is treating between 45 and 50 tons of dump ore from the Gold Sovereign mine daily, the tonnage having been recently increased. The Gold Sovereign dump ore assays between \$3 and \$4, and it is estimated the saving affected will be close to 90%. The first gold brick was sent from the mine about July 11.

Leadville.

According to S. P. McDonald the enlargement of the bottom station at the Penrose shaft has been completed. Ten feet have been added to the height of the station to allow the installation of a new electric pump and motor. The motor is the largest of its type in the district, having 650-hp. When in place in the station it will stand 30 ft. above the pump to allow the greatest possible distance between the water level and the motor. A drift from the top of the station is being driven to cut the shaft for providing air circulation for the motor. This drift will be 50 ft. long. Preparations are being made for the installation of the station pump and motor. Everything will be in shape for the machinery as soon as drifting is finished. No mining on a large scale has been undertaken. The work of cleaning out the upper levels continues and a large part of the old workings are now in

shape for operation. The fact that one of the hoisting compartments is still being used for operation of one of the sinking pumps limits mining to a minimum.

The Western Zinc Oxide Co. started the construction of a block of four new furnaces. The building over the furnace has been completed and a 350-ft. cooling pipe has been added. The furnaces are about half complete and will be blown in not later than Aug. 1. It is planned to add a roasting plant to the smelter and handle sulphide ore. The supply of carbonate, although sufficient for the requirements of the smelter at this time, is not as great as was planned on. The addition of facilities for the handling of sulphide will open an unlimited supply of ore and make it possible for the plant to greatly increase production. Steady shipments of carbonate are being received from the Baby, California gulch; the Little Sliver, Fryer hill, and Mikado on Iron hill.

Rico.

Impressed with the showings of development work at the Rico-Argentine, F. W. Price, who recently visited the property, says: "The main tunnel is in 380 ft. and there is 100 ft. to drive to get under the Copper stope, from which I am reliably informed more than \$2,000,000 was extracted. The downward extension of the ore will be cut at an additional depth of between 350 to 400 ft. The Honduras vein, on which work is now under way, shows strong. In the face of the tunnel the vein is between 4 and 5 ft. wide and filled with splendid gangue material. To the left of this face is a bed of ore 4 ft. wide, with no hanging or foot wall in sight. I have recommended that power drills be installed and the work of opening up the ground be rushed."

IDAHO.

Wallace.

The strike in the Union mine, now under lease to the Sherman Development Co., is even more important than at first anticipated, according to Harry L. Allen, a stockholder in the leasing concern. "When we closed down work in the Union mine on the 3d for the holidays we had a showing of 3½ ft. of fine ore in the face of the east drift from the Oreano tunnel. Since we cut the Union ledge in the Sherman claim by a crosscut from the Oreano tunnel we have drifted 300 ft. and have had ore continuously, though not the full width of the workings all the time. We will now open up the vein at an added depth of 480 ft. by an extension of the old Hidden Treasure tunnel. To reach the portion of the Sherman ground in which we are now drifting with the Hidden Treasure tunnel will involve its extension for 1800 ft., and to provide for this work we have set aside \$30,000 and are equipping the mine with a compressor. The face of the Hidden Treasure tunnel was in iron ore, a showing which had been undisturbed for many years, when we punched a hole into one side of it and disclosed a good body of galena ore. The ore body opened in the Union mine is composed of galena and zinc sulphides, much of it being rich enough to hand sort and ship. The clean galena has been found to average close to 70% lead and 50 ozs. silver, and the solid black jack about 42% zinc with low silver values."

At the meeting of the directors of the Success Mining Co. on the 10th declared the regular monthly dividend of 3 cts., or \$45,000, payable the 25th to stockholders of record the 15th. This will make the disbursements for the current year \$345,000 and will increase the grand total to \$1,940,000, including \$900,000 credited to the old Granite Mining Co., which owned and operated the property prior to the organization of the Success corporation.

Kellogg.

Having practically exhausted the ore resources of the Stewart mine, the Stewart Mining Co. is preparing to invade other fields to prolong the active life of the corporation, and at a stockholders' meeting recently the capitalization was increased from 1,250,000 shares, of which 1,238,362 are issued, to 3,000,000 shares at \$1 each. It was announced at the conference that two properties in Nevada, recently examined by William A. Beaundry, general manager, probably would

be taken over soon, and that three Idaho properties, presumably in the Coeur d'Alenes, were now being examined with a view to their purchase. President Hiram C. Tood and Vice-President Charles W. Saacks have been authorized to purchase any desirable properties that can be acquired at a satisfactory figure, and finances for the purchases and to operate the acquired holdings are to be secured from the sale of the increased capital stock.

Mullan.

The National Copper Mining Co. has decided to suspend operations at its mine and mill. Following statement by Charles McKinnis, secretary, has been made: "During June the property was given a fair try-out with the new equipment and under the best possible working conditions. The mining costs were low, but the milling costs were higher than expected, due principally to hard rock, which made machinery repair costs high. The decision of the directors is that the ore is too low grade to pay a profit, even at the prevailing prices of copper. Different suggestions have been made by stockholders about sinking deeper, or driving a lower tunnel, on the presumption that richer ore might be found. No action has been taken on these suggestions. A complete statement of the June operations will be made to the stockholders as soon as complete smelter returns are in, showing all costs in detail."

Orogrande.

It is reported that James Mazua of Spokane, one of the large stockholders in the International Gold Mining & Milling Co., reports a rich strike of 20 ins. of gold ore on the Riverside fraction owned by that company in the Orogrande district. The full width of the ore is said to run \$100. The strike is in a tunnel a distance of 200 ft. and was made about 10 days ago. The company is negotiating for an improved mill which will cost \$15,000 and which it expects to have ready for operation by Oct. 1. It has had a two-stamp mill in operation, but the stamps are only 150 lbs. each and the plant was otherwise inadequate. The new one is expected to be able to handle 25 tons of ore a day. There are said to be 2000 ft. of tunnels and shafts on this property. The No. 1 tunnel is all in ore and 48 open cuts have exposed the ore for 1000 ft. on the surface. Most of the stockholders and all of the officers of the company are Spokane men. James Tyra is president, D. Miloradovich is vice-president, James Mazua, secretary-treasurer and Loui Scassy and Neil Johnson are the other directors.

LAKE SUPERIOR.

COPPER.

Houghton.

Lake is now making preparations to unwater and open up a shaft located on the Knowlton lode in order to explore the latter, and probably the Mass, North Butler and Butler lodes, the last named, the southernmost, being 415 ft. distant from the Knowlton.

Adventure has retimbered the 80-ft. collar and has now begun to overhaul the timbering of the shaft itself, and as soon as a level is reached that looks promising drifting will be started.

Michigan is still in the high-grade copper of the Butler lode—mass of all sizes—and has advanced its drifts about 125 ft. to the east of the shaft and a little to the west.

New Arcadian is getting the same grades of stamp rock in the north drift of the lode discovered 265 ft. west of the first shaft on the 50 level. The shaft pit in the overburden is down about 25 ft. and has just uncovered the top of the ledge where considerable copper is seen on the outcrop of the lode, and it is located about 50 ft. north of the junction of the lode and the crosscut. John J. Michels, a Houghton contractor, is putting up the buildings, and in about 60 days the new hoist will be running. The sinking from the bottom level, the 1250 to the 1400, is being pushed as fast as possible; two drills are being operated.

Quincy has put in an electric pump at the 6th level of the No. 9 shaft and is utilizing the water that is the result of a filtration through the rock above. It is very pure and greatly

resembles the best spring water. A complete system of pipes is being laid, and a standpipe has been erected. No. 8 shaft has the same kind of water, and pipes will be soon laid there and the water supplied in the same way.

Winona is being inspected by Pres. C. H. Paine, Jr., of Boston, who will also visit the Houghton Copper, the Mayflower and other properties that the St. Mary's Mineral Land Co. is interested in.

Isle Royale's increase of tonnage that is treated at its own mill is due principally to the working of the stamps to the highest limit. Since the completion of the new mill, the daily tonnage stamped has been about 2200 as compared with 1800 at the old mill.

South Lake has just made arrangements with Lake so that there will be a connection of the drifts on the sixth level of South lode No. 2 on which the latter is thought to be mining, so that a better ventilation can be had for both mines, that a knowledge of the intervening ground can be obtained, and any doubt that may exist as to the lodes being the same will be dispelled. The distance to be covered by drifts on each side is less than 500 ft.

Victoria produced at the mill 102 tons of mineral for June as compared with 83 for May. The new skipway is practically completed, but the work of installing the new Nordberg hoist is being delayed by the continued difficulty of getting surface men even when the wages have been increased 20 cts. a day. There was also an increase for the underground men of 25 cts. Work is being continued on the 19th level west and on the 11th east, and resumed on the bottom level, the 26th east. In all these levels the rock is averaging good. The eastern level on the 26th is in especially good ground.

Franklin has been shipping its mineral and mass to the Quincy smelter, but as its quantity is constantly increasing, it was becoming too much to be handled without inconvenience, and Pres. Edwards made arrangements for the future Copper Range to handle it at the Michigan smelter, 3 miles north of Houghton.

Calumet & Hecla is not now sinking at any of its shafts on the conglomerate or on the Osceola amygdaloid, as miners are none too plenty, and as everywhere there is plenty of ground not yet opened by drifts.

Contact has discontinued its diamond drilling, having found a most excellent amygdaloid in four of the five holes drilled at this time, but no copper. The Wyandot No. 8 is the lode that is being explored; and is giving good values, and here there was never exposed a better amygdaloid—one that if it had been visited by the copper would have received a fine deposit. The showing at the Wyandot would warrant a shaft being sunk here, but the funds are low and assessments on properties that give no great promise would not be very successful just now. At some future time when there is more interest in coppers or if Wyandot continues to make the favorable showing it is doing now it is probable that the exploratory work will be taken up again.

New York Con., which lies a half a mile north of the Seneca in Secs. 3, 5 and 10, T. 57 N., R. 32 W., and which comprises 720 acres, has just been sold by Receiver F. W. Nichols to R. H. Rickard, for \$4850, the amount of the claims against it. It was a defunct company, which had had two charters, and which has been dissolved by order of the court. It has been owned from the first down to the present time by the Rickard and Palmer families; some work was done on it in the early days, some 60 years ago. The New York carries the Osceola amygdaloid, Calumet & Hecla and some other of the lodes to the west. There is no intention of doing any exploration on it at the present time. Rickard, whose residence is in New York, has quite large holdings of land on the peninsula and is making a short stay in this district for the purpose of settling the affairs of this company, and looking after his other interests.

Hancock held its annual meeting June 21 and the old directorate was re-elected with one exception, J. H. Hicock, secretary-treasurer, succeeding F. W. Nichols, the local agent of the St. Mary's Mineral Land Co., who no longer hold any stock, having distributed theirs to their stockholders. The other directors are A. F. Rees, J. D. Cuddihy, S. E. Harris and Jas. Hoatson. F. M. Preucil, J. H. Hammel and D. C.

Purdy of Chicago, representing themselves and other stockholders, were present at the meeting, and visited the mine and other points of interest in the district. Preucil has made the trip for a number of years.

IRON.

Negaunee, Mich.

The hydro-electric plant being constructed by the Cleveland-Cliffs Co. north of here will be finished about Sept. 15. There are about 30 men working. The power house, which is of brick upon a concrete foundation, is completed. The machinery has arrived and is being assembled. The equipment will be similar to that generally used. The power will be generated by a 1000-kw. dynamo direct connected to a turbine. The power will be transmitted to the Maas mine, where it will be distributed over the main lines of the company. The transmission line from the mine to the plant has been completed. The dam behind which the water will be stored was built several years ago by the lumber companies operating in the vicinity, to get power for the hoist. It is of the crib type, rock-filled, and only needs slight repairs to again make it serviceable. A water head of 100 ft. is obtained. The purpose of the plant is to provide increased power to take care of the load which is constantly being put on the lines, and which is at present being taken care of solely by the plant near Marquette. There has been water enough to allow the hydro-electric plant to carry the load alone without aid from the steam turbo-generator at the Maas, which has been idle since last fall, but the consumption of current has grown to an extent that makes an auxiliary plant advisable.

The new rock crushing plant at the Hard Ore mine of the Oliver Co. is now in operation. The frame is 100 ft. high and is constructed of steel. Carpenters are covering the structure. Two engines are used. One hoists the ore from the pockets and the other operates the crushers. The ore first passes through the large crusher, which is installed above two smaller ones. The latter stand side by side, and separate revolving screens lead to them. The crushed ore is a 2-in. size. Some 15 men are employed at the plant. The ore is hard, but there has not been a breakdown since the plant went into operation. The ore, as it comes from the mine, is dumped into the pockets on the west side of the plant and the empty cars are run down to the pockets leading from the crusher, so that no extra switching is required. The plant is crushing from 2000 to 2500 tons per 10 hours.

MISSOURI-KANSAS.

Joplin, Mo.

Conditions in the Joplin field for week ending the 15th showed a marked readjustment in the matter of the ore output, with a desire on the part of the operators toward lessening the accumulating surplus stocks, and also waiting reduction in cost of mine and mill supplies. Many of the operators had already closed down where the cost of operation was too close. Others are following voluntarily. An enforced curtailment came from the failure of power from the Empire District Electric Power Co. This is especially felt in the large sheet ground fields in Webb City, Cartersville and Prosperity. It is believed that fully 2500 tons of concentrates were cut from this week's production.

One of the undertakings which promises a considerable activity in a camp long neglected is that of C. M. Sheldon and associates in the old Peacock camp, just across the line in Kansas. This concern has undertaken to build a dike along the bank of Spring river to prevent flooding during high water. This dike is 1500 ft. long, most of which is made of concrete, heavily riprapped. During the recent construction work the heaviest flood the river has seen for years took place and completely washed away over half of the dike which was in the process of construction. Large Texas pumps are now draining the ground and have brought the water level down to 80 ft. The drainage will be continued until the water is brought down to the old levels at 130 to 180 ft., at which point the company expects to resume mining operations. The company is also building a

mill which will be ready for treating the ores as soon as the drainage of the ground is completed. The company expects to sublease a considerable portion of the old camp. The recovery from this old camp after being under water for 10 years will bring to life one of the heaviest producers the district has ever known. It is from this camp that the United Zinc Co. earned its greatest dividends.

On the C. F. Martin land north of Galena Heights Bob and M. J. Andrews and associates are constructing a new 200-ton mill. This plant is expected to be ready for operation by Aug. 15. The company has put down 15 drill holes over a 40-acre lease, and has opened up a very extensive ore body at the 150 level. The ground was operated about 15 years ago; \$25,000 worth of ore was taken out at shallow level. The company has opened up the old shafts but will in addition sink several new shafts.

On the old Powhattan lease at Thoms Station, the Short Land & Mining Co. is completing the erection of a new 200 mill. This mine was extensively worked several years ago. The upper portion of the workings showing a recovery of 15 to 25% zinc. The lower levels developed sheet ground which ran from 3 to 4% zinc. The new company expects to work the lower ground and clean up the old upper workings in an effort to prospect some of the richer runs on that level. This work is being done by J. M. Short who is the former operator of the Powhattan lease.

The Culbert Lead & Zinc Mining Co. is erecting a 150-ton concentrating plant on the Missouri Lead & Zinc Co.'s land southeast of Joplin. The mill is being erected on a well-developed lease which shows a shallow ore deposit on the 40 to 60 ft.-level.

The Poor Boy's Mining Co. is sinking a shaft 176 ft. deep to open a run of ore at that level by prospecting. The company holds a 40-acre lease on the U. R. Hogset place. The company operated for a while on a run of lead ore at the 40 level, that portion of the deposit having been cut out prospecting for a lower level was undertaken and was successful. Jesse Ader of Webb City is general manager of the property.

Galena, Kans.

Dr. Carl Mining Co. holding a 50-acre lease on the Shoman and Stoice land just south of the Galena smelter, has started the erection of a modern concentrating plant. Drilling showed good ore in 5 holes. Contract has been let for 6000 ft. of drilling.

Glen Toms and associates have opened a rich prospect on the Little Homestake mining lease at a depth of 65 ft; 700 tons were hauled out and show a recovery of 10% lead and zinc. The ore is free, and the concentrates run 62% zinc.

Mooney & Co. owning a lease on adjoining ground have taken out some very rich ore at the 100 level running 15% zinc. Most of the mines on this lease were drowned out by the recent flood.

Vincent & Co. holding a lease on the Homestake ground lost their shaft by caving ground and are just now completing a new shaft down to the 60 level, and are just getting into the ore.

The prospecting west of Baxter Springs continues to attract attention, being an extension of the Miami district up into Kansas, the number of prospect drills moving from the Oklahoma camp across the line has been very large. One of the important strikes recently made was that on the Harry Harris tract, west of Blue Mound. Harris put down one hole to test out a number that had previously been put down, which showed 39% zinc. He is now engaged in sinking a shaft which encountered the ore at 235 ft.

W. C. Frisbie and H. L. Freeman of Joplin have leased the Bob Parr land, west of Baxter Springs, and have started sinking a shaft. The same company has leased the Mulberry and is installing new machinery and boilers to unwater the old mine at once. W. J. Shaddin of Baxter Springs is the owner of the Mulberry lease.

Harley Wells and associates are prospecting a lease southwest of Baxter Springs on the Thomas land. Ore was struck at 66 ft. and continued down to 90. Both lead and zinc showed in the cuttings, but zinc predominated. Other drilling will be done.

MONTANA.

Butte.

Butte employes are enjoying the greatest payroll in the history of the camp. For the month ending the 15th the payroll amounted to approximately \$3,500,000. The miners employed by the Anaconda Copper Mining Co. received their pay checks for the Butte mines, amounting to \$1,567,719. This is the largest ever paid by this company to its miners. This does not include the payroll for the general offices, including the legal or geological departments and other offices, nor does it include the payroll of the hardware department, nor of any of the subsidiary companies. It does not include the payroll of the Washoe smelter or any of the other departments of the company located at Anaconda. The entire payroll of the big company is estimated at close to \$2,500,000 alone, if the Great Falls plant and other divisions are included with those mentioned above. The payroll of the Butte & Superior Mining Co., including the mine, mill and general offices, amounted close to \$300,000. The payroll of the North Butte Co. was \$160,331. The men were paid on Friday last. The payrolls of the East Butte, Davis-Daly, Butte-Ballaklava, Butte & Zenith, Butte & Great Falls, Elm Orlu and Timber Butte Milling companies, Tuolumne, Colusa-Leonard Extension, Butte & London, Rainbow Development and many other companies operating in this district add fully \$300,000 more.

The water in the Ophir shaft of the Butte-Detroit property has been lowered 1000 ft. The shaft has been found to be in good condition, although in some places some retimbering is necessary. The management expects to have the shaft unwatered within 10 days now, and within a month expects to begin sinking. The 500 station has been cleared and the old pump at this station, which had been submerged, has been placed in good working order. It is planned to cut a pumping and working station at the 1000.

The Barnes-King mill at Kendall ran 14 days in June and treated 945 tons of ore. The cleanup, however, not complete, amounted to about \$7800. The power plant, purchased from the Kendall Gold Mining Co., has been in need of repairs for some time, and when these repairs were undertaken on June 15 it was found that the time required to make them was much greater than anticipated. Mining and milling operations were resumed July 1. The Piegan-Gloster mill was in operation 8 days, and was then shut down, without a cleanup from the treatment of 700 tons. The installation of new machinery, required for the treatment of Shannon ore, made this shutdown necessary. The pumping equipment for the Gloster shaft, which was promised for March 15, has not yet arrived, and consequently there has been a delay in unwatering the deeper workings of the mine. However, the mine is now drained to the 500 level, and it is expected that there will not be much further delay in unwatering the winze below the 500, when the extraction of the good ore, which it is believed exists below the 500, will begin. The Shannon, on account of slow delivery of building material and much bad weather in the spring, the construction of the aerial tramway has been delayed, but it is now probable that it will be completed this month, and the treatment of ore at the Gloster mill will then proceed. The Shannon vein on the tunnel level is being explored to the west, but has not yet discovered a new ore shoot. The work on the Woodrow Wilson was continued on tunnels Nos. 2 and 3, a distance of 105 ft. being driven. No. 1 tunnel was timbered where beginning to cave. During the month the snow largely disappeared, and then the ground was covered with a fresh fall to a depth of over a foot. That also disappeared, with the exception of drifts, leaving the ground saturated with moisture. Very good surface showings in shallow cuts were exposed by the going of the snow between No. 1 and No. 2 tunnels.

Reports of the Washoe smelter on carload shipments from the Nancy Hanks mine indicate that this property has again joined the ranks of the producers. For several years and up to 3 or 4 years ago this mine was the largest producer of the Garnet district, but it was closed when the ore supply apparently was exhausted. It was thought then that the vein

had badly faulted, but under the new management, in sinking from the 300 to the 400 levels, the vein was picked up at the 380. Sam Richie, former owner of the mine, was in Butte recently. According to Richie the vein is 30 ins. wide. The ore ranged in value between 4 and 5 ozs. gold on the 300 level and at the 380, where the vein was picked up, the richest shipment returned 9.3 ozs. silver, \$12.60 gold and 3¼% copper. The ore is hoisted through an incline shaft and all shipments are made to the Washoe smelter, cars being loaded at Bearmouth, 11 miles from Garnet, the nearest railroad point.

Daily shipments of 75 tons of silver-zinc concentrates are being made from the Comet mine in Highore gulch, under the ownership of the Montana Con. Mining Co. The mill belonging to this company and in which the product is being treated has a daily capacity of 150 tons. There is a considerable tonnage of ore blocked out and the management hopes to increase the mill output within a short time.

Helena.

At least a car of ore a day will be shipped from the property of the Helena Scratch Gravel Mining Co., according to Captain Hosking, superintendent. The company is now opening up extensive bodies of ore in the B. and B. and Armilda groups in Ophir gulch. Owing to the heavy rains of the past few weeks, however, shipments have been seriously delayed. It is planned to put on ten 4-horse teams as soon as the roads are in suitable condition, which will probably be within the next few days. The bins are filled with ore. There are several hundred tons of ore already stripped and ready for blasting as soon as the ore which has already been taken out can be taken out of the way.

In the Cone Butte district in the Judith mountains Chas. Edwards and Jack Leonard are developing the Lost Cabin group on Elk mountain by sinking a shaft. A depth of 40 ft. shows a vein 4 ft. 8 ins. wide. An average sample of 50 lbs. from this vein sent to Butte for assay showed \$3.60 in gold, 17 ozs. silver and 18% lead.

Also Badger & Winston, who are working the Green-Morrison group in this district, sank a shaft 50 ft. and ran a crosscut, cutting a vein 10 ft. wide that goes 60% in lead.

Elk mountain, where those properties are located, is given special mention in the U. S. Geological Survey of 1898 of the Judith mountains, as to geologic condition; also by B. F. Hoyt in his report on the "Golden Eagle" and "Accident" properties in this district. Those properties will soon ship ore, and are within 5 miles of the railroad.

NEVADA.

Goldfield.

The new flotation plant of the Goldfield Con. is treating upward of 700 tons per day and will soon be handling 1000. It is said the gold and copper recovery is highly satisfactory, being fully as good as with the 50-ton experimental plant. Developments on the 600 level of the Mohawk are exposing fair-grade ore, and on the 333 level of the Red Top-Laguna group stoping is proceeding in ore averaging over \$12. It is estimated the June net earnings were about \$40,000 and that July will record a substantial increase.

It is reported the Philadelphia owners of the Vernal mine are arranging to install a core drill and prospect the deep sections. The Vernal is situated in the Diamondfield portion of the district, adjoining the Goldfield Belmont. It has produced considerable shipping ore from above the 200 level and indications are stated to be favorable for persistence of the ore shoots to depth.

The Charles S. Sprague interests of Goldfield have taken under option the Kanrohat property in Jefferson canyon, north of Round Mountain. A large tonnage of ore is in the mine and on the dumps, and the property is equipped with a small mill. The ore is largely silver bearing and it is probable flotation will be employed. Work will be prosecuted under direction of J. K. Turner, consulting engineer of the Sprague Co.

Tonopah.

The Victor shaft of the Tonopah Extension has been repaired and is again the main working outlet of the property.

A heavy tonnage of good ore is coming from the lower levels and the mill is being worked up to capacity. Fifty stamps are dropping and the management expects to keep the future output at over 2200 tons per week. Developments are going on from the 850 level down to the 1540 workings, with the stopes in ore at all points. A particularly large amount of new work is being done on the 1200 level.

The Halifax Co. has completed arrangements to shut off the flow of hot water on the bottom level and is ready to resume driving of the crosscut, which is designed to intersect the big vein exposed in the 1200 workings. At the latter point drifting and raising in ore continues and a good tonnage is being extracted, the ore being of the same high grade as previously reported; 180 tons are crushed weekly at the West End mill.

The Tonopah Mining Co. has completed sinking a winze in the Mizpah Extension, which will be the 1345 level. A station is being cut at this point and considerable lateral work has been decided on. Stoping on the flat vein continues to expose 4 ft. of good ore. Small shipments are made as ore is broken in course of developments. The Tonopah Mining Co. has declined to exercise its option on the California-Tonopah group, following a comprehensive exploration of the workings.

Carlin.

An important development is reported from the Lynn Big Six mine, controlled by Salt Lake capitalists. A new ore body, 400 ft. from and paralleling the main ledge, has been opened and assays around \$46; 20 ins. of the face is said to run from \$115 to \$290.

Pioche.

High-grade silver-lead ore has been encountered in the property of the Pioche-Bristol Mining Co. The vein is about 3 ft. wide, of which 11 ins. averages \$550. There are also 24 ins. of good milling grade. Machinery is to be installed and sinking prosecuted. H. W. Parker is superintendent.

Battle Mountain.

Rehabilitation of the group of copper mines in Copper canyon recently acquired from the Glasgow & Western Co. by eastern capitalists has begun; two 50-h.p. gasoline engines have been purchased to operate the generator which delivers electric power to the pumps. Endeavors will be made to recover the main ore bodies on the 530 and 590 levels as soon as the water is out. Shipments of selected ore are being made from the old dumps. F. Sommer Schmidt is manager.

Gold Circle.

Los Angeles people are negotiating for the old Guzman mill with the intention of reconstructing it and converting it into a custom plant. Much custom ore is available and developments are hampered by lack of milling facilities.

Seven Troughs.

The north drift on the 1700 level of the Seven Troughs Coalition is now breaking about 8 ins. of \$700 ore. Since first encountered in the main winze the north drift has penetrated this ore shoot 25 ft., and about an equal distance to the south, where although good quartz is showing, the values are not as high. The new level is now officially designated as the 1700, although in previously referring to the strike on that level, it was called the 1660. The first bullion shipment of the month was made a few days ago. It amounted to \$10,000. A new direct-drive compressor of 395-ft. displacement from the Chicago Pneumatic Tool Co., just received at the mine, is being installed. This will practically double the air capacity and will greatly facilitate the exploration work.

Rochester.

The work of the past week has developed several excellent faces of ore in stopes in the north end workings of the Rochester Mines Co. In Raise 166 from the 320 in the East vein in Block 2 of the Crown Point, miners are breaking 7 ft. running around \$25. On the 250 in Block 3 the West vein shows 3½ ft. running \$20 to \$30. The East vein is showing equally well in this territory. All of these points are south of the strike reported in the extreme north workings of the East vein last week when at a point 250-ft. below the apex 2 ft. of ore was broken running \$154.70 in silver and \$5.20 in gold. Sinking has been resumed in the

Codd winze now at the 800 point below the apex of the East vein. The south drift on the West vein is still in ore and is approaching the Weaver ground of the company. Work has begun on foundations for new machinery about to be installed in the mill. The new equipment will double the capacity bringing the treatment rate around 200 tons per day.

Roach.

White Pine Mining Co. is building a cable aerial tramway, 2500 ft. long, to transport zinc ore from the mine to loading bins on a wagon road, over which there will be a haul of 7 miles. The ore runs 25 to 30% zinc, and is a sulphide. The plan was prepared by Otto Wartenweiler, Los Angeles.

Bruner.

The Kansas City-Nevada Con. Mines Co. property, located at Bruner, in the northwest corner of Nye county, is about ready for a ball mill. A good many hundred thousand dollars' worth of ore is now blocked out ready for the mill, and the prospects are very bright for the company.

NEW MEXICO.

Mogollon.

Recent development work on the Gold Eagle group by Louis Gramas has placed the property among the producers, the ore being shipped to local custom mill. The property is opened by shaft and tunnels and its location in the district is such as to give it a promising future.

Operations for last half of June by Socorro Mining & Milling Co. produced 18 bars of gold and silver bullion weighing about one ton; also several tons of high-grade concentrates. The plant treats 230 tons of ore daily.

At the Eberle mine, operated by the Oaks Co., preparations are being made for more extensive development work, including unwatering of main shaft. A good grade of mill ore is exposed in face of both north and south drifts from bottom of this shaft and will materially increase the production of this company.

The merchants and business men of Clifton are making a strong bid for the Mogollon business. It is said that from a survey down the Frisco river good road grades have been found. This route would give a haul to railroad of about 65 miles, instead of over 80 miles via Silver City, and would reduce freight charges in the neighborhood of \$5 per ton.

OREGON.

Grants Pass.

The evidence that Spaniards worked the gold deposits of southwest Oregon is now being well linked together. A recent discovery, in the sluice boxes of the Logan mine in the Illinois valley, of a Spanish coin bearing the date mark of 1784, is held to establish the approximate date of their operations. Besides this the cross of some Franciscan friars was found some years ago. They founded a mission at Monterey in 1770.

It has been rumored that certain financial interests are now endeavoring to reopen the Takilma smelter, which has been closed since 1908.

Grave Creek.

It is said that operations are picking up in this district and many farms have been leased for both prospecting and dredging operations. Among them are the farms of Kirk, Patton, Blalock and Williams.

Marshfield.

At Marshfield experiments conducted show black sand rich in platinum and gold. A recent shipment reports \$5 lbs. having produced \$17 platinum and \$2.70 gold.

Sumpter.

The Blue Ribbon mine is arranging to start shipping to the Oregon-Idaho Investment Co. The ore will be hauled here by team and from here over the S. V. to Baker. The Blue Ribbon has been developed sufficient to disclose con-

siderable sacking ore. It is owned and operated by J. B. Tardiff, who expects to get out at least 100 tons of a high grade. Tardiff has devoted many years to developing the Blue Ribbon from a mere prospect.

Canyon City.

The dredge which is operating here has only recently been completed at a cost of about \$150,000.

Chrome iron has been discovered on Canyon mountain. It crops on the surface in a 50-ft. ledge, said to be the largest in United States. Zinc deposits are also being developed and many native copper specimens have been brought in. There is at present more interest in the mining activity here than for years. About 100 claims have been staked during the past few days and a number of mining men have been here. Some of the chrome iron has been sold right on the ground and the expectations are to haul it out this summer.

SOUTH DAKOTA.

Lead.

The Ofer Mining Co., formed in March, 1916, to take over property of the Dakota Mining Co., is now sending 100 tons of ore per day to the Mogul mill. The ore is being hoisted through the old Mogul shaft and is coming principally from the Monday ground, one of the former properties of the Dakota. There is also some production from the Apex claim. At the Monday the Dakota Co. left numerous pillars to support the ground and these are now being used as milling material. The ore is also being taken from the extensions of verticals, which were worked in the North lode of the Mogul property and produced a material part of the rock taken from that ground. The ore is not high grade, but it contains sufficient value to permit of its treatment. In addition to the verticals, Ofer has in sight a considerable quantity of flat formation ore, upon which it can rely for the future.

Maitland.

A. J. Simmons, general manager of the Echo Mining Co., says the new electric pump is working good and progress is being made in development. The crosscuts, which are being driven east and west from the 200 level of the main shaft, are now in about 200 ft. each. The shaft was started outside of the ore body, the intention being to sink in ground more easily broken and crosscut to the vein when a suitable depth had been reached, but the shaft dropped into ore at the 200 level. This remained in the east crosscut for a considerable distance. The west crosscut encountered another ledge at the expected point. Assay returns from the ore on the 200 level are materially higher than those from the ore which was prospected by tunnel work at higher levels.

UTAH.

Salt Lake.

The reorganization of the Western Pacific Railroad promises the building of a railroad into the Deep Creek district where there are a number of mines that with transportation facilities could be steady shippers. Plans for this road have been held in abeyance for several years until the road was properly financed. A special meeting of the Western Utah Copper Co. has been called this month at which the voting of 50,000 shares of treasury stock will be made towards the building of the road. The call is signed by Duncan MacVichie, a local mining engineer, H. H. Green, city commissioner of Salt Lake, Henry Hornblower, John W. Weeks and James J. Phelan of Hornblower & Weeks of Boston and J. A. Coran. It is understood several other companies will do the same thing.

From the Lucy L. Mining Co. property in Deep Creek some tungsten ore is being mined. This ground also carried bismuth and gold.

Ore has been encountered in the lowest tunnel at the O. K. Silver property in Deep Creek. This gives a depth of about 500 ft. on the ore body. A winze below this level for

several feet is also in ore. This gives promise of continuing to considerable depth in ore. The ore is exceptionally rich in silver and shipments have been made that carried over \$5000 a car.

Eureka.

Mrs. R. S. Robertson of Salt Lake has started work on the Victoria Gold Mining Co. property in North Tintic. The old shaft has been retimbered and work has been started in the dolomite lime on the 450 level. Within the next few weeks the drift should be under a large iron blow-out where ore is expected. Mrs. Robertson is also owner of the Highland Mary group in the same section.

Preparations are being made to start operations on the old Bradley group in North Tintic under the direction of R. A. Brown, former superintendent of the Centennial Eureka. The property was once under option to the Eagle & Blue Bell.

The Chief Con. is making a record in shaft sinking on its new holdings at Homansville. Walter Fitch, Jr., has a contract for the work. The first 5 days the shaft went down at the rate of 10 ft. a day.

The machinery for the Lehi Tintic property in North Tintic is beginning to arrive and being installed.

The first shipment of ore from the property of the Desert Mountain Mines Co. in West Tintic has just been sent to market. General Manager Jake Turner expects the property will be able to ship about 2 cars of ore a week. The ore is hoisted by a whim from a 130-ft. shaft, and carries sufficient copper to stand an 18-mile haul. The Lucky Shepherd in the same district has just made its first shipment.

Andrew P. Madsen in charge of the Tintic Delamar in North Tintic says that some interesting development work is being done at the bottom of a winze 100 ft. below the tunnel level and at a vertical depth of 250 ft. There has been 450 ft. of drifting and 165 ft. of sinking on the property. Some of the quartz has carried as high as \$145 in gold.

The Eagle & Blue Bell shipments have been cut down from 150 to 50 tons a day and Supt. William Owens has put most of the 70 men on development work. The shaft is being sunk to the 1850 level and is now 65 ft. below the 1700. On the 1000 and the 1300 levels drifts are being driven into the Victoria ground. New development drifts are being run on the 1300 and 1500 levels. The present tonnage is coming from the 1500 and 1700, although there are large quantities of ore exposed on almost every level in the mine.

June earnings for Iron Blossom were \$35,000. A dividend of 10 cts. a share has been posted, payable July 25 to stockholders of record the 15th.

Ophir.

A car of ore which has been shipped from the St. Clair lease on the Lion Hill property brought \$2876.59 net from the smelter. There are 2 more cars of about the same grade that will be marketed shortly. The ore averaged 0.13 oz. gold, 50 ozs. silver, 37.2% lead and 10% iron. This is the deepest at which ore has been mined in the property at a vertical depth of 300 ft. There are two shoots of ore and they are going down strong.

The Trace tunnel on the Banner Mining Co.'s ground is being pushed ahead with two shifts. The tunnel is now in 200 ft. Within the next 80 to 100 ft. it is expected the Banner fissure will be encountered. Four hundred feet ahead of the present face of the tunnel the old workings on the Lion Hill will be reached. This will be 300 ft. below where nearly \$1,500,000 was taken out within 125 ft. of the surface.

Park City.

Within the next 10 days the Big Four mills will be in operation handling daily 750 tons of tailings. This mill will make a lead and a zinc product.

The output of ore from Park City for June amounted to 206 cars, 122 being shipped over the Denver & Rio Grande and 84 over the Union Pacific. The cars aggregated 8714 tons. The shippers were: Silver King Coalition, 2379 tons; Federal Leasing Co., Ontario, 323; Ontario Silver Mining Co., 1207; New Quincy, 124; Daly West, 1001; Silver King Con., 107; Daly Mining Co., 142; Judge Smelting & Mining

Co., 1724; Park City Mines Co., 7; Charles Moore, 34; Western Ore Co., 118; American Flag, 83; E. J. Beggs, 99; Broadwater Mills, 158.

The Daly West mill is now in operation handling 150 tons a day and regular shipments of crude ore are also being made. The company is making good earnings for the first time in several years and is fast paying off its indebtedness.

The curtailment of shipments ordered by the smelters has cut off shipments almost entirely at the Ontario. The company is taking advantage of this to push development work on the 1700 level where there was considerable good ore left standing in the early days.

Bingham.

Another new record has been made in loading ore by the Utah Copper. On the 6th, 43,000 tons were loaded at the mine. During the day 653 ore cars were filled. The company is now handling about 75,000 tons of ore and waste a day.

The old Yampa mine, owned by the Tintic Mining & Development Co., is employing 150 men and shipping at the rate of 200 tons a day. The company has now opened up the mine to the 1600 level where new ore bodies have been opened up on the lime-quartzite contact. This ore carries from 3 to 4% copper and a fine excess in iron that makes a good smelting product which is going to the Garfield smelter.

Lincoln.

The drift from the 150 level at the Croff has opened up ore 30 ft. from the shaft. This is one of the ore bodies that showed good in the levels above.

At the Creole mine, which is under lease to Dern & Griggs, high-grade ore has been struck to the northwest in a drift from the winze below the lowest level from the shaft. Samples of the ore showed 21.2% iron, 14.6% copper, 9.2 ozs. silver and \$3.60 gold. The lessees are shipping about 15 cars a month and since the lease started have sent out 2000 tons.

Alta.

South Hecla has posted its initial dividend of 15 cts., payable Aug. 10 to stockholders of record July 31. The company has 202,000 shares issued of a par value of \$1. The dividend amounts to \$39,300.

The Michigan Utah is making preparations to ship on company account from the Copper Prince tunnel where 18 ins. of copper ore carrying \$30 values has been opened up for 100 ft. The Triangle lease on the property will shortly be shipping at the rate of 2 car loads a day.

The machinery is being connected up for the long drain tunnel at the Wasatch Mines property. The grading has all been done and three shifts will be at work shortly.

A ventilation pipe and suction fan are being put in at the Alta Tunnel & Transportation Co.'s long tunnel. As soon as this is finished three shifts will be put to work. The tunnel is now in better than 2000 ft. The ultimate length of the tunnel will be 4000 ft.

The Emma Copper Co. and the Old Emma have united in prospecting with a diamond drill from the Bay State tunnel. The Emma Copper Co.'s geologist has figured that the faulted ore body should be encountered with 200 ft. of drilling.

As soon as the new ore bins are finished the Cardiff will begin shipping 300 tons of ore a day as compared with 100 now. James Austin and Abe Meekin have just received five caterpillar tractors and 60 trailers that will be used for the hauling of ore.

American Fork.

Four feet of ore in the Pacific in which a stope is being made shows average values of 3% copper and 8 ozs. silver. In doing this work there has already been taken out 2 car loads of ore.

Three shifts are now at work on the Copper Glance property which was recently incorporated. The ground adjoins the Pacific mine on the north and has the extension of the ore body. The tunnel is now in 40 ft. and it is expected that the fissure will be encountered at a distance of 400 or 500 ft.

The recent strike at the Belorophan property shows several feet of milling ore that will average \$1.10 gold, 11.2 ozs. silver, 2.1% lead, and 0.65% copper. There is also a 12 to

14-in. streak of ore that carries \$4.20 gold, 39.95 ozs. silver, and 38.90% lead. A drift from the tunnel level is now being extended into the mountain and along the strike of the vein. This is showing better ore. A raise is also being made to the surface in the vein so as to get better ventilation, and prospect some lime beds.

A foot of ore carrying \$100 in values has just been opened up in a 30-ft. tunnel on the Gold Hills Mines property in the western part of the district. The ore carries values in copper, silver and lead.

Grading is being done for the mill for the Pacific and Dutchman properties which it is expected will be completed within 60 days.

Control of the Alpine Empire property has been purchased by Jesse Knight.

WASHINGTON.

Spokane.

Shipments have been begun from the Electric Point mine, near Northport, and 30 horses and a motor truck now are employed hauling to the railway at Boundary, according to Roy A. Young, president of the Electric Point Mining Co., in which Walter Nicholls, Thaddeus S. Lane and other Spokane men are heavily interested. The ore bins at Boundary already are filled, and the railway company is constructing a siding to them. "We have not definitely decided where we will ship our ore; but we will have settled this point by the time the railway company can get cars into our bins," said Young, "and in the interval we will load directly from the ore wagons. We shall keep adding teams as rapidly as the new road from the mine to Boundary permits of heavier traffic, and in the next week or so we hope to be producing at capacity. We have a good offer for our entire output for one year from the Trail smelter and offers from Joplin, Mo., for all our galena ore, and from the Northport smelter for all our carbonate ore. The Trail plant is the only one offering to take our entire output irrespective of grade with no other provision but that we shall endeavor to keep the galena ore separate from the carbonate ore and average our shipments at 100 tons daily. The settlement basis of the proposed contract is the New York price of both lead and silver. The development of the No. 2 ore chimney has proved its ore contents to be much richer than those of the first chimney we discovered. This is because of the presence of crystallized lead in great abundance throughout the carbonate ore body. We are now about 40 ft. from the point where we expect to tap the No. 3 ore chimney by the drift on the 225 level, the same on which we opened up our No. 2 chimney. The No. 3 chimney appears to be much the largest so far found. The drift toward it is following a stringer of ore which has averaged 10 ins. in width all the way, but which occasionally widens out into a lens, or pocket. From the last of these pockets which we encountered we took out a ton of clean galena."

WISCONSIN-ILLINOIS.

Highland.

The New Jersey Zinc Co., after remodelling a \$35,000 plant, has resumed operations at the Red Jacket mine, in the Centerville camp, and the first shipment of 1 car of carbonate zinc ore was made to smelter at DePue last week. Six cars of carbonate and complex ores were also delivered from company mines. A 200-ton concentrator is being completed on new strikes known as the Kennedy-Eberle mine.

Buyers of carbonate zinc ore—Lanyon Zinc Co. and Eagle-Picher Lead Co.—took a car each, while the New Jersey Zinc Co. shipped 2 cars from the Highland mine last week. Considerable ore is held in reserve in this district.

Linden.

The Linden Zinc Co. shipped 3 cars finished product last week to Eagle-Picher Lead Co., Collinsville, Ill., 120 tons. The only other shipper was the Saxe-Pollard Co., 3 cars to

separators; 2500 tons of crude concentrates is held in reserve here.

Mineral Point.

Receipts of ore for week ending the 15th at the ore refineries of the New Jersey Zinc Co. totaled 27 cars, 977 tons, about half of the tonnage usually received. Shipments of high-grade finished ore to smelter at DePue, 21 cars, 745 tons.

Service is being extended from the Mineral Point Public Service Co. to Richland Center, Wis., 55 miles north.

Receipts of raw ore ran high at the Mineral Point Zinc Co.'s works for week of June 24—46 cars, 1753 tons. Refined ore to smelter at DePue, 18 cars, 1,372,000 lbs.

Platteville.

Returns for the field for week of 15th show 116 cars of zinc ore delivered to track, 4542 tons. Lead ore 2 cars at Federal Lead Co., 130,000 lbs.; pyrites to General Chemical Co., 966,300 lbs. The gross recovery mine run for the week, 3391 tons, shows a considerable curtailment of output due to a steadily declining ore market. Net shipment of high-grade refinery product to smelter and mine run ore to smelter direct for the week, 2745 tons.

The market was off about \$5 per ton over the figures of previous week, \$60 to \$65 base 60% zinc content, and top grade ore down to \$53 for medium grades, assaying down to 50% zinc. These figures leave low grades without a market. A conservative estimate of concentrate held in bin falls not far short of 10,000 tons.

Mifflin district shipped 13 cars last week, 532 tons; Mineral Point locals to furnace, small lots, 21 tons; Dodgeville, Montfort, Hazel Green and Potosi districts reported no shipments.

Mifflin.

The Grunow, handling 75 tons of mill feed daily, is making 8 tons of concentrates which is held. Peni Mining Co. has 100 tons of high-grade ore on hand. The B. M. & B. Mining Co. has opened up the old Squirrel mine with a fine showing. The Biddick shipped 14 cars in June, but shipments at present are light; 7 cars of ore is held in bin. The Lucky Six is running an average of 150 tons of mill rock daily and is making 10 tons of high-grade ore. Rewey business men have purchased the Phoenix mine and will supply a milling plant. The Coker No. 1 is treating 300 tons daily and recovering 25 tons of concentrates. Shipments for June totaled 18 cars. Coker No. 2 is handling 350 tons daily and recovering 15 tons of concentrates; 9 cars were shipped in June. The Rundell is holding about 150 tons of ore. The main forehead is carrying over the line into the Yewdall lease where a new shaft is down to ore level and another mill will be built without delay. The Big Tom is in running order with a new rig being tried out this week. The mine has been unwatered. Livingston mining men assumed control of the O. K., equipped the property and now have an ore run 70 ft. wide and still undetermined. The ore is high grade. The Senator is going steadily and shows two working faces, one driving east 80 ft. wide and another driving west 70 ft. wide. Several hundred tons of concentrates are held in bin. Drills are at work on six leases in camp.

Last week's deliveries were: Lucky Six, 4 cars, 124 tons; Coker mines, 7 cars, 282 tons; all to Mineral Point Zinc Co. Rundell to Cuba, 43 tons; Biddick to Benton Roaster Co., 2 cars, 91 tons; Senator to Galena, 42 tons. A new shaft is going down on the Udell lease of the Vinegar Hill Co. Mineral Point to furnace, small lots, 8 tons in all. O. P. David at Montfort is going steadily; shipped 2 cars to LaSalle, Ill.

Benton.

Shipments have been appreciably lessened since the recent slump in ore values. Last week's reports account for 45 cars of zinc ore, 1800 tons. The Vinegar Hill Co. led with 9 cars from the Martin, Kittoe & Blackstone; Frontier Co., Burr mine, 3 cars; Hird, 2 cars, and Bull Moose 3 cars, 326 tons. The Hird is a new producer. New Jersey Zinc Co., Fox mine, 5 cars, 218 tons. Fields Crawhall mine to Wisconsin Zinc Roasters, 3 cars, 105 tons; to Galena Refining Co., 4 cars, 120 tons; Fields Thompson mine to Galena Refining Co., 2 cars, 80 tons; Wilkinson Mining Co. reports an initial shipment of 1 car to Mineral Point, 42 tons; Skinner Separat-

ing Works, New Diggings, to LaSalle, 1 car, 41 tons; American Zinc Co., 4 cars, 150 tons, to Edgar Zinc Co., 3 cars, 120 tons, all high-grade ore. The Champion mine delivered 5 cars mine run to Wisconsin Zinc Roasters, Galena, 200 tons.

Cuba City.

The National Separating Works received 16 cars zinc ore last week, 691 tons; shipments of finished product to Illinois Zinc Co. 5 cars, 185 tons; Granby Mining & Smelting Co., 7 cars, 286 tons; Utt-Thorne Co., to Benton Roasters, 2 cars, 88 tons. Standard Metals Co. is rushing reconstruction of a second-hand plant on the Gritty Six mine; is supplying a pumping and power station to the old Dall mine. Baxter Mining Co. resumed operations on the old Baxter.

Shullsburg.

Shipments of zinc concentrates to Wisconsin Zinc Roasters from the Winskill mine continues in volume, 5 cars going last week, 200 tons. Rodhams Mining Co. is producing heavily both of lead ore and zinc ore. A new producer, including independent zinc ore refinery, boarding house and miners' cottages, is in operating order on the Mulcahy land for the Oliver Mining Co., a subsidiary of the Cleveland-Cliffs interests. T. Hawson is superintendent in charge. A score of drill rigs are engaged in prospect work at as many different points in this district.

Galena.

Shipments for week of 15th showed improvement, 4 cars coming from the Black-Jack mine, 152 tons; Galena Refinery Co. to American Zinc Co., 1 car, 30 tons; to Lanyon Zinc Co., 3 cars, 100 tons, all high grade; Federal Mining Co. to Wisconsin Zinc Roasters, 1 car, 40 tons; North Unity to Cuba, 3 cars, 131 tons; Wisconsin Zinc Roasters, 61% ore to LaSalle, 40 tons; to American Zinc Co., 2 cars, 80 tons. New producers are going on trial runs this week satisfactory in all details. The Birkbeck, Graham, Little Corporal, Dinsdale and others being in the list of new entries. Under more favorable conditions reports would be forthcoming on shipments. All have ore in bin ready for bids.

WYOMING.

Cheyenne.

The Pilot Petroleum Co. has filed papers here as a \$2,000,000 company. It has organized for the purpose of developing oil lands in Fremont county, with head offices at Riverton. Ex-Governor Fenimore Chatterton is president; W. R. Weeks, secretary, and these, with John Dillon, W. S. Adams and Ralph Kimball, form the directorate. The company has about 1400 acres of land in the Pilot Dome field, and will begin drilling immediately.

Cody.

James Murray of the Flathead Oil Co. says: "We have a standard rig, 4½ Pennsylvania type, on the way from the factory, which will be installed as soon as it arrives, either near here or at Salt Creek, both of which are big producing fields. A contract to sink a well with this rig to a depth of 1000 ft. if necessary has been let to A. Cannady of Tenino and he has instructions to get a well down with all possible speed. The work will be under the direction of the company's engineer and geologist, Ferry Lens. He has made a close study of the fields in which our drilling operations will be carried on. He informs us that there are three oil-bearing sands in the Cody field. The first is found at an average depth of 400 ft.; the second is usually encountered between 800 and 1000 ft. and 1500 ft. down."

CANADA.

BRITISH COLUMBIA.

Trail.

Receipts of ore the first week of July at the Trail smelter showed a considerable falling off in tonnage, especially from the Sullivan mine in East Kootenai, due to

interruption to the railroad service by floods. During the first 7 days of the month only one new shipper was added to the list—the Ottawa mine near Slocan City. Following is a tonnage of ore receipts for the week, with the totals furnished by the same shippers for the year to date:

Mine.	Week.	Year.
Center Star, Rossland.....	3,253	97,171
Le Roi, Rossland.....	2,409	72,989
Le Roi No. 2, Rossland.....	174	8,421
Sullivan, Kimberley.....	33	36,871
San Poll, Republic, Wash.....	545	5,964
Knob Hill, Republic, Wash.....	122	1,699
Rambler-Carlboo, Slocan.....	43	949
Silver Standard, Hazelton.....	32	289
Ottawa, Slocan City.....	43	43
Eureka, Nelson.....	114	623
Standard, Silverton.....	67	3,783
Galena Farm, Silverton.....	42	685
United Copper, Chewelah.....	119	5,126
Bluebell, Alnsworth.....	61	3,522
Other mines.....	.....	14,732
Totals.....	7,057	252,867

Nelson.

Plans for the further development of the Granite-Poorman mine include the driving immediately of a crosscut tunnel to connect the Poorman workings with the Hardscrabble vein. This crosscut should be about 475 ft. in length and should give an increased depth on the Hardscrabble vein of about 200 ft. It is from the Hardscrabble vein, which was developed by a shaft put down by the Nelson syndicate last winter, that rich ore is being secured to put through the mill. F. H. Skeels, manager, proposes to keep the 20-stamp mill in operation during the development work. Improvements are to be made to the mill.

Revelstoke.

Large ore bodies, carrying good values in gray copper and galena, are reported to have been opened up in the old Lanark mine by W. B. Dornberg of Spokane, who purchased the property about 2 years ago from the Horne-Payne Co., which formerly controlled it. To date this year the mine has shipped 371 tons of ore to the Trail smelter and arrangements are being made for a larger output. Dornberg last fall constructed a tramway to connect the mine with the Canadian Pacific railway, a distance of about a mile. Another property in this district in which Spokane men are interested is the Donald at Albert canyon. Reeves Bros. of Spokane are associated with David Woolsey in its operation. Woolsey states a new 7-ft. vein of ore, carrying good values in silver, has been discovered. It is proposed to connect the mine with the Canadian Pacific railway by a 2-mile aerial tramway.

If the French Complex Ore Reduction Co. can secure the necessary electrical machinery it should be turning out refined zinc at its Nelson plant within 2 months. Thomas French, manager, has announced that the \$40,000 worth of bonds which had been guaranteed by the provincial government to aid in the establishment of the industry had been sold at 97. Interest payable is 5%. The proceeds of the bonds are now in the bank at Victoria and will be released to the company in payment for construction work by the minister of finance as the work proceeds. French has gone to Victoria to make the final arrangements for commencing work and construction will commence immediately after his return. The company will treat complex zinc ores by an electrolytic process which has proved successful under experiments. It has secured a power rate of ¼-ct. a kw. from the city of Nelson. French expects to get an extraction of 90% of the zinc contents. Lead and silver contents will also be saved.

Salmo.

That the Hudson Bay zinc mine, in the Sheep creek district, is destined to become an important producer is the belief of W. E. Cullen of Spokane, treasurer of the Hudson Bay Zinc Mines Co., recently organized to take over and develop the property. "In our main tunnel we have opened an ore body 15 to 60 ft. wide for a distance of several hundred feet. On the lower level we have drifted on the same shoot for 700 ft., and the conditions lead us to believe that it is not less than 2000 ft. long. Our new crosscut tunnel, which will tap the ledge at a depth of 700 ft. below the outcrop, and almost directly under the center of our present

workings, is being advanced at the rate of 12 ft. daily, and should reach the vein some time next month. We expect that it will tap the ledge below the zone of oxidation. We are shipping continuously from development work an average of 50 tons daily of 30% carbonate ore. If the ore disclosures on the 700-ft. level prove to be satisfactory, the company will drive a third tunnel to tap the ledge at a depth of 1700 ft., erect a large concentrator at the tunnel mouth and construct a railroad from the mill to Salmo, a distance of 8 miles, where connection will be made with the Great Northern system."

Silverton.

The net earnings of the Standard Silver-Lead Mining Co. were but \$38,436 in May, or \$11,564 less than the month's dividend requirements, according to operating report for the period, issued by Charles Hussey of Spokane, secretary-treasurer. Regardless of this, however, the company undoubtedly will continue to make monthly disbursements at the rate of 2½ cts., or \$50,000. The net profits in April were \$86,773, and in March \$136,943, making the earnings for the 3 months \$223,716, while the dividend payments for the same period were but \$150,000, leaving a surplus for the 90 days of \$70,716. The financial statement shows a balance of \$309,373 on May 31, as compared with \$320,936 on April 30 and \$284,163 on March 31.

The net earnings of the Galena Farm Mining Co., which owns and operates the Galena Farm mine and mill, near here, were \$40,000 in May, according to James J. Stewart of New York, one of the principal stockholders in the corporation, who inspected the property recently. The mine recently was equipped with a 100-ton mill, and production now averages 35 tons of concentrates daily, the output running high in lead and zinc. The vein from which ore now is being extracted is 14 ft. wide, and it is said that development has revealed reserves sufficient to operate the property at capacity for the next 5 years. Shipments in May aggregated 759 tons of concentrates that averaged 46.5% zinc and 20 ozs. silver, which netted about \$25 a ton, and 237 tons of concentrates averaging 67.3% lead and 66.1 ozs. silver, netting \$125 a ton.

Three Forks.

June shipments of the Rambler-Cariboo Mining Co. were 30 tons of lead ore, 160 tons of lead concentrates and 60 tons of zinc concentrates, according to a report of Supt. Cameron. The gross profit from the lead product was approximately \$17,000, and the net earnings about the same as in May, or \$11,000, leaving the zinc output for the 2 months still on hand, difficulty having been experienced marketing it. "In the present condition of the spelter market our zinc concentrates are not particularly attractive to the smelters, owing to their low grade and the excess of iron content," said A. F. McClaine, president. "To work them into a desirable product we are arranging with the management of the new custom mill at Kaslo for their treatment, and we hope soon to have a large tonnage of these re-milled concentrates in good merchantable condition. We have not been crediting any part of our earnings from zinc to any particular month because we have not been shipping our product at a uniform rate. A short time ago we realized \$11,000 from the sale of zinc concentrates, but we did not credit it to the earnings that month, as we figured it should have been spread over two or three. We shall probably market another lot in the same way soon."

Zincton.

The Lucky Jim Zinc Mines shipped 460 tons of concentrates and 70 tons of crude ore in May, according to the report of Andrew G. Larson of Spokane, trustee in bankruptcy for the corporation, filed recently with the registrar of British Columbia. The net smelter returns for the period were \$15,673 and operating expenses were \$6640, leaving a surplus for the month of \$9033. Operations for June and July according to estimate will net approximately the same. It is anticipated that the new custom concentrating plant at Kaslo, being constructed by M. S. Davys, one of the owners of the Hewitt mine, will be ready to operate soon. It will handle Lucky Jim ore exclusively, and it is expected that it will be able to treat a tonnage equal to that now being milled at the Roseberry concentrator. The Kaslo plant is

being equipped with electric separator and flotation process and is consequently depended on to produce a fine grade of concentrates. Arrangements are being made to improve the Roseberry mill by the addition of similar equipment, which will permit of the retreatment there on the large tonnage of middlings already accumulated at that plant. Beginning with August the output of the Lucky Jim will be doubled and possibly even more largely increased. Developments of late in the mine have been most encouraging and have resulted in enabling a resumption of shipments of crude ore which, the present indications are, will be maintained indefinitely. The winze from the No. 5 level and the main workings both are showing a marked improvement in the size and character of the ore bodies. The appointment of a receiver for the mine was brought about by the holders of two mortgages aggregating \$75,000. Receiver Larson has paid into court \$20,000 in all to apply on the reduction of these mortgages and now has on hand \$10,000 more, which will be applied to the same object. Aside from its mortgage indebtedness nothing is known as to the financial obligations or standing of the Lucky Jim company.

ONTARIO.

Porcupine.

Production at the Dome Mines Co.'s properties fell off during June because of some changes in both mines and mill. A much greater production is anticipated in July. It is expected that a steady increase will be made until the five Hardinge ball mills are in operation. During June 36,700 tons of ore were treated of a gross value of \$179,000, or \$4.88 per ton. Average values showed an increase of 9 cts. above May. The average value of ore treated in April was \$4.75, in March \$5.05, in February \$5.10 and in January \$5.58. Costs showed an increase to \$2.62, due to extra cost of chemicals and the big development and exploration work being carried on. This compares with \$2.46 in May and \$2.41 in April. The problem at the Dome is no longer one of ore reserves, but rather of milling capacity. Excepting times when changes are being made, such as during last month, the tonnage has been steadily increasing, showing the activity of the company and giving an inkling of what may be expected when the present program of mill addition is carried out.

Kirkland Lake.

Beaver Con. has met with some success at the McKane mine, according to president F. L. Culver. The shaft has reached a depth of 200 ft. and stations have been cut at the 100 and 200 levels. On the first level sinking was continuously in ore for 115 ft. Channel assays running as high as \$112, while assays from vein samples show values of nearly \$400. At the present time a crosscut is being driven on the 200 level to prove the vein at this depth. Development shows 115 ft. of sinking, 278 ft. of crosscutting and 208 ft. of drifting.

Cobalt.

The old Red Jacket mine is now under the supervision of Frank Hatch. It has been pumped out and is now receiving power from the hydraulic air line passing nearby. On one vein there is a good showing of nickelite and smaltite. Some good assays of silver have been obtained, both from the vein matter and dump. The shaft is down 120 ft. and there is about 600 ft. of drifting. Near the end of this drift a pocket of silver ore was cut into before closing down several years ago. The conglomerate at this point is 260 ft. in depth. With good showings at 120 ft. it is believed that along the contact should be a promising place to carry on exploration. A winze will probably be sunk from the 120 level to this contact.

The Hudson Bay Mines, Ltd., now has two shifts and six drills working. On the 300 and 400 levels of the No. 3 vein it has run into high grade, running from 7000 to 8000 ozs. silver. Considerable of this ore has been bagged. It is the intention to start stoping on this and the No. 2 vein at once. Repairs on the mill are being rapidly rushed to completion. Particular attention will be paid to an oil flotation unit, which will be installed, and it is very probable that the company will adopt this process for the treatment of all the ore, including the tailings.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Burdick, A. J.—*Valuable Minerals, How to Find and Know Them*. [Physical and chemical tests of an elementary nature are given. Topographic features which indicate deposits are also spoken of].—Gateway Pub. Co., Beaumont, Cal.; book; pp 42*; 50c.

Daly, M. R.—*The Diastrophic Theory*. [A study and discussion of the theory as regards the mechanics of oil and natural gas accumulations].—Bull. A. I. M. E. July 1916; p 1137; pp 21*; 35c.

McGrath, J. W.—*The Iron Mines of Wabana, Newfoundland*. [Describes the geology nature of the ores, disposal of the same and mining costs].—Canadian Mg. Jnl. July 1 1916; p 315; pp 2¼; 35c.

Uglov, W. L.—*Lead and Zinc Deposits in Ontario and Eastern Canada*. Separate descriptions of deposits are given and these are classified according to the geologic nature of the deposit].—Annual Report Ont. Bur. of Mines Vol. XXV, Part II; pp 56*.

Mineralogy and Petrography

Burdick, A. J.—*Valuable Minerals, How to Find and Know Them*. [Physical and chemical tests of an elementary nature are given. Topographic features which indicate deposits are also spoken of].—Gateway Pub. Co., Beaumont, Cal.; book; pp 42*; 50c.

Murdoch, Joseph.—*Microscopical Determination of Opaque Minerals*. [Reflected light is used entirely. A classification of the minerals is made and the peculiarities as seen under the microscope described].—John Wiley & Son; book; pp 165*; \$2.

Watson, T. L.—*Zircon-Bearing Pegmatites in Virginia*. [The rock occurs in North Carolina and the chemical analysis of the rock is taken up in detail].—Bull. A. I. M. E. July 1916; p 1237; pp 7*; 35c.

II. ORES AND METALS

(1) METALS AND ORES

Copper

Howard, L. O.—*Copper Metallurgy at Garfield, Utah*. [Describes crushing, concentration, flotation and smelting as regards equipment and operations].—M. & S. P. July 8 1916; p 54; pp 3½; 20c.

Mathewson, C. H.; Thalheimer, E. M.—*Comparisons Between Electrolytic and Two Varieties of Arsenical Lake Copper with Respect to Strength and Ductility in Cold-Worked and Annealed Test Strips*. [The results are tabulated and the nature of each test is described].—Bull. A. I. M. E. July 1916; p 1185; pp 40*; 35c.

Moore, H. W.—*Blasting Practice at Chuquicamata, Chile*. [A system of electric blasting. Tunnels are made and loaded with powder for the blasting of large blocks of ground].—M. & S. P. July 8 1916; p 60; pp 2*; 20c.

Sale, A. J.—*Drilling and Analysis of Copper Ores*. [A general discussion of errors made from taking averages of churn-drill hole samples. Also speaks of the sulpho-cyanide assay of copper].—E. & M. J. July 8 1916; p 87; pp 3¼; 25c.

Scott, W. A.—*The Old Dominion Copper Co.'s Operations, Arizona*. [The questions of hoisting, mine waters and concentration by flotation are dealt with].—Mg. World July 8 1916; p 43; pp 2¼*; 10c.

Wilson, P. D.—*Stoping in the Calumet & Arizona Mines, Bisbee, Arizona*. [Gives detail of procedure for systems used as square-setting, top-slicing, caving systems, etc.].—Bull. A. I. M. E. July 1916; p 1099; pp 19*; 35c.

—*Britannia Mining and Smelting Co., Ltd., Howe Sound, B. C.* [Reprint of a company balance sheet and report closed Jan. 1 1916].—Canadian Mg. Jnl. July 1 1916; p 323; pp 3¼; 35c.

Gold Fields and Mining

Alderson, Matt. W.—*Mining Possibilities in Colombia, South America*. [The fourth article of a series reviewing the country, its people and customs].—Mg. World July 8 1916; p 51; pp 4*; 10c.

Edmands, H. R.—*Some Notes on the Effect of Lead Salts and of Varying Degree of Alkalinity on the Solvent Power of Cyanide Solution for Gold*. [The results of tests are tabulated and described].—Jnl. Chamber of Mines West Aust. April 29 1916; p 63; pp 8; 75c.

—*Rhodesia Chamber of Mines, Annual Report, 1915*. [Questions brought up during the year are spoken of, with accounts of the production of various metals and a review of the labor bureau].—Rhodesia Chamber of Mines, 1915 Report; pp 71.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

McGrath, J. W.—*The Iron Mines of Wabana, Newfoundland*. [Describes the geology, nature of the ores, disposal of the same and mining costs].—Canadian Mg. Jnl. July 1 1916; p 315; pp 2¼; 35c.

—*Rhodesia Chamber of Mines, Annual Report, 1915*. [Questions brought up during the year are spoken of, with accounts of the production of various metals and a review of the labor bureau].—Rhodesia Chamber of Mines, 1915 Report; pp 71.

Iron and Steel: Foundry and Furnace Practice

Howland, H. P.—*Calculations with Reference to the Use of Carbon in Modern American Blast Furnaces*. [Discussion giving results of thermic tests and chemical reactions].—Bull. A. I. M. E. July 1916; p 1245; pp 7; 35c.

Johnson, J. E., Jr.—*The Rate of Driving the Blast Furnace*. [The effects resulting from too slow or fast a rate are discussed in detail in particular on the power requirements for blowing and fuel consumption].—Met. & Chem. Engg. July 1 1916; p 21; pp 4¼*; 30c.

Lead

Edmands, H. R.—*Some Notes on the Effect of Lead Salts and of Varying Degree of Alkalinity on the Solvent Power of Cyanide Solution for Gold*. [The results of tests are tabulated and described].—Jnl. Chamber of Mines West Aust. April 29 1916; p 63; pp 8; 75c.

Handy, R. S.—*Bunker Hill & Sullivan Milling Data*. [Flow sheets and drawings with brief description of operations and detailed cost sheet are dealt with].—E. & M. J. July 1 1916; p 35; pp 2¼*; 25c.

Ugnow, W. L.—*Lead and Zinc Deposits in Ontario and Eastern Canada*. [Separate descriptions of deposits are given and these are classified according to the geologic nature of the deposit].—Annual Report Ont. Bur. of Mines Vol. XXV, Part II; pp 56*.

Mercury

Mudd, S. W.—*Mining and Metallurgical Progress in the Southwest*. [Address delivered before the Chamber of Mines and Oil, Los Angeles, being on the production of ores and metals].—Mg. World July 1 1916; p 11; pp 2; 10c.

Molybdenum

Jeffries, Zay. — *Tungsten-Molybdenum Equilibrium Diagram and System of Crystallization*. [A method for the determination of the melting point of metals and alloys with high fusion points].—Bull. A. I. M. E. July 1916; p 1225; pp 12*; 35c.

Platinum

Gruetter, T. W.—*Platinum on the Pacific Coast*. [On the qualities and places at which platinum is found and methods are briefly described for recovering the metal].—M. & S. P. July 1 1916; p 20; pp 1¼; 20c.

Silver

— *Rhodesia Chamber of Mines, Annual Report, 1915*. [Questions brought up during the year are spoken of, with accounts of the production of various metals and a review of the labor bureau].—Rhodesia Chamber of Mines, 1915 Report; pp 71.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Lamb, M. R.—*Amenities of Bolivian Mining*. [A general review of the mining industry in the country which is for tin. The altitude is 13,000 ft.].—E. & M. J. July 8 1916; p 81; pp 3¼*; 25c.

Tungsten

Hartman, M. L.—*Chemistry and Metallurgy of Tungsten*. [Abst. from Pahasapa Quarterly. Describes the hydrofluoric acid, fusion and aquaregia methods of analysis, all of which are gravimetric].—Mg. World July 8 1916; p 55; pp 1½; 10c.

Jeffries, Zay. — *Tungsten-Molybdenum Equilibrium Diagram and System of Crystallization*. [A method for the determination of the melting point of metals and alloys with high fusion points].—Bull. A. I. M. E. July 1916; p 1225; pp 12*; 35c.

— *Rhodesia Chamber of Mines, Annual Report, 1915*. [Questions brought up during the year are spoken of, with accounts of the production of various metals and a review of the labor bureau].—Rhodesia Chamber of Mines, 1915 Report; pp 71.

Zinc

Ugnow, W. L.—*Lead and Zinc Deposits in Ontario and Eastern Canada*. [Separate descriptions of deposits are given and these are classified according to the geologic nature of the deposit].—Annual Report Ont. Bur. of Mines Vol. XXV, Part II; pp 56*.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Crankshaw, H. M.—*Modern Methods of Mining and Ventilating Thick Pitching Beds*. [Confined to coal deposits. Details and drawings of the methods are shown].—Bull. A. I. M. E. July 1916; p 1159; pp 11*; 35c.

Fay, A. H.—*Coal Mine Fatalities in the United States, 1870-1914*. Also contains statistics on coal production, labor and mining methods by states and calendar years].—U. S. Bur. of Mines; Bull. 115; pp 366; 50c.

Johnson, Moses. — *Ventilating Mines When Tipples Are on Fire*. [Diagrams are given to illustrate the methods].—Bull. Canadian Mg. Inst. July 1916; p 655; pp 7*; 35c.

Lathrop, L. A.—*Coal Trade in Wales During 1915*. [Extract from a report of the U. S. Bureau of Commerce].—Coal Tar Bull. July 1 1916; p 50; pp 3½; 25c.

— *Coal Miners' Pocketbook*. [Gives rules, principals, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$1.

— *Cost of Coal and Oil as Fuel*. [Abst. from Power. The cost of steam per pound is given, with the evaporation per pound of coal and B. T. U. per gallon of oil].—E. & M. J. July 8 1916; p 93; pp 1¼*; 25c.

— *Rhodesia Chamber of Mines, Annual Report, 1915*. [Questions brought up during the year are spoken of, with accounts of the production of various metals and a review of the labor bureau].—Rhodesia Chamber of Mines, 1915 Report; pp 71.

Coal Preparation, Marketing, Etc.

Edsall, H. J.—*Some Modern Coal Tipples*. [Describes the tipples of several companies].—Coal Age July 8 1916; p 60; pp 4*; 20c.

— *Coal Miners' Pocketbook*. [Gives rules, principles, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$1.

Coal Dust, Fire Damp, Etc.

Shaw, Wm.—*Coal Dust, How It Affects the Mines in Crowsnest Pass*. [Speaks of the peculiarities of coal dust in this mine and methods employed to cope with it].—Bull. Canadian Mg. Inst. July 1916; p 647; pp 8; 35c.

Coal and Coke By-Products

Egloff, G.; Twomey, T. J.—*The Formation of Aromatic Compounds from the Cracking of a Gas Oil*. [This kind of oil is found in Pennsylvania].—Met. & Chem. Engg. July 1 1916; p 15; pp 2¼*; 30c.

— *Thristington Colliery's New Coking and By-Product Plant, Durham, England*.—I. & C. Tr. Rev. June 23 1916; p 717; pp 1*; 35c.

Peat

Lisitzin, Fr.—*Russian Peat Industry*. [Gives the results of the analyses of many samples].—Jnl. of American Peat Soc. July 1916; p 138; pp 3.

Morgan, G. T.—*Some Chemical Aspects of the Peat Problem*. [Reprint from the Irish Technical Jnl. Treats on the using of this resource for making gas and ammonia products].—Jnl. of American Peat Soc. July 1916; p 141; pp 10*.

— *Jameson-Wet Carbonizing, Ltd., Patent Lawsuit*. [Much of the discussion is of interest in regards to dewatering

peat in general].—Jnl. of American Peat Soc. July 1916; p 151; pp 14.

Petroleum

Ball, Max W.—*Petroleum Withdrawals and Restorations Affecting the Public Domain*. [Gives the law controlling petroleum lands, with information on withdrawals and restorations. Maps, by states, are given, showing the areas affected].—U. S. G. S. Bull. 623; pp 425; \$1.20.

Daly, M. R.—*The Diastrophic Theory*. [A study and discussion of the theory as regards the mechanics of oil and natural gas accumulations].—Bull. A. I. M. E. July 1916; p 1137; pp 21*; 35c.

Egloff, G.; Twomey, T. J.—*The Formation of Aromatic Compounds from the Cracking of a Gas Oil*. [This kind of oil is found in Pennsylvania].—Met. & Chem. Engg. July 1 1916; p 15; pp 2¼*; 30c.

Taylor, W. G.—*Oil Well Motor Equipment*. [A paper read before the American Inst. of Elect. Eng. Gives the electrical power and equipment needed in drilling an oil well].—Jnl. of Elect. Power & Gas July 1 1916; p 6; pp 2¼*; 35c.

— *New Safety Method for Drilling Tools*. [These tools have recently been invented with the idea of helping to prevent their loss in the hole].—Petro. World July 1916; p 313; pp 2*; 35c.

Natural Gas

Daly, M. R.—*The Diastrophic Theory*. [A study and discussion of the theory as regards the mechanics of oil and natural gas accumulations].—Bull. A. I. M. E. July 1916; p 1137; pp 21*; 35c.

Fuels Miscellaneous

Haas, Herbert.—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Compares the advantages and costs of operating each with respect to generating electricity. Details on fuel costs are given].—Bull. A. I. M. E. July 1916; p 1171; pp 13*; 35c.

Johnson, J. E., Jr.—*The Rate of Driving the Blast Furnace*. [The effects resulting from too slow or fast a rate are discussed in detail in particular on the power requirements for blowing and fuel consumption].—Met. & Chem. Engg. July 1 1916; p 21; pp 4¼*; 30c.

Smith, E. B.—*Efficiency of Shaking Grates as Applied to Lime Kilns*. [Details and drawings bringing out the use of this grate are given].—National Lime Mfg. Assn. Bull. 10; pp 10*.

— *Coal Miners' Pocketbook*. [Gives rules, principles, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$1.

— *Cost of Coal and Oil as Fuel*. [Abst. from Power. The cost of steam per pound is given, with the evaporation per pound of coal and B. T. U. per gallon of oil].—E. & M. J. July 8 1916; p 93; pp 1¼*; 25c.

(B) STRUCTURALS AND CERAMICS

Cement

Diekman, P.—*Chemistry of Portland Cement*. [Abst. from the Jnl. of the American Soc. of Mechanical Engineers].—Met. & Chem. Engg. July 1 1916; p 41; pp 1½; 30c.

Clays, Ceramics

Greaves-Walker, A. F.—*The Path to Success in Operating a Continuous Coal-Fired Tunnel Kiln*.—B. & C. Rec. July 4 1916; p 27; pp 2¼*; 35c.

Concrete

Sherwin, R. A.—*Forms for Concrete Work*. [Abst. of a paper read before the American Concrete Inst.].—Western Engg. July 1916; p 261; pp 6¾; 20c.

—*Coal Miners' Pocketbook*. [Gives rules, principles, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$4.

Lime

Smith, E. B.—*Efficiency of Shaking Grates as Applied to Lime Kilns*. [Details and drawings bringing out the use of this grate are given].—National Lime Mfg. Assn. Bull. 10; pp 10*.

(C) OTHER NON-METALS**Abrasives**

Katz, F. J.—*Abrasive Materials in 1915*. [Each material is reviewed separately].—Min. Res. of U. S. 11:10; pp 16.

Feldspar

Katz, F. J.—*Feldspar in 1915*. [Reviews the occurrence and nature of the mineral with methods of mining and refining and statistics on its production].—Min. Res. of U. S. 11:7; pp 11.

Graphite

Bastin, E. S.—*Graphite in 1915*. [The market conditions and U. S. in general are first reviewed and followed by separate reviews of the industry in each state].—Min. Res. of U. S. 11:11; pp 13.

Magnesite

Mudd, S. W.—*Mining and Metallurgical Progress in the Southwest*. [Address delivered before the Chamber of Mines and Oil, Los Angeles, being on the production of ores and metals].—Mg. World July 1 1916; p 11; pp 2; 10c.

Soapstone

Diller, J. S.—*Talc and Soapstone in 1915*. [Each is taken separately in general for U. S. Both prices and production are given].—Min. Res. of U. S. 11:9; pp 4.

Talc

Diller, J. S.—*Talc and Soapstone in 1915*. [Each is taken separately in general for U. S. Both prices and production are given].—Min. Res. of U. S. 11:9; pp 4.

III. TECHNOLOGY**MINES AND MINING****Surveying and Drafting**

Marshall, R. B.—*Spirit Leveling in West Virginia*. [Specific data on level lines run datum plains, and bench marks in the state].—U. S. G. S. Bull. 632; pp 168; 20c.

Marshall, R. B.—*Triangulation in Arizona and New Mexico*. [Gives specific data for the location and survey computations from stations established by the U. S. G. S.].—U. S. G. S. Bulletin 644-B; pp 12*.

—*Coal Miners' Pocketbook*. [Gives rules, principles, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$1.

Drilling and Boring

Sale, A. J.—*Drilling and Analysis of Copper Ores*. [A general discussion of errors made from taking average of churn-drill hole samples. Also speaks of the sulpho-cyanide assay of copper].—E. & M. J. July 8 1916; p 87; pp 3¾; 25c.

Taylor, W. G.—*Oil Well Motor Equipment*. [A paper read before the American Inst. of Elect. Eng. Gives the electrical power and equipment needed in drilling an oil well].—Jnl. of Elect. Power & Gas July 1 1916; p 6; pp 2½*; 35c.

—*New Safety Method for Drilling Tools*. [These tools have recently been invented with the idea of helping to prevent their loss in the hole].—Petro. World July 1916; p 313; pp 2*; 35c.

Explosives and Blasting

Higgins, E.—*Accidents from Mishfires and How to Prevent Them*. [Many causes of mishfires are taken up, important among which is the making of the primer].—Mg. World July 1 1916; p 17; pp 1*; 10c.

Moore, H. W.—*Blasting Practice at Chuquicamata, Chile*. [A system of electric blasting. Tunnels are made and loaded with powder for the blasting of large blocks of ground].—M. & S. P. July 8 1916; p 60; pp 2*; 20c.

—*Coal Miners' Pocketbook*. [Gives rules, principles, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$1.

Mine Water

Scott, W. A.—*The Old Dominion Copper Co.'s Operations, Arizona*. [The questions of hoisting, mine waters and concentration by flotation are dealt with].—Mg. World July 8 1916; p 43; pp 2¾*; 10c.

Ventilation

Crankshaw, H. M.—*Modern Methods of Mining and Ventilating Thick Pitching Beds*. [Confined to coal deposits. Details and drawings of the methods are shown].—Bull. A. I. M. E. July 1916; p 1159; pp 11*; 35c.

Johnson, Moses.—*Ventilating Mines When Tipples Are on Fire*. [Diagrams are given to illustrate the methods].—Bull. Canadian Mg. Inst. July 1916; p 655; pp 7*; 35c.

Shaw, Wm.—*Coal Dust, How It Affects the Mines in Crowsnest Pass*. [Speaks of the peculiarities of coal dust in this mine and methods employed to cope with it].—Bull. Canadian Mg. Inst. July 1916; p 647; pp 8; 35c.

—*Coal Miners' Pocketbook*. [Gives rules, principles, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$1.

Supports: Timbers, Props, Stowing

Crankshaw, H. M.—*Modern Methods of Mining and Ventilating Thick Pitching Beds*. [Confined to coal deposits. Details and drawings of the methods are shown].—Bull. A. I. M. E. July 1916; p 1159; pp 11*; 35c.

Dewell, H. D.—*Timber Framing*. [Speaks of the strength of timbers according to the direction of the stress with respect to the wood fibers].—Western Engg. July 1916; p 251; pp 6*; 20c.

Wilson, P. D.—*Stoping in the Calumet & Arizona Mines, Bisbee, Arizona*. [Gives detail of procedure for systems used as square-setting, top-slicing, caving systems, etc.].—Bull. A. I. M. E. July 1916; p 1099; pp 19*; 35c.

Hoists and Hoisting

Scott, W. A.—*The Old Dominion Copper Co.'s Operations, Arizona*. [The questions of hoisting, mine waters, and concentration by flotation are dealt with].—Mg. World July 8 1916; p 43; pp 2¾*; 10c.

—*Coal Miners' Pocketbook*.

[Gives rules, principles, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$4.

—*Prices of Machinery for Mines*. [The average prices for mine equipment are plotted in curves for separate classes of machinery, according to the size and capacity].—Coal Age July 1 1916; p 22; pp 3*; 20c.

Mine Sampling

Sale, A. J.—*Drilling and Analysis of Copper Ores*. [A general discussion of errors made from taking averages of churn-drill hole samples. Also speaks of the sulpho-cyanide assay of copper].—E. & M. J. July 8 1916; p 87; pp 3¾; 25c.

Lighting

—*Costs of Operating Electric Cap Lamps*.—Coal Age July 1 1916; p 17; pp ¾; 20c.

Transport

McBride, W. G.—*Motor Truck Operation at Mammoth Collins Mine, Shultz, Arizona*. [Some costs of operation are given].—Bull. A. I. M. E. July 1916; p 1253; pp 4; 35c. Abst. in M. & S. P. July 8 1916; p 45; pp 2; 20c.

Trauttschold, R.—*The Economics of Material Handling in Manufacturing Plants*. [Treats more directly with cranes and other plants and equipment for loading boats and cars].—Engg. Mag. July 1916; p 528; pp 9*; 35c.

Haulage and Conveying

Baker, H. W.—*Aerial Tramway Locked by Windstorm*. [An account of the tramway construction and the accident which occurred to it during a windstorm].—E. & M. J. July 8 1916; p 91; pp 1½*; 25c.

—*Coal Miners' Pocketbook*. [Gives rules, principle, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$4.

Accidents

Baker, H. W.—*Aerial Tramway Locked by Windstorm*. [An account of the tramway construction and the accident which occurred to it during a windstorm].—E. & M. J. July 8 1916; p 91; pp 1½*; 25c.

Fay, A. H.—*Coal Mine Fatalities in the United States, 1870-1914*. [Also contains statistics on coal production, labor and mining methods by states and calendar years].—U. S. Bur. of Mines; Bull. 115; pp 366; 50c.

Higgins, E.—*Accidents from Mishfires and How to Prevent Them*. [Many causes of mishfires are taken up, important among which is the making of the primer].—Mg. World July 1 1916; p 17; pp 1*; 10c.

Safety

Higgins, W. C.—*List of Sketches of Safety Devices*.—Mg. World July 8 1916; p 46; pp 1; 10c.

Manning, Van H.—*Hazards to Men Increase as Mines Become Larger and Employ More Men*. [A paper read before the meeting of operators and inspectors at Harrisburg, Pa.].—Coal Tr. Bull. July 1 1916; p 43; pp 4; 25c.

Labor and Management

Alderson, Matt. W.—*Mining Possibilities in Colombia, South America*. [The fourth article of a series reviewing the country, its people and customs].—Mg. World July 8 1916; p 51; pp 4*; 10c.

Fay, A. H.—*Coal Mine Fatalities in the United States, 1870-1914*. [Also contains

statistics on coal production, labor and mining methods by states and calendar years].—U. S. Bur. of Mines; Bull. 115; pp 366; 50c.

Lathrop, L. A.—*Coal Trade in Wales During 1915*. [Extract from a report of the U. S. Bur. of Commerce].—Coal Tr. Bull. July 1 1916; p 50; pp 3½; 25c.

Manning, Van H.—*Hazards to Men Increase as Mines Become Larger and Employ More Men*. [A paper read before the meeting of operators and inspectors at Harrisburg, Pa.].—Coal Tr. Bull. July 1 1916; p 43; pp 4; 25c.

—Rhodesia Chamber of Mines, *Annual Report, 1915*. [Questions brought up during the year are spoken of, with accounts of the production of various metals and a review of the labor bureau].—Rhodesia Chamber of Mines, 1915 Report; pp 71.

Production

Bastin, E. S.—*Graphite in 1915*. [The market conditions and U. S. in general are reviewed and followed by separate reviews of the industry in each state].—Min. Res. of U. S. II:11; pp 13.

Diller, J. S.—*Talc and Soapstone in 1915*. Each is taken separately in general for U. S. Both prices and production are given].—Min. Res. of U. S. II:9; pp 4.

Fay, A. H.—*Coal Mine Fatalities in the United States, 1870-1914*. [Also contains statistics on coal production, labor and mining methods by states and calendar years].—U. S. Bur. of Mines; Bull. 115; pp 366; 50c.

Katz, F. J.—*Abrasive Materials in 1915*. [Each material is reviewed separately].—Min. Res. of U. S. II:10; pp 16.

Katz, F. J.—*Feldspar in 1915*. [Reviews the occurrence and nature of the mineral, with methods of mining and refining and statistics on its production].—Min. Res. of U. S. II:7; pp 11.

Lathrop, L. A.—*Coal Trade in Wales During 1915*. [Extract from a report of the U. S. Bureau of Commerce].—Coal Tr. Bull. July 1 1916; p 50; pp 3½; 25c.

—Rhodesia Chamber of Mines, *Annual Report, 1915*. [Questions brought up during the year are spoken of, with accounts of the production of various metals and a review of the labor bureau].—Rhodesia Chamber of Mines, 1915 Report; pp 71.

Mining Costs

McGrath, J. W.—*The Iron Mines of Wabana, Newfoundland*. [Describes the geology, nature of the ores, disposal of the same and mining costs].—Canadian Mg. Jnl. July 1 1916; p 315; pp 2½; 35c.

Wilson, P. D.—*Stoping in the Calumet & Arizona Mines, Bisbee, Arizona*. [Gives detail of procedure for systems used as square-setting, top-slicing, caving systems, etc.].—Bull. A. I. M. E. July 1916; p 1099; pp 19*; 35c.

—Britannia Mining and Smelting Co., Ltd., *Howe Sound, B. C.* [Reprint of a company balance sheet and report closed Jan. 1 1916].—Canadian Mg. Jnl. July 1 1916; p 323; pp 3¼; 35c.

Mining Miscellany

Crankshaw, H. M.—*Modern Methods of Mining and Ventilating Thick Pitching Beds*. [Confined to coal deposits. Details and drawings of the methods are shown].—Bull. A. I. M. E. July 1916; p 1159; pp 11*; 35c.

Wilson, P. D.—*Stoping in the Calumet & Arizona Mines, Bisbee, Arizona*. [Gives detail of procedure for systems used as square-setting, top-slicing, caving sys-

tems, etc.].—Bull. A. I. M. E. July 1916; p 1099; pp 19*; 35c.

MILL AND MILLING

Sampling

Turnbull, J. M.—*Relations Between Custom Smelters and Small Mine Owners*. [Abst. of an address to the Vancouver Chamber of Mines. Deals with the ways in which the ore is purchased by the smelters].—Mg. World July 8 1916; p 47; pp 2½; 10c.

Crushing, Grinding, Etc.

Howard, L. O.—*Copper Metallurgy at Garfield, Utah*. [Describes crushing, concentration, flotation and smelting as regards equipment and operations].—M. & S. P. July 8 1916; p 51; pp 3½; 20c.

Flotation

Anderson, R. J.—*Metallurgical Disposal of Flotation Concentrates*. [Missouri School of Mines Bulletin. Treats on the breaking and dewatering of the froth and the final methods of smelting the concentrate].—Mg. World July 8 1916; p 57; pp 2½; 10c.

Anderson, R. J.—*The Flotation of Minerals*. [A general detailed discussion and description of theory and practice].—Bull. A. I. M. E. July 1916; p 1119; pp 18; 35c. M. & S. P. July 8 1916; p 47; pp 3¼; 20c.

Howard, L. O.—*Copper Metallurgy at Garfield, Utah*. [Describes crushing, concentration, flotation and smelting as regards equipment and operations].—M. & S. P. July 8 1916; p 54; pp 3½; 20c.

Scott, W. A.—*The Old Dominion Copper Co.'s Operations, Arizona*. [The questions of hoisting, mine waters and concentration by flotation are dealt with].—Mg. World July 8 1916; p 43; pp 2½*; 10c.

Amalgamation

Lamb, M. R.—*Don Luis Charme's Tremain Steam Stamp*. [Some details of worries which come to consignees of mining machinery in South America].—E. & M. J. July 1 1916; p 17; pp 2¼*; 25c.

Concentration: Sorting, Sizing, Washing

Howard, L. O.—*Copper Metallurgy at Garfield, Utah*. [Describes crushing, concentration, flotation and smelting as regards equipment and operations].—M. & S. P. July 8 1916; p 54; pp 3½; 20c.

Cyaniding

Edmonds, H. R.—*Some Notes on the Effect of Lead Salts and of Varying Degree of Alkalinity on the Solvent Power of Cyanide Solution for Gold*. [The results of tests are tabulated and described].—Jnl. Chamber of Mines West Aust. April 29 1916; p 63; pp 8; 75c.

Briquetting

Anderson, R. J.—*Metallurgical Disposal of Flotation Concentrates*. [On methods and results obtained in the breaking up and dewatering of the froth. The concentrates are smelted both direct and briquetted].—Mg. World July 8 1916; p 57; pp 2½; 10c.

Mill and Smelter Costs

Turnbull, J. M.—*Relations Between Custom Smelters and Small Mine Owners*. [Abst. of an address to the Vancouver Chamber of Mines. Deals with the ways in which the ore is purchased by the smelters].—Mg. World July 8 1916; p 47; pp 2½; 10c.

—Britannia Mining and Smelting Co., Ltd., *Howe Sound, B. C.* [Reprint of a company balance sheet and report closed Jan. 1 1916].—Canadian Mg. Jnl. July 1 1916; p 323; pp 3¼; 35c.

CHEMISTRY AND ASSAYING

Chemistry

Diekman, P.—*Chemistry of Portland Cement*. [Abst. from the Jnl. of the American Soc. of Mechanical Engineers].—Met. & Chem. Engg. July 1 1916; p 41; pp 1½; 30c.

Hartman, M. L.—*Chemistry and Metallurgy of Tungsten*. [Abst. from Pahasapa Quarterly. Describes the hydrofluoric acid, fusion and aqua regia methods of analysis, all of which are gravimetric].—Mg. World July 8 1916; p 55; pp 1½; 10c.

Howland, H. P.—*Calculations with Reference to the Use of Carbon in Modern American Blast Furnaces*. [Discussion giving results of thermic tests and chemical reactions].—Bull. A. I. M. E. July 1916; p 1245; pp 7; 35c.

Layng, H. R.—*Determination of Antimony*. [Methods of procedure for a wet chemical method].—M. & S. P. July 8 1916; p 57; pp 1½; 20c.

Morgan, G. T.—*Some Chemical Aspects of the Peat Problem*. [Reprint from the Irish Technical Jnl. Treats on the using of this resource for making gas and ammonia products].—Jnl. of American Peat Soc. July 1916; p 141; pp 10*.

Watson, T. L.—*Zircon-Bearing Pegmatites in Virginia*. [The rock occurs in North Carolina and the chemical analysis of the rock is taken up in detail].—Bull. A. I. M. E. July 1916; p 1237; pp 7*; 35c.

Assaying

Salc, A. J.—*Drilling and Analysis of Copper Ores*. [A general discussion of errors made from taking averages of churn-drill hole samples. Also speaks of the sulpho-cyanide assay of copper].—E. & M. J. July 8 1916; p 87; pp 3¼; 25c.

Analysis

Hartman, M. L.—*Chemistry and Metallurgy of Tungsten*. [Abst. from Pahasapa Quarterly. Describes the hydrofluoric acid fusion and aqua regia methods of analysis, all of which are gravimetric].—Mg. World July 8 1916; p 55; pp 1½; 10c.

Layng, H. R.—*Determination of Antimony*. [Method of procedure for a wet chemical method].—M. & S. P. July 8 1916; p 57; pp 1½; 20c.

Lisitzin, Fr.—*Russian Peat Industry*. [Gives the results of the analyses of many samples].—Jnl. of American Peat Soc. July 1916; p 138; pp 3.

Runner, J. J.—*Specific Gravity Method for Tungsten Analysis*. [Curves for use in this connection are reproduced].—M. & S. P. July 1 1916; p 11; pp 2¼*; 20c.

Watson, T. L.—*Zircon-Bearing Pegmatites in Virginia*. [The rock occurs in North Carolina and the chemical analysis of the rock is taken up in detail].—Bull. A. I. M. E. July 1916; p 1237; pp 7*; 35c.

Thermic Metallurgy

Anderson, R. J.—*Metallurgical Disposal of Flotation Concentrates*. [On methods and results obtained in the breaking up and dewatering of the froth. The concentrates are smelted both direct and briquetted].—Mg. World July 8 1916; p 57; pp 2½; 10c.

METALLURGY

Thermic Metallurgy

Anderson, R. J.—*Metallurgical Disposal of Flotation Concentrates*. [Missouri School of Mines Bulletin. Treats on the breaking and dewatering of the froth and the final methods of smelting the concentrate].—*Mg. World* July 8 1916; p 57; pp 24; 10c.

Howard, L. O.—*Copper Metallurgy at Garfield, Utah*. [Describes crushing, concentration, flotation and smelting as regards equipment and operation].—*M. & S. P.* July 8 1916; p 54; pp 3½; 20c.

Sale, A. J.—*Drilling and Analysis of Copper Ores*. [A general discussion of errors made from taking averages of churn-drill hole samples. Also speaks of the sulpho-cyanide assay of copper].—*E. & M. J.* July 8 1916; p 87; pp 3¼; 25c.

Turnbull, J. M.—*Relations Between Custom Smelters and Small Mine Owners*. [Abst. of an address to the Vancouver Chamber of Mines. Deals with the ways in which the ore is purchased by the smelters].—*Mg. World* July 8 1916; p 47; pp 2¼; 10c.

Metallurgy General

Turnbull, J. M.—*Relations Between Custom Smelters and Small Mine Owners*. [Excerpts from an address to the Vancouver Chamber of Mines. Treats in general on the buying of ores by a custom smelter].—*Mg. World* July 8 1916; p 47; pp 2¼; 10c.

POWER AND MACHINERY

Electricity

Haas, Herbert.—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Compares the advantages and costs of operating each with respect to generating electricity. Details on fuel costs are given].—*Bull. A. I. M. E.* July 1916; p 1171; pp 13*; 35c.

Moore, H. W.—*Blasting Practice at Chuquicamata, Chile*. [A system of electric blasting. Tunnels are made and loaded with powder for the blasting of large blocks of ground].—*M. & S. P.* July 8 1916; p 60; pp 2*; 20c.

Taylor, W. G.—*Oil Well Motor Equipment*. [A paper read before the American Inst. of Elect. Eng. Gives the electrical power and equipment needed in drilling an oil well].—*Jnl. of Elect. Power & Gas* July 1 1916; p 6; pp 2½*; 35c.

Compressed Air

Johnson, J. E., Jr.—*The Rate of Driving the Blast Furnace*. [The effects resulting from too slow or fast a rate are discussed in detail in particular on the power requirements for blowing and fuel consumption].—*Met. & Chem. Engg.* July 1 1916; p 21; pp 4¼*; 30c.

Gas Producers, Producer Gas

Morgan, G. T.—*Some Chemical Aspects of the Peat Problem*. [Reprint from the Irish Technical Jnl. Treats on the using of this resource for making gas and ammonia products].—*Jnl. of American Peat Soc.* July 1916; p 141; pp 10*.

Combustion Engines

Haas, Herbert.—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Compares the advantages and costs of operating each with respect to generating electricity. Details on fuel costs are given].—*Bull. A. I. M. E.* July 1916; p 1171; pp 13*; 35c.

Steam and Steam Engines

Haas, Herbert.—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Compares the advantages and costs of operating each with respect to generating electricity. Details on fuel costs are given].—*Bull. A. I. M. E.* July 1916; p 1171; pp 13*; 35c.

Hubbard, C. L.—*Boiler and Piping Arrangements for Small Central Plants*.—*Steam* July 1916; p 3; pp 2¼*; 35c.

Hubbard, C. L.—*Steam Requirements for Power and Heating*. [General and detailed information on the design and operation of steam plants].—*Engg. Mag.* July 1916; p 553; pp 9*; 35c.

Keller, J. H.—*New Empirical Formulae for Hot Water Heating, with Pipe Sizes for Two-Pipe Systems*.—*Steam* July 1916; p 11; pp 2; 35c.

White, A. E.; Wood H. F.—*Recrystallization of Boiler Tubes*. [A paper read before the American Soc. of Testing Materials].—*Iron Age* July 6 1916; p 20; pp 1¼; 30c.

— *Coal Miners' Pocketbook*. [Gives rules, principles, formulas and tables].—*McGraw-Hill Co.*; book; pp 1172*; \$4.

— *Cost of Coal and Oil as Fuel*. [Abst. from *Power*. The cost of steam per pound is given, with the evaporation per pound of coal and B. T. U. per gallon of oil].—*E. & M. J.* July 8 1916; p 93; pp 1¼*; 25c.

Miscellaneous Power and Machinery

Morrison, C. J.—*Belts—Their Selection and Care*. [Thoroughly practical information with no theory or formulas].—*Engg. Mag.* July 1916; p 567; pp 19*; 35c.

— *Coal Miners' Pocketbook*. [Gives rules, principles, formulas and tables].—*McGraw-Hill Co.*; book; pp 1172*; \$4.

IV. MISCELLANEOUS

Miscellaneous Costs

Haas, Herbert.—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Compares the advantages and costs of operating each with respect to generating electricity. Details on fuel costs are given].—*Bull. A. I. M. E.* July 1916; p 1171; pp 13*; 35c.

Mason, J. K.—*How to Study Factory Efficiency*. [The methods and ideas are of a nature which makes them possible of application to the studying of efficiency in any operating body].—*Engg. Mag.* July 1916; p 542; pp 5½*; 35c.

McBride, W. G.—*Motor Truck Operation at Mammoth Collins Mine, Shultz, Arizona*. [Some costs of operation are given].—*Bull. A. I. M. E.* July 1916; p 1253; pp 4; 35c. *M. & S. P.* July 8 1916; p 45; pp 2; 20c.

Sale, A. J.—*Drilling and Analysis of Copper Ores*. [A general discussion of errors made from taking averages of churn-drill hole samples. Also speaks of the sulpho-cyanide assay of copper].—*E. & M. J.* July 8 1916; p 87; pp 3¼; 25c.

— *Cost of Coal and Oil as Fuel*. [Abst. from *Power*. The cost of steam per pound is given, with the evaporation per pound of coal and B. T. U. per gallon of oil].—*E. & M. J.* July 8 1916; p 93; pp 1¼*; 25c.

Testing

Edmonds, H. R.—*Some Notes on the Effect of Lead Salts and of Varying Degree of Alkalinity on the Solvent Power of Cyanide Solution for Gold*. [The results of tests are tabulated and described].—*Jnl. Chamber of Mines West Aust.* April 29 1916; p 63; pp 8; 75c.

Howland, H. P.—*Calculations with Reference to the Use of Carbon in Modern American Blast Furnaces*. [Discussion giving results of thermic tests and chemical reactions].—*Bull. A. I. M. E.* July 1916; p 1245; pp 7; 35c.

Mathewson, C. H.; Thalheimer, E. M.—*Comparisons Between Electrolytic and Two Varieties of Arsenical Lake Copper with Respect to Strength and Ductility in Cold-Worked and Annealed Test Strips*. [The results are tabulated and the nature of each test is described].—*Bull. A. I. M. E.* July 1916; p 1185; pp 40*; 35c.

Law, Legislation, Taxation

Ball, Max. W.—*Petroleum Withdrawals and Restorations Affecting the Public Domain*. [Gives the law controlling petroleum lands, with information on withdrawals and restorations. Maps, by states, are given, showing the areas affected].—*U. S. G. S. Bull.* 623; pp 425; \$1.20.

— *Rhodesia Chamber of Mines, Annual Report 1915*. [Questions brought up during the year are spoken of with accounts of the production of various metals and a review of the labor bureau].—*Rhodesia Chamber of Mines, 1915 Report*; pp 71.

Societies

Parsons, F. W.—*The Rocky Mountain Coal Mining Institute Meeting*.—*Coal Age* July 8 1916; p 66; pp 6*; 20c.

— *American Society of Testing Materials*.—*Iron Age* July 6 1916; p 24; pp 5; 30c.

— *Mine Inspectors' Institute, U. S. A.*.—*Coal Age* July 8 1916; p 64; pp 1½; 20c.

Financial

Lathrop, L. A.—*Coal Trade in Wales During 1915*. [Extract from a report of the U. S. Bureau of Commerce].—*Coal Tr. Bull.* July 1 1916; p 50; pp 3½; 25c.

Turnbull, J. M.—*Relations Between Custom Smelters and Small Mine Owners*. [Abst. of an address to the Vancouver Chamber of Mines. Deals with the ways in which the ore is purchased by the smelters].—*Mg. World* July 8 1916; p 47; pp 2¼; 10c.

— *Britannia Mining and Smelting Co., Ltd., Howe Sound, B. C.* [Reprint of a company balance sheet and report closed Jan. 1 1916].—*Canadian Mg. Jnl.* July 1 1916; p 323; pp 3¼; 35c.

General Miscellany

Garrison, F. L.—*Mining Education*. [Tells of characters and points which should be brought out in an engineer besides his knowledge of the several sciences].—*M. & S. P.* July 1 1916; p 9; pp 2; 20c.

Mason, J. K.—*How to Study Factory Efficiency*. [The methods and ideas are of a nature which makes them possible of application to the studying of efficiency in any operating body].—*Engg. Mag.* July 1916; p 542; pp 5½*; 35c.

Paul, C. E.—*Heavy Timber Mill Construction Buildings*. [Treats in detail on the use of timbers in timber construction of buildings].—*National Lumber Mfg. Assn. Bull.* No. 2; pp 65*.

Ore and Metal Markets; Prices-Current

New York, July 20, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended July 19 were as follows:

		New York. Cts.	London. Pence.
July 13.....	.....	62½	30
14.....	.....	62½	29½
15.....	.....	61½	29 9/16
17.....	.....	62½	29 15/16
18.....	.....	62½	29 15/16
19.....	.....	62½	29½

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London Standard Oz.	
	1916 High.	1916 Low.	1916 Avg.	1916 Avg.	1915 Avg.
January	57½	55½	56.775	48.890	26.875
February	57	56½	56.755	48.477	27.000
March	69¾	56½	57.935	49.926	27.080
April	73½	60½	64.415	50.034	31.375
May	77½	68¾	73	49.915	34.182
June	68¾	62¾	64.175	49.072	31.038
July .....	.....	.....	.....	47.519	22.950
August .....	.....	.....	.....	47.178	22.750
September .....	.....	.....	.....	48.68	23.600
October .....	.....	.....	.....	49.285	23.923
November .....	.....	.....	.....	51.713	24.640
December .....	.....	.....	.....	55.038	26.232
Year .....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Conditions in the copper market have undergone no essential change since our last report. Business has been lacking and price recessions are steadily appearing, although the extent of the decline has been small. The situation in the red metal is undergoing more analyzing at the present time than when the price was around 11c. On every hand one hears of either an inflated copper market or one fundamentally strong. The absence of business has caused those to believe that the situation has been inflated to give vent to their beliefs in circular letters. They point out that the efforts of copper producers to maintain prices above 25c will be extremely harmful, unless there is a strong certainty that war buying will again come to the fore. Otherwise they assert that a bulge worse than that of 1907 will transpire. Some conservative copper factors declare that the large producers are using their abnormal profits to tide the market over the dull period and that unless business again develops on an extensive scale these producers will not only have lost a good part of their profits but also sacrificed an opportunity to maintain a strong market for the metal for a lengthy period. In other words, they contend that it would be far better to bring copper down to a stable basis around 20c with steady buying than to maintain prices from 27c to 29c until consumers can be forced to buy.

Copper has always been a subject of conflicting views owing to the active speculation that exists in the metal. The opinions expressed above are combated by views of producers who assert that the status of the market is as strong as could be wanted. In the first place, production over the rest of the year to the extent of about 70% is already sold. The warring powers are deferring copper buying until the results of the summer military operations can be studied so that a basis of opinion as to the war's duration can be formed. In the event that the conclusion is reached that the war will continue well into the summer of 1917, perhaps into the winter of next year, then a resumption of war material buying on a tremendous scale will be witnessed. Producers of copper are banking on the war continuing into 1917. Explaining the maintenance of the present high copper prices one large producer asserted that the extensive orders now booked fully warranted the present level of values and as to their being a repetition of 1907 he scouted the idea, declaring that producers were doing all in their power to prevent a top heavy market. "We have built this structure carefully," said this producer. "The foundation can support much more. There need be no danger of it toppling."

Resellers sold nearby electrolytic down to 24¼c with August electrolytic offered at 24c and September to December at 23 to 23¼c, the inside price being for the latter month. First hands, however, asked 26¾c to 27½c for September to December. It must be stated that the reported quotations of 29c to 29¾c for the late months are absolutely fictitious. Spot casting copper was sold this week at 23½c with producers quoting August and September at 23 to 23¼c.

The London market moved up and down since our last report and the trend can not be defined. Some days standard advance and electrolytic declined, a condition which reflects manipulation of standard by English Government officials.

Quotations for copper per pound at New York for the week ended July 19 were as follows:

	(For Third Quarter Delivery.)		Casting.
	Lake.	Electrolytic.	
July 13.....	26¾ @ 27	26¾ @ 27	24 @ 24½
14.....	26¾ @ 27	26½ @ 27	23½ @ 24
15.....	26 @ 26½	26 @ 26½	23½ @ 24
17.....	26 @ 26½	26 @ 26½	24¼ @ 23½
18.....	26 @ 26½	26 @ 26½	23¼ @ 23½
19.....	26 @ 26½	26 @ 26½	23¼ @ 23½

Quotations for copper per ton at London for the week ended July 19 were as follows:

	Standard		Electrolytic.
	Spot.	Futures.	
July 13.....	£90 10 0	£89 0 0	£125 0 0
14.....	91 0 0	89 10 0	124 10 0
15.....	91 0 0	89 10 0	124 10 0
17.....	88 0 0	86 10 0	123 0 0
18.....	88 0 0	87 0 0	122 0 0
19.....	89 0 0	87 0 0	122 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916			1915. Average.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July .....	.....	.....	.....	19.423
August .....	.....	.....	.....	17.472
September .....	.....	.....	.....	17.758
October .....	.....	.....	.....	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915. Average.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July .....	.....	.....	.....	19.08
August .....	.....	.....	.....	17.222
September .....	.....	.....	.....	17.705
October .....	.....	.....	.....	17.859
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York—1916			London—1916, 1915.	
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	101.794	77.360
June	24.00	25.25	24.38	94.316	82.350
July .....	.....	.....	.....	.....	74.807
August .....	.....	.....	.....	.....	67.850
September .....	.....	.....	.....	.....	68.560
October .....	.....	.....	.....	.....	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—Stagnation in the tin market has been prevailing now for 4 weeks and prices are showing the effect of the

lack of demand. Sellers have lowered prices on spot and futures but without inducing any response from users. Consumers are well supplied up to September. Sellers are now paying for the false alarms that stirred tin consumers last March and February. At that time, it will be recalled, the closing of the Suez Canal caused a very active demand for futures, consumers buying up to September fearing delays in arrivals due to the longer voyage around the Cape of Good Hope. Being well stocked and amply protected by supplies afloat consumers are ignoring the current market and holders of unsold spot tin are seeking to liquidate before their losses become greater. Spot straits tin has been offered down to 38 cts. with spot Banka held at 37 cts. Importers have done no business either, as consumers realize that their indifference may bring still lower prices for September to December deliveries. At the present time August delivery is held at 37½ cts., September and October at 37½ cts. and November and December at 37¼ cts.

Arrivals of tin are increasing but July is not expected to equal June imports. Up to July 17 imports total 1530 tons, while the stock afloat totals 2109 tons. On this basis it is possible that stocks at the end of July will be smaller and should straits shipments show a decline the improved statistical position may swerve the market more in the favor of the metal.

Foreign markets continued their downward movement, traders abroad feeling the effect of the smaller demand from this country. Last week Singapore dropped £2 10s and opened this week £4 10s lower. Straits tin at London declined £1 last week with a drop of £2 10s on Monday. Standard tin has also been declining.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended July 19 were as follows:

	New York		London		Singapore
	Spot.	July.	Straits, spot.		
June 13.....	38½c	38¼c	£171	0 0	£171 10 0
14.....	38½c	38¾c	170	0 0	173 10 0
15.....	38½c	38¾c	170	0 0	173 10 0
17.....	38c	37¾c	167	10 0	169 0 0
18.....	37½c	37¾c	164	0 0	167 10 0
19.....	37½c	37c	164	0 0	165 10 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.43	43.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July .....	.....	.....	.....	37.498
August .....	.....	.....	.....	34.386
September .....	.....	.....	.....	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	33.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Another reduction by the American Smelting & Refining Co. is impending. The cut on July 5 failed of its purpose and instead of stimulating business has had the opposite effect with the market steadily weakening. Consumers will not buy on a declining market and the lack of business is causing supplies to accumulate despite the fact that producers have good orders for future delivery. Little is heard of the weakness in lead being a bear drive on ore, as the ore market has been declining of late. Independents reported that some business could be closed if the spread in prices were narrowed but with the A. S. & R. Co. quoting 6.50 cts., New York 6.42½ cts., St. Louis and outsiders 6.35 cts. New York and 6.25 cts. St. Louis the market is unbalanced and consumers look for lower prices. Foreign business has not appeared but buying agents intimate that business may be done after the next reduction.

The London market held firm in spot with futures showing a slightly easier tendency at times. The fluctuations were small and cable advices indicate that the London lead market is dull and featureless.

Quotations for lead per pound at New York and per ton at London for the week ended July 19 were as follows:

	New York		London	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
July 13.....	6.40c	6.60c	£28 5 0	£26 15 0
14.....	6.35c	6.50c	28 5 0	27 0 0
15.....	6.35c	6.50c	28 5 0	27 0 0

17.....	6.35c	6.50c	28 5 0	27 0 0
18.....	6.30c	6.50c	28 10 0	27 5 0
19.....	6.50c	6.50c	28 10 0	27 5 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	18.637
March	8.00	6.50	7.47	4.066	33.108
April	8.00	7.37½	7.70½	4.235	34.410
May	7.50	7.22½	7.34	4.235	33.709
June	7.20	6.75	6.88	5.875	20.120
July .....	.....	.....	.....	5.738	25.750
August .....	.....	.....	.....	4.750	25.611
September .....	.....	.....	.....	4.627	22.150
October .....	.....	.....	.....	4.612	22.953
November .....	.....	.....	.....	5.152	23.932
December .....	.....	.....	.....	5.346	26.240
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—In the Missouri-Kansas-Oklahoma district the Riverton electric plant in the Empire district was down during the week ended July 15 and caused the closing down of many producers. Prices for lead ore were slightly off during the week. For the most part \$72.50 was obtained, but this ranged down to \$70. There were produced during the week 1,882,590 lbs. of concentrate and the total for the year to that date was 59,031,632 lbs. These were given the respective values of \$70,618 and \$2,606,515.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July .....	.....	.....	.....	59.00
August .....	.....	.....	.....	47.50
September .....	.....	.....	.....	48.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	63.34

Zinc Ore.—In the Missouri-Kansas-Oklahoma district the drop in spelter was felt by the ore market, and prices were down another \$5 for the week ended July 15. The top price paid was \$75 and this ranged down to \$50. Towards the latter part of the week a general strengthening tendency seemed to be making its appearance. Production for the week was 10,236,990 lbs. bringing the total for the year to 384,482,544 lbs. These amounts were respectively valued at \$333,002 and \$18,034,698.

Calamine was down a little for the better grades, being quoted at \$50, with the poorer grades being offered at \$40. There were 88,750 lbs. produced and the total for the year to date was 18,963,030 lbs., these being valued at \$1980 and \$703,453.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	63.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.60	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	83.125	69.60
June	90.00	60.00	77.00	116.00
July .....	.....	.....	.....	111.00
August .....	.....	.....	.....	60.25
September .....	.....	.....	.....	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Consumers of spelter have become alert to the opportunity that the present prices contain and are covering requirements over the third quarter. Business has bloomed out and sellers are taking good sized orders for the first time in almost 2 months. Most of the spot metal now being sold is from dealers who are accepting losses while producers are endeavoring to limit forward business, in fact, absolutely declining to accept fourth quarter contracts at the present range of prices. Spot business was mainly done at 8¾ cts. New York and 8½ cts. St. Louis, with August delivery sold at 8¼ cts. St. Louis and September at 8.00 cts. St. Louis. As has been pointed out these prices are unusually low considering that we are in the midst of a great war with the increased consumption that it entails. Consumers

realized this state of affairs and entered the market at the opportune time. There has been a change of trend at London also. After having experienced the most violent reaction the market is beginning to recover but the advances are small compared with the declines. Last week spot advanced £3 and futures £2 10s with further advances this week that brought spot up to £48 and futures to £44.

Quotations for spelter per pound at New York and per ton at London for the week ended July 19 were as follows:

	New York.	London.	
	Spot.	Spot.	Futures.
July 13.....	9.00c	£45 5 0	£43 10 0
14.....	9.25c	47 0 0	43 10 0
15.....	9.25c	47 0 0	43 10 0
17.....	8.75c	48 0 0	44 0 0
18.....	9.37½c	48 0 0	44 0 0
19.....	9.62½c	50 0 0	46 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1915	1916	1915	1916	1915
January	19.42½	17.30	18.801	6.519	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	41.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July				20.803		98.150
August				16.110		68.250
September ..				14.493		64.400
October				14.196		64.196
November ..				16.875		88.240
December ..				16.675		89.153
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Business in quicksilver has been less active, but the market has remained firmly established at \$83 per flask for virgin spot. There is a fair amount of metal on the market and incoming supplies are adequate.

Antimony.—Sellers have offered spot antimony at 14½ cts. a lb., but no buyers have cared to take the metal even at this price. It appears that nothing can develop that will prevent antimony from going below 10 cts. Producers are actively competing for business and are now beginning to lay lines for trade after the war. It is realized that Cooksons and Hallett's can quickly regain their trade and the Chinese and Japanese are now desirous of arranging long term contracts with consumers at prices slightly above normal.

Nickel.—Aside from the stir created by the trouble that will develop due to the sale of nickel to Germans for transportation on the submarine Deutschland the trade has little to engage its interest. Demand is small but prices are maintained at 45 to 50 cts. for ordinary forms and 5 cts. extra for electrolytic. England plans to blacklist every metal house having allowed Germans to secure hold of nickel and the trade is waiting to see where the hatchet will fall.

Platinum.—Prices are receding on platinum, sales having been made at \$63 to \$65 per ounce as against a price of \$88 an ounce prevailing two months ago.

Finished Copper, Brass and Other Products.—Lead sheets have been lowered and prices on seamless tubes have been revised downwards. An easier tone is also noted in copper wire. Following prices are all f. o. b. mill:

Sheet zinc	\$17.00@
Sheet aluminum, 1917, contract.....	40.00@
Sheet aluminum, outside market, prompt shipment..	80.00@95.00
Copper wire	29.00@32.00
Sheet copper, hot rolled.....	37.50@
Sheet copper, cold rolled.....	38.50@
High brass sheet, wire and rods.....	38.00@39.50
Low brass sheet, wire and rods.....	39.50@42.00
Bronze sheet and wire.....	40.00@42.00
Bronze rods	40.00@42.00
Brazed brass tubing.....	45.00@46.50
Brazed bronze tubing.....	46.00@47.00
Seamless copper tubing.....	43.00@44.00
Seamless brass tubing.....	42.00@43.00
Seamless bronze tubing.....	43.00@44.00
Full lead sheets.....	8.75@
Cut lead sheets.....	9.00@

Pig Iron.—There has been no cessation in foreign buying of Bessemer iron, Italy and France taking over 40,000 tons in the past week, while new inquiries in the market call

for 75,000 tons. Bessemer remains firm and unchanged at \$21 to \$21.50 valley furnace. Foundry grades are inactive with furnace prices steady.

Ferromanganese.—Sellers of both domestic and foreign ferromanganese have lowered their prices for nearby deliveries to \$175, this being similar to the quotation for 1917 contracts. Spot English 80% has sold at \$175 seaboard, while domestic furnaces have also taken business at \$175 furnace. Little in the way of contract business is noted. Spiegeleisen is quiet with the market showing an easy tendency and prices quoted at \$50 to \$55 furnace for 20%.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	3.00	to	3.25
Muriatic, 20 deg.....	3.25	to	3.50
Nitric, 36 deg.....	.07½	to	.08
Nitric, 40 deg.....	.08½	to	.08¾
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured, 188 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.71
Alum—Powdered, lb.....	.05¼	to	.08
Lump, lb.....	.04	to	.06½
Ground, lbs.....	.041	to	.07¼
Ammonia—			
Muriate, white grain, lb.....	.08¾	to	.08¾
Muriate, lump .....	.17	to	.18
Arsenic—White, lb.....	.06¼	to	.06½
Red, lb.....	.55	to	.60
Barium Chloride—Ton	110.00	to	115.00
Nitrate, kegs, lb.....	.14	to	.15
Bismuth—Metallic, lb.....	3.11	to	3.20
Subnitrate	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	5.25	to	5.75
Borax—100 lbs., car lots.....	8.00	to	8.25
Coke—Connellsville furnace	2.50	to	2.75
Foundry	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese—Spot	175.00	to	.....
Last half	175.00	to	.....
Ferrosilicon, 50%			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.60	to	.70
Calclined			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
White crystals .....	.15½	to	.15¾
Broken, cakes .....	.14½	to	.15
Powdered .....	.17	to	.17½
Lead—Granulated, lb.....	.15	to	.15½
Brown sugar .....	.13¾	to	.14
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer .....	.13	to	.14
20 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 20 gr.....	.37½	to	.38
Wood grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity .....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto .....	.32¾	to	.33¾
Benzine, 59 to 62°, gal.....	.29	to	.29½
Nickel Salt, double.....	.07½	to	.08½
Single .....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	80.00	to	\$4 00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate .....	.39	to	.40
Carbonate, cal. 96 to 98%	1.30	to	1.35
Cyanide, bulk, per 100% .....	.75	to	1.00
Chlorate .....	.48	to	.50
Prussiate, yellow .....	.95	to	1.00
Prussiate, red	3.50	to	4.00
Saltpeter—Crude, lb.....	.15	to	.15¾
Refined .....	.27	to	.29½
Soda—Ash, 58% (43% basis), bbl.....	1.25	to	1.50
Strontia Nitrate, casks, lb.....	.48	to	.50
Sulphur—			
Crude, ton	28.50	to	29.00
Flowers, 100 lbs.....	2.50	to	2.70
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs .....	.13¾	to	.14¼
Crystals, bbls., lb.....	.30	to	.30½
Oxide, lb.....	.44	to	.46
Zinc Chloride .....	.14	to	.20

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization			NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization		
					Paid in 1915	Total to date	Latest						Paid in 1915	Total to date	Latest
							Date Amt.								Date Amt.
Acacia, g.....	Colo.	1,438,989	\$1	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.....	Colo.	480,915	\$1	\$98,916	Sept. 1, '01	\$0.01		
Adams, a l c.....	Colo.	80,000	10	778,000	Dec. 13, '09	.04	Golden Star, g.....	Ariz.	400,000	5	120,000	Mar. 15, '10	.05		
Ahmeek c.....	Mich.	200,000	25	4,650,000	Apr. 10, '16	3.00	Gold'f Com. Fra. g.....	Nav.	922,000	1	92,111	Oct. 15, '09	.10		
Alaska Goldfields.....	Alaska	250,000	5	403,250	Jan. 10, '16	.15	Goldfield Con.....	Nav.	3,559,148	10	28,999,831	Oct. 31, '15	.10		
Alaska Mexican, g.....	Alaska	600,000	5	3,507,381	Nov. 28, '15	.10	Good Hope, g. s.....	Colo.	500	100	941,250	Jan. 1, '08	.25		
Alaska Mines Sec.....	U. S.	200,000	25	90,000	Nov. 1, '06	.50	Good Sp. Anchor, z.s.	Nav.	550,000	1	119,755	June 15, '16	.01		
Alaska Treadwell, g.....	Alaska	180,000	5	15,780,000	May 29, '16	.50	Grand Central, g.....	Utah	600,000	1	1,545,200	Dec. 23, '15	.02%		
Alouez.....	Mich.	100,000	25	250,000	Apr. 10, '16	1.50	Grand Gulch, c. s.....	Nav.	232,345	2.50	11,992	June 1, '18	.03		
Amalgamated, c.....	Mont.	1,538,829	100	103,444,983	Ang. 30, '15	3.77	Granite, g.....	Alaska	430,000	1	17,200	May 10, '16	.02		
Am. Sm. & R. com.....	U. S.	500,000	100	30,333,333	June 1, '16	1.50	Gwin, g.....	Cal.	100,000	10	481,500	Jan. 5, '15	.01		
Am. Sm. & R. pf.....	U. S.	500,000	100	56,546,386	June 1, '16	1.75	Hazel, g.....	Cal.	900,000	1	1,114,000	Jan. 5, '15	.01		
Am. Sm. Sec. A pf.....	U. S.	170,000	100	11,210,000	Apr. 1, '16	1.60	Hecla, a l.....	Idaho	1,000,000	0.25	4,405,000	June 20, '16	.15		
Am. Sm. Sec. B pf.....	U. S.	300,000	100	16,390,000	Apr. 3, '16	1.25	Hercules.....	Idaho	1,000,000	1	1,450,000	June 16, '16	.20		
Am. Zinc, L. & Sm.....	Mo.	193,120	25	3,622,825	June 10, '16	1.25	Hidden Treasure, g.....	Cal.	30,000	10	457,452	Sept. 1, '00	.10		
Anacoda, c.....	Mont.	2,331,250	50	171,851,771	May 20, '16	1.50	Holy Terror, g.....	S. D.	600,000	1	172,000	Jan. 1, '00	.01		
Annie Laurie, g.....	Utah	25,000	10	439,949	Apr. 22, '05	.10	Homestake, g.....	S. D.	251,160	100	979,524	June 25, '16	.65		
Argonaut, g.....	Cal.	200,000	5	1,640,000	Mar. 27, '16	.10	Hope Dev.....	Cal.	600,000	1	5,000	Dec. 31, '15	.01		
Arizona, c.....	Ariz.	100,000	25	20,000	Apr. 1, '16	.30	Horn Silver, l. s. z.....	Utah	400,000	1	5,182,000	June 30, '16	.06		
Atlantic, c.....	Mich.	100,000	25	529,550	Feb. 21, '16	.10	Imperial, c.....	Ariz.	600,000	10	300,000	June 24, '07	.20		
Bacdad Chase, g. pf.	Cal.	84,819	5	202,394	Jan. 1, '09	.10	Independ'ce Con. g.....	Colo.	2,500,000	1	281,375	Apr. 1, '01	.04		
Bald Butte, g. s.....	Mont.	250,000	1	1,354,648	Nov. 1, '07	.04	Inspiration Con.....	Ariz.	920,687	20	1,149,859	May 1, '18	1.25		
Baltic, c.....	Mich.	100,000	25	7,950,000	Dec. 31, '13	2.00	Inter'l Nickel, com.....	U. S.	1,673,334	25	30,941,338	June 1, '16	2.00		
Barnes-King, g.....	Mont.	40,000	5	60,000	June 1, '16	.07%	Inter'l Nickel, pf.....	U. S.	89,125	100	6,814,824	May 1, '16	1.50		
Beck Tunnel Con.....	Utah	1,000,000	0.10	940,000	Nov. 15, '07	.02	Inter'n Sm. & Ref.....	U. S.	100,000	100	4,100,000	May 2, '14	.00		
Big Four Expl.....	Utah	400,000	1	50,000	June 15, '16	.05	Interstate Callahan	Idaho	464,990	10	3,952,415	June 30, '16	1.50		
Biogham-N. Haven	Utah	228,689	5	980,493	Dec. 20, '15	.20	Iowa, g. s. l.....	Colo.	1,666,667	1	270,167	Dec. 31, '15	.00%		
Board of Trade, z.....	Wis.	120,000	1	78,000	Jan. 15, '11	.05	Iowa Tiger, g. s. l.....	Colo.	3,000	1	25,179	Jan. 15, '16	.50		
Bonanza Dev.....	Colo.	300,000	1	1,425,000	Oct. 28, '11	.20	Iron Blossom, s. l. g.....	Utah	1,000,000	1	2,650,000	Apr. 15, '16	.10		
Booth (Reorganized)	Nebr.	993,250	6	349,949	June 25, '16	.05	Iron Cap pf. c.....	Ariz.	33,481	10	23,381	Dec. 31, '16	.17%		
Boss, g.....	Nebr.	400,000	1	40,850	Dec. 30, '14	.10	Iron Clad, g.....	Colo.	1,000,000	1	60,000	Nov. 1, '06	.06		
Boston & Colo. Sm.....	Colo.	15,000	10	402,350	Oct. 1, '07	.75	Iron Silver.....	Colo.	600,000	20	6,050,000	Dec. 31, '15	.10		
Bot. & Mont. Con.....	Mont.	100,000	25	63,225,000	May 15, '11	4.00	Isabella, g.....	Colo.	2,250,000	1	742,600	Mar. 1, '01	.01		
Breco, l. s.....	Colo.	200,000	25	230,000	Dec. 15, '13	.10	Isle Royale, c.....	Mich.	180,000	25	150,000	Mar. 31, '13	1.00		
Brunswick Con., g.....	Cal.	300,000	1	203,315	Sept. 15, '15	.08	Jamison, g.....	Cal.	390,000	10	378,300	Jan. 1, '11	.07		
Bullion-B. & Champ	Utah	100,000	10	2,768,400	July 11, '08	.10	Jerry Johnson, g.....	Colo.	2,500,000	10	187,500	Nov. 5, '14	.00%		
Bullwhacker, c.....	Mont.	450,000	1	10,000	July 1, '07	.01	John Butler.....	Nebr.	1,718,020	1	343,694	Feb. 2, '16	.10		
Bunker Hill Con, g.....	Cal.	200,000	1	851,000	June 4, '16	.02%	Johns Ora & Spelter	Mo.	400,000	6	41,008	June 22, '16	.05%		
Bunker Hill & Sull.	Idaho	327,000	10	17,590,500	June 4, '16	.40	Jumbo Ext, g.....	Nebr.	1,550,000	1	694,998	June 30, '16	.05		
Butte Alex Scott.....	Mont.	75,000	10	1,054,119	Apr. 10, '16	10.60	Kendall, g.....	Mont.	600,000	6	1,555,000	Apr. 3, '16	.10		
Butte-Ballaklava, c.....	Mont.	250,000	10	125,000	Aug. 1, '10	.60	Kennediff Zinc.....	Mo.	200,000	1	60,000	June 30, '16	.10		
Butte Coalition, c.....	Mont.	1,000,000	15	4,700,000	Dec. 1, '11	.25	Kennecott.....	Alas.	250,000	10	12,000,000	June 30, '16	1.50		
Butte & Superior, z.....	Idaho	2,697,697	10	11,853,917	June 30, '16	.10	Kennedy, g.....	Cal.	100,000	100	1,801,001	June 1, '00	.06		
California, l. a. c.....	Idaho	1,000,000	1	1,351,831	June 5, '16	.03	King of Arizona, g.....	Ariz.	200,000	1	396,000	Aug. 2, '09	.12		
Calumet & Ariz., c.....	Ariz.	841,923	10	2,565,676	June 20, '16	2.00	Klar Pluett, z.....	Wis.	20,000	1	157,600	Dec. 16, '12	.25		
Calumet & Hecla, c.....	Mich.	100,000	25	3,039,000	June 23, '16	15.00	Knob Hill, g.....	Wash.	1,000,000	1	70,000	Aug. 1, '13	.00%		
Camp Bird, g.....	Colo.	1,750,000	25	10,243,964	Jan. 1, '16	.17%	La Fortune, g.....	Ariz.	250,000	1	1,200,500	Oct. 1, '02	.01%		
Cardiff, a l.....	Utah	600,000	1	250,000	June 1, '16	.25	Lake View.....	Utah	500,000	.05	102,600	May 10, '16	.02%		
Carlisa, g. s. c.....	Utah	600,000	1	60,000	Dec. 1, '06	.01	Last Dollar, g.....	Colo.	1,600,000	1	180,000	Feb. 23, '03	.02		
Cashier, g.....	Colo.	900,000	1	28,160	Apr. 1, '04	.00%	Liberty Bell, g.....	Colo.	133,551	5	1,752,795	Jan. 31, '16	.05		
Centennial Kureka.....	Utah	100,000	25	4,000,000	Apr. 25, '16	1.00	Lightner, g.....	Cal.	102,255	1	331,179	June 1, '06	.05		
Centor Creek, l. z.....	Mo.	100,000	10	580,000	Apr. 1, '15	.25	Linden, z.....	Wis.	1,020	10	11,200	Dec. 31, '16	3.00		
Central Kureka, g.....	Cal.	100,000	1	799,159	Mar. 6, '06	.05	Little Bell, s. l.....	Utah	300,000	1	75,000	Apr. 22, '16	.05		
Century, g. s. l.....	Utah	1,000,000	1	392,057	Feb. 15, '16	.05	Little Florence.....	Nebr.	1,000,000	1	430,000	Jan. 1, '08	.03		
Champion, c.....	Mich.	100,000	25	13,729,000	June 7, '16	6.40	Lost Packer.....	Idaho	160,000	1	37,600	Oct. 23, '13	.25		
Chel Con.....	Utah	892,960	1	439,312	May 15, '16	.05	Lower Mammoth.....	Utah	1,000,000	1	67,000	Dec. 15, '11	.10		
Chico Con.....	Cal.	892,960	1	9,743,925	June 30, '16	2.25	MacNamara, g. s.....	Nebr.	734,578	1	48,800	Apr. 23, '06	12.00		
C. K. & N. g.....	Colo.	1,431,800	1	171,828	Nov. 1, '04	.01	Magma, c.....	Ariz.	240,000	5.00	240,000	June 30, '16	.60		
Cliff, g.....	Alaska	100,000	1	115,000	Feb. 7, '14	.05	Manitou, c.....	Utah	400,000	10	2,380,000	Apr. 20, '16	.05		
Cliff, s. l.....	Utah	300,000	10	90,000	Jan. 1, '13	.10	Manhattan-Big 4 g.....	Nebr.	762,400	1	30,248	Aug. 16, '11	.02		
Clinton, g. s.....	Colo.	1,000	10	60,000	Dec. 1, '03	.30	Mary McKinney, g.....	Colo.	1,309,252	1	1,189,306	July 28, '16	.02		
Colo. G. Dredging.....	Colo.	200,000	10	425,000	Feb. 23, '16	1.00	May Day.....	Utah	800,000	0.25	284,000	May 28, '16	.02		
Colorado, s. l.....	Utah	1,000,000	0.20	2,600,000	Mar. 15, '13	.03	May Day.....	Utah	800,000	0.25	284,000	May 28, '16	.02		
Columbus Con., l. a. c.....	Utah	283,540	6	212,623	Oct. 14, '07	.20	Mary Murphy, g. s. l. z.....	Colo.	370,000	5	93,106	May 1, '16	.07		
Combination, g.....	Nebr.	320,000	1	873,000	Dec. 1, '06	.15	Mexican, g. s.....	Nebr.	201,600	3	171,389	June 4, '14	.75		
Comstock-Phoenix.....	Nebr.	785,000	1	60,000	Nov. 14, '11	.06	Miami, c.....	Ariz.	747,114	6	7,464,442	May 15, '16	1.60		
Con. Mercur, g.....	Utah	1,000,000	1	1,265,000	June 25, '13	.03	Mine La Motte, l.....	Mo.	300,000	10	300,000	Jan. 23, '04	.20		
Consolidated.....	Colo.	2,500,000	1	380,000	Mar. 1, '02	.01	Modoc, g. s.....	Colo.	600,000	1	275,000	Oct. 20, '11	.01		
Cons. St. (Goldfield), g.....	Cal.	100,000	1	11,430	Oct. 14, '08	.15	Mogolon, g. s.....	N. M.	355,582	1	130,000	Oct. 1, '15	.10		
Continental, z.....	Sto.	22,000	25	561,000	Dec. 30, '15	10.00									

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest		Paid in 1916					Total to Date	Latest			
						Date	Amt.							Date	Amt.	Date	Amt.
Petro, g. s.	Utah	600,000	\$ 1	\$	\$65,000	Aug. 9, '06	\$0.04	Success.	Ida.	1,600,000	\$1	\$300,000	June 23, '16	\$0.03			
Pharmacist, g.	Colo.	1,600,000	1		91,500	Feb. 1, '10	.00%	Superior & Pitts. c.	Ariz.	1,499,792	10		10,318,568	Dec. 21, '15	.38		
Phelps, Dodge & Co	U. S.	450,000	100	6,400,000	53,771,627	June 30, '16	6.00	Swansea, s. l.	Utah	100,000	6		334,500	Apr. 29, '07	.03		
Pioneer, g. s.	Alaska	5,000,000	1		2,041,626	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25		9,430,000	July 23, '07	4.00		
Pittsburg, l. z.	Mo.	1,000,000	1		20,000	July 15, '07	.02	Tamarack-Custer	Idaho	2,000,000	1	80,000	June 1, '16	.02			
Pittsburg-Idaho, l.	Ida.	1,000,000	1		249,104	July 15, '13	.04	Tennessee, c.	Tenn.	200,000	25	300,000	Apr. 15, '16	.75			
Pitts Silver Peak	Nev.	2,790,000	1		840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100		160,000	Jan. 3, '14	.00		
Platteville, l. z.	Wis.	600	60		179,500	June 15, '07	10.00	Tomboy, g. s.	Colo.	310,000	6		3,659,000	Dec. 31, '16	.24		
Plumas Eureka, g.	Cal.	150,626	10		2,831,294	Apr. 8, '01	.06	Tom Reed, g.	Ariz.	909,555	1	2,555,934	Sept. 6, '15	.01			
Plymouth Con.	Cal.	240,000	5	68,250	231,050	Apr. 10, '16	.24	Ton-Belmont, g.	Nev.	1,600,000	1	375,008	Apr. 1, '16	.12%			
Portland, g.	Colo.	3,000,000	1	180,000	10,357,080	Apr. 20, '16	.03	Ton-Extension, g. s.	Nev.	1,272,301	1	190,888	Apr. 1, '16	.10			
Prince Con., s. l.	Nev.	1,000,000	2	75,000	200,000	Apr. 1, '16	.06	Tonpah, g. s.	Nev.	1,000,000	1	300,000	Apr. 21, '16	.15			
Quartette, g. s.	Nev.	100,000	10		375,000	July 31, '07	.20	Tonpah Midway, g	Nev.	1,000,000	1	250,000	Jan. 1, '07	.05%			
Quicksilver, pf.	Cal.	43,000	100		1,931,411	Apr. 8, '03	.50	Tremnis.	Cal.	200,000	2.50		234,000	Apr. 28, '16	.02		
Quip, g.	Wash.	1,500,000	1		67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	1,100,000	Oct. 30, '12	3.00			
Quincy, c.	Mich.	110,000	25	770,000	22,547,600	June 30, '16	4.00	Tuolumne, c.	Mont.	800,000	1	496,525	Apr. 15, '13	.00			
Ray Con., c.	Ariz.	1,671,279	10	1,571,279	6,144,406	June 30, '16	.60	Uncle Sam Con., s.	Utah	600,000	1	470,000	Sept. 20, '11	.05			
Red Bird, g. s. c. l.	Mont.	300,000	5		72,000	Oct. 9, '04	.01	Union, g.	Colo.	1,250,000	1	444,244	Jan. 27, '03	.02			
Red Metal, c.	Nev.	100,000	10		1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	167,070	Nov. 16, '15	.10			
Red Top, g.	Nev.	1,000,000	1		128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	1,500,000	Apr. 15, '07	3.00			
Republic, g.	Wash.	1,000,000	1		85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	6,125,000	Aug. 6, '07	1.75			
Richmond, g. s. l.	Nev.	54,000	1		4,463,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,555	25	211,527	Oct. 15, '07	.60			
Rocco-Home, l. s.	Nev.	300,000	1		152,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,008	1	40,000	Dec. 21, '12	.01			
Rochester Ld. & L.	Mo.	4,900	100		190,846	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1	440,435	Jan. 1, '10	.04			
Round Mountain, g.	Nev.	889,018	1		383,964	Aug. 25, '13	.04	United Olobe, c.	Ariz.	23,000	100	759,000	June 30, '16	18.00			
Sacramento, g.	Utah	1,000,000	6		303,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	50,000	100	11,000,000	Sept. 23, '10	6.00			
St. Joseph, l.	Mo.	1,464,798	10	704,733	10,972,631	June 28, '16	.25	United Verde, c.	Ariz.	300,000	10	1,395,000	June 3, '16	1.50			
St. Mary's M. L.	Mich.	160,000	25	1,440,000	6,240,000	June 28, '16	2.00	U. S. Red & R. com.	Colo.	59,188	100	414,078	Oct. 9, '03	1.50			
Schoenh'r-Wal'n.z.l	Mo.	10,000	10		90,000	Sept. 20, '16	.20	U. S. Red & R. pf.	Colo.	30,458	100	1,775,330	Oct. 1, '07	1.60			
Scratch Oravel	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. S. R. & M. com	USMx	351,116	50	614,451	Apr. 15, '16	1.00			
Seven Tro. Co., g. s.	Nev.	1,443,077	1	36,076	252,632	Apr. 1, '16	.02%	U. S. S. R. & M. pf.	USMx	486,550	50	859,112	Apr. 15, '16	.87%			
Shannon, c.	Ariz.	300,000	10		750,000	Jan. 30, '13	.60	Utah, c.	Utah	1,624,490	10	8,934,695	June 30, '16	8.00			
Shattuck-Ariz, c.	Ariz.	350,000	10	787,500	3,762,600	Apr. 20, '16	1.26	Utah, s. l. (Fish Sps)	Utah	93,000	10	283,720	Oct. 21, '10	.02%			
Silver Hill, g. s.	Nev.	108,000	1		88,200	June 24, '07	.06	Utah-Apex, s. l.	Utah	528,200	6	132,050	Apr. 1, '16	.12%			
*Silver King Coal'n	Utah	1,250,000	6	375,000	13,959,885	Apr. 1, '16	.15	Utah Con., c.	Utah	300,000	6	450,000	June 26, '16	.75			
Silver King Con.	Utah	637,582	1	63,758	878,615	Apr. 22, '15	.10	Utah-Missouri, z.	Mo.	10,000	1	10,000	May 29, '16	1.00			
Silver Mines Expl.	N. Y.	10,000	100		250,000	June 16, '10	2.00	Victoria, g. s. l.	Utah	250,000	1	207,500	Apr. 23, '10	.04			
Sioux Cons., l. s. c.	Utah	745,389	1		872,105	July 20, '11	.04	Vindicator Con., g.	Colo.	1,600,000	1	90,000	Apr. 25, '16	.03			
Skidoo, g.	Cal.	1,000,000	6		365,000	Oct. 2, '14	.01	Wasp No. 2, g.	S. D.	500,000	1	100,000	May 16, '16	.02%			
Smuggler, s. l. z.	Colo.	1,000,000	1		2,235,000	Nov. 22, '06	.03	Wellington, l. z.	Colo.	10,000,000	1	200,000	May 15, '16	.02			
Snowstorm, c.	Idaho	1,600,000	1		1,169,610	Oct. 10, '13	.01%	West End Con.	Nev.	1,785,486	1	636,455	Jan. 15, '16	.06			
Soconco, c.	N. M.	377,312	6	37,734	127,205	June 1, '16	.06	West Hill	Wis.	20,000	1	40,000	June 29, '16	.20			
South Eureka, g.	Cal.	229,981	1	125,940	1,367,774	June 16, '16	.07	White Knob, g. pf.	Cal.	200,000	10	170,000	May 29, '16	.01			
So. Swansea, g. s. l.	Utah	300,000	1		267,600	Jan. 3, '04	.01%	Wilbert	Ida.	1,000,000	1	20,000	Apr. 1, '16	.01			
Spears, g.	S. D.	1,600,000	1		155,600	Apr. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	360,600	Apr. 1, '16	6.00			
Standard Con., g. s.	Cal.	178,394	10		5,274,408	Nov. 17, '13	.26	Wolverine & Ariz. c	Ariz.	118,674	16	53,403	.....	.15	
Standard, c.	Ariz.	425,000	1		69,600	Sept. 8, '05	.50%	Work, g.	Colo.	1,500,000	1	1,597,685	Apr. 31, '12	.02			
Stewart, l. z.	Idaho	1,238,362	1		2,043,297	Dec. 31, '15	.08	Yak.	Colo.	1,000,000	1	120,000	June 30, '16	.07			
Stratton's Crip. Ck.	Colo.	2,000,000	1		300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	167,500	Feb. 1, '13	.01			
Stratton's Ind.	Colo.	1,000,000	5		5,028,668	Dec. 23, '06	.12	Yellow Aster, g.	Cal.	100,000	10	13,000	June 6, '16	.02			
Str'n's Ind. (new)g.	Colo.	1,000,000	.30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine.	Cal.	1,000,000	1	600,000	June 25, '16	.15			
Strong, g.	Colo.	1,000,000	1		2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	102,583	July 15, '14	.10			

Corrected to July 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675.00

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest		Paid in 1916					Total to Date	Latest			
						Date	Amt.							Date	Amt.		
Ajuchitlan.	Mex.	50,000	\$ 6	\$	\$237,600	July 1, '13	\$0.26	Las Cabilas.	Mex.	1,040	\$10	\$	\$591,400	June 3, '12	10.00		
Amistad y Concordia g.	Mex.	9,600	60		429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25	36,450	Mar. 15, '16	\$0.30			
Amparo, s.	Mex.	2,000,000	1	200,000	2,132,176	May 10, '16	.05	Lucky Tiger	Mex.	715,337	10	207,448	June 20, '16	.08			
Bartolo de Medina Mill	Mex.	2,000	25		103,691	Aug. 1, '07	.60	McKinley-Darragh-Sav.	Ont.	2,247,692	1	134,861	Apr. 1, '16	.03			
Batopilas, s.	Mex.	446,258	20		65,870	Dec. 31, '07	.12%	Mexican, l. pf.	Mex.	12,500	100		May 1, '12	8.50			
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex.	240,000	10		Mar. 10, '08	.25			
Boleo, g.	Mex.	120,000	20		721,871	May 8, '11	.60	Mexico Mines of El Oro	Mex.	180,000	5	4,478,500	June 26, '14	.96			
British Columbia, c.	B. C.	591,709	5		615,399	Jan. 5, '13	.15	Minas Pedrazzini.	Mex.	1,000,000	1	497,500	Jan. 23, '11	.06%			
Buena Tierra.	Mex.	330,000	6		160,380	Jan. 30, '15	.24	Mines Co. of Am.	Mex.	900,000	10	4,968,600	July 25, '13	.12%			
Buffalo, Ont.	Ont.	1,000,000	1		2,787,000	July 1, '14	.05	Minning Corp. of Canada.	Can.	2,075,000	1	259,375	Mar. 30, '16	.12%			
Canadian Goldfields.	Can.	600,000	0.10		237,099	July 15, '14	.01%	Montezuma, l. pf.	Mex.	6,000	100	402,500	Nov. 15, '12	8.50			
Cananea Central, c.	Mex.	600,000	10		360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex.	500,000	1	100,000	July 30, '09	.04			
Cariboo-Cobalt	Ont.	1,000,000	1		285,000	Sept. 1, '15	.09	Mother Lode.	B. C.	1,250,000	1	137,500	Jan. 3, '16	.11			
Cariboo-McKinney, g.	B. C.	1,250,000	1		66,250	Dec. 1, '09	.00%	Naica, s. l.	Mex.	100	300	3,190,000	Oct. 11, '09	\$283			
City of Cobalt.	Ont.	600,000	1		138,375	May 15, '09	.01	N. Y. & Hond. Rosario.	C. A.	200,000	10	140,000	Apr. 25, '16	.25			
Cobalt Central, s.	Ont.	4,761,500	1		192,485	Aug. 24, '09	.01	Nipissing, s.	Ont.	1,200,000	6	600,000	Apr. 20, '16	.25			
Cobalt Lake, s.	Ont.	3,000,000	1		465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	533,000	Feb. 1, '10	.02			
Cobalt Silver Queen	Ont.	1,500,000	1		315,000	Dec. 1, '08	.03	Paloma, g.	Mex.	3,000		99,600	Dec. 1, '12	.60			
Cobalt Townsite, s.	Ont.	199,282	6		1,042,259	Aug. 20, '14	.24	Panuco.	Mex.	10,000		7,465,000	Nov. 4, '09	5.00			
Conlaras, s.	Ont.	800,000	6	200,000	8,040,000	Feb. 6, '16	.25	Penoles, s. g.	Mex.	120,000	20	6,481,687	Sept. 30, '11	3.60			
Con. Mg. & Sm., g. & c.	B. C.	68,050	100	290,262	2,470,246	Apr. 1, '16	2.60	Perezgrina, pf.	Mex.	10,000	100	328,656	Sept. 1, '10	3.60			
Crown Reserve, s.	Ont.	1,999,357	1		6,102,408	July 16, '15	.03	Peterson Lake.	Ont.	2,401,820	1	42,032	Mar. 1, '16	.01%			
Dolores.	Mex.	400,000	6		1,374,865	July 24, '11	.22%	Pinguico, pf.	Mex.	20,000	100	780,000	Apr. 15, '13	3.00			
Dome Mines, s.	Ont.	400,000	10	400,000	890,000	June 1, '16	.60	Porcupine Crown.	Ont.	2,000,000	1	120,000	Apr. 2, '16	.03			
Dos Estrellas, (El Oro)	Mex.	300,000	0.60		15,405,000	Sept. 30, '13	1.60	Providencia, (S. J.).	Mex.	6,000	15	963,360	Apr. 1, '08	1.00			
El Favor.	Mex.	3,600,000	1		210,000	Apr. 30, '14	.01	Rambler-Cariboo.	B. C.	17,500	100	62,500	June 15, '16	.02			
El Oro, g. s.	Mex.	1,147,600	2		9,136,940	July 1, '15	.24	Ran Mines Leasing	Ont.	20,000	100	472,750	Feb. 20, '16	.06%			
El Rayo, g. s.	Mex.	260,020	2		140,410	Apr. 24, '11	.16	Right of Way	Ont.	1,685,500	1	16,240	June 15, '16	.02			
El Triunfo, c.	Mex.	2,000,000	1		20,000	Aug. 28, '11	.01	Rio Plata	Mex.	374,615	5	345,744	Feb. 1, '13	.06			
Esperanza, s. g.	Mex.	450,000	6		12,521,250	Dec. 31, '15	.10	San Francisco Mill	Mex.	6,000	25	445,086	Oct. 15, '08	1.00			
Oranby Con. c. g. s.	B. C.	149,385	100	449,966	8,050,341	May 1, '16	1.60	San Rafael.	Mex.	2,400	25	6,798,260	Jan. 11, '12	2.00			
Greene-Cananea, c.	Mex.	474,411	100	1,438,627	6,694,432	May 29, '16	2.00	San Toy, s. l.	Mex.	6,000,000	1.00	640,000	July 24, '13	.01			
Greene Con. c.	Mex.	1,000,000	10	1,500,000	11,640,000	Apr. 26, '16	1.00	Santa Gertrudis, Hdgo.	Mex.	1,500,000	5	2,455,272	Nov. 16, '15	.24			
Greene Gold-Silver, pf.	Mex.	300,000	10		194,871	Mar. 23, '07	.04%	Sta. Gerty y Guadalupe, g. s.	Mex.	60,000		3,980,000	Mar. 27, '09	1.00			
Guanaquato Con.	Mex.	540,000	6		600,000	Oct. 1, '08	.30	Sta. Maria del Paz.	Mex.	9,600	12%	6,696,000	Jan. 2, '13	2.50			
Guanaquato Dev. c.	Mex.	10,000	25		274,356	Jan. 1, '11	3.00	Seneca Superior.	Ont.	475,840	20	335,219	Jan. 15, '16	.30			
Guggenbuhl Explorat.	Mex.	833,732	10	10,713,456	54,032,760	Apr. 3, '16	11.85	Soledad, s. l.	Mex.	200,000	100	4,489,540	Oct. 17, '11	8.00			
Halleybury, s.	Ont.	50,000	1		50,000	Apr. 6, '11	.50	Sorresra, g. s.	Mex.	19,200	20	3,979,240	Jan. 6, '11	34.00			
Hedley.	B. C.	120,000	10	120,000	1,943,620	June 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	300,000	June 10, '16	.02%			
Hinds Con., g. s. l.	Mex.	5,000,000	1		88,000	Feb. 27, '03	.02	Temiskaming & Hud. Bay	Ont.	7,761	1	1,940,250	Nov. 10, '14	3.00			
Hollinger.	Ont.	609,000	6	720,000	4,890,000	June 16, '16	.20	Temiskaming, s.	Ont.	2,500,000	1	1,423,156	Dec. 31, '16	.03			
Humulco, c.	Mex.	10,000	100		975,000	Feb. 27, '11	1.00	Teziutlan, c.	Mex.	5,000	100	1,955,000	Jan. 1, '09	1.50			
Kerr & Blance.	Mex.	600,000	6	300,000	6,420,000	May 1, '16	.25	Tough-Oakes.	Ont.	61,600	6	132,575	Apr. 1, '16	.12%			
La Alcaza.	Mex.	140,000	20		2,775,700	May 1, '16	.05	Tretheway, s.	Ont.	1,000,000	1	1,061,000	July 15, '14	.08			
La Republica, s.	Mex.	400,000	5		110,000	Aug. 16, '11	.06	Wetlaufer-Lorrain.	Ont.	1,416,890	1	856,388	Oct. 17, '11	.08			
La Rosa Con., s.	Ont.	1,498,627	5	149,862	6,536,992	Apr. 20, '16	.05	Yukon, E.	Y. T.	3,400,000	6	625,000	June 30, '16	.02			

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RUSH CAMP IN BUFFALO RIVER DISTRICT.



YELLOW ROSE IN RUSH CAMP.

Great Activity in the North Arkansas Zinc Fields

By THOMAS SHIRAS.

During the first 6 months of this year, according to reports from the ore buyers in the North Arkansas zinc field, the production was as much as the entire production of 1915. The production in that year was between 400 and 500% more than it was in 1914, and the last 6 months in this year promises to see the first 6 months' output doubled.

The field is just beginning to catch its stride, and is responding with cash dividends, to the more modern and thorough mining and milling methods that have been introduced during the past year's operations. There is not an idle mill in the whole field, and new installations during the year will average one each 2 weeks.

When the price of zinc ore began to soar a ripple of unrest swept over the field. It struck the local people first, especially those who owned land that showed croppings of free carbonate or silicate ores. They started to work and began to make a production immediately. Then suddenly the outsiders began to come in.

Few flat country operators are entering the field. Most of them are coming from the west, and from Mexico. They are introducing mountain methods, which accounts largely for their success. Up until last year nothing but flat country mills and methods were being used.

The ore bodies that are being worked are practically all in the upper ore-bearing stratas that outcrop on the mountain sides. They are worked by tunneling. Some of these tunnels have been driven back in ore to a distance of 1500 ft., which has proven conclusively that these deposits are not just rim deposits, but extend into the mountains. Invariably they are found in breaks, synclines, fractures or old underground water courses, that have become choked.

By far the greatest part of the ore that is being mined in the field is carbonate and silicate. It would be quite safe to say that nine-tenths of the production of the field is this class, assaying anywhere from 30 to 49% metallic zinc; much of it is shipped to the smelters just as it comes from the ground, without crushing or cleaning. This ore is termed hand-cobbed ore, and is in strong demand by the smelters.

Some drilling has been done in the valleys, and bodies of sulphide ores have been encountered, but they will not be mined to any considerable extent for many years, as the ore in the upper stratas is much more easy to mine, and can be produced much cheaper.

At the present time there are between 300 and 400 mines working in the field. Most of these however are small diggings, being operated with a force



O'MEARA MINE IN BUFFALO RIVER DISTRICT.

of from 2 to 5 men. Invariably these small mines are free-ore producers, and are being worked by men with small capital. This one feature has been responsible to a great extent for the success of the field during the last year. A man does not need a fortune to start operations. It is not a trust ridden field owned by a few big corporations. Every man is his own boss who can raise a grubstake. He can always find some land owner that will stake him with a lease to work on. He has the same chance as the old placer gold miner of the west had, for his free-



MACKINTOSH IN RUSH CAMP.

ore carbonate mine at the start has a good chance to develop into a big mill proposition with enough development work.

During the past 12 months, a much better working knowledge has been gained of the field, and some very glaring mistakes have been found that in a great measure were responsible for failures during the early history of the field.

One of the most startling disclosures that have

been made was the fact that former operators in the field threw away into their tailings piles on an average of 4% of their values. Mill construction during the early history of the field was very poor as far as it pertained to saving values. Few mills had tables or even sand jigs. Carbonate and silicate ore does not have quite as much specific gravity as jack. In some instances it is so closely interwoven in fine grains into the lime, that unless ground very fine complete recovery is impossible. The values were



ROSLIN JACK MINE IN ZINC CAMP.

lost both in the coarse and fine tailings. Some of these tailings piles have been found to contain as high as 8%. In a late interview with J. C. Shepherd, of Rush, the largest producer in the field, he states that a saving of all but slightly over 1% is possible. He has been experimenting for several months on this one problem, and at this time is building a 200-ton tailings mill on his Big Hurricane mine in Searcy county, and will run his 25,000-ton tailings pile over it, and all other tailings that come from his regular concentrating mill.

A radical change in mills has been made during the last few months. Tables of the Wilfley type have been installed, also sand jigs, and extra rolls, and the loss generally hereafter will be small.

During the early history of the field flat country mills were constructed in spite of the fact that nine out of ten mines were high enough on the hill to in-



SURE POP MINE ON WATER CREEK.

stall gravity or mountain mills. Now wherever feasible the gravity type is being constructed.

There has also been a radical change in power. To the average man who comes into the field and looks at the countless mountains covered with growing timber, the fuel question is settled for him at once. Cheapest on earth, he thinks. But it has been found to be the most expensive steam producing fuel that could be had. Last winter shutdowns were numerous because of lack of wood cutters. The roads



SILVER HOLLOW PROPERTY IN BUFFALO DISTRICT.



MARKLE MINE IN DODD CITY CAMP.

are now in these old cuts and tunnels, that were considered non-productive 10 or 20 years ago.

The producing counties in the field now are Marion, Baxter, Boone, Newton, Searcy and Sharp. Independence and Izard counties are producing large quantities of manganese ore, but no zinc. Prospecting is general over those counties, and also in Stone and Izard, where some good ore bodies apparently will be developed during the next few months.

are rough and in bad weather it is hard to get teams to haul.

Crude oil was tried under the boilers as a substitute, but was not much better owing to long hauls, and the power has finally evolved itself into gasoline engines, which are giving the satisfaction desired. Over wood they have cut the power cost on 100-ton plants \$25 a day.

Knowledge of ore too has been one of the most important things gained. The field produces an unlimited number of carbonate and silicate ores. Not a week passes that does not bring in one different in color, texture or weight from anything that has been found. Old dumps have been cleaned up in the field that have been rich in value, in which the operator who did the work years ago didn't know he had a "shine." These old diggings have been eagerly looked for, and many of the best mines in the field



MORNING STAR GROUP IN RUSH CAMP.



GROUND HOG MINE ON COW CREEK.

Cement Industry in 1915.—Shipments of natural cement in 1915 were 750,863 bbls., valued at \$358,627, a decrease in quantity of 422 bbls. and an increase in value of \$7257, compared with 1914. There was a slight increase in shipments of Portland cement and a small decrease in production and stocks, compared with 1914, shown as follows: Shipments in 1916, 86,891,681 bbls.; in 1915, 86,437,956. Production in 1915,

85,914,907 bbls.; in 1914, 88,230,170 bbls. Stocks in 1915, 11,781,166 bbls.; in 1914, 12,773,463 bbls.

The method of handling material by means of a cableway is one which has a great deal of practical interest for all mining men interested in heavy excavating, filling and erective work, the construction of a power or reservoir dam, headworks, etc., stripping deposits and the disposal of waste, tailings, or other refuse over a dump.

• C. F. Kelley on the Proposed Tax on Copper.

It is the belief of C. F. Kelley, vice-president of the Anaconda Copper Co., that the tax on copper which is incorporated in the new revenue bill will be stricken out in the senate. In a recent interview Mr. Kelley discussed the situation and the result of his trip to Washington:

I, of course, have no definite knowledge as to what the action of either the senate finance committee or that body itself will be upon the proposed measure. Upon our arrival in Washington we found that protests had been received from practically every commercial body in the state of Montana and from a large number of prominent citizens, including not only those who would be directly or indirectly affected, but also disinterested people who merely had the general welfare of the state at heart. We also found that the matter of opposing this provision of the bill has been actively taken up by the congressional delegations of many of the western states, but particularly by the Montana delegation, under the very able and intelligent leadership of Senator Walsh, Senator Myers being ill at the time. Mr. Evans had opposed the measure in the house, and had there been further time for consideration, I believe that his effort to have the provision stricken from the bill in the lower house would have been successful. Our mission resolved itself merely into that of furnishing such information, statistical and otherwise, with reference to the copper business, as was available to those directly engaged in it.

As a matter of fact there prevails an erroneous impression as to the amount of copper which is being used in munition manufacture. It is quite impossible for the producers to follow the copper disposed of to its ultimate use, as by far the greater part is worked up into brass and other alloys and used by manufacturers engaged in making an infinite variety of articles, of which munition manufacture is in some instances incidental to, or forms a part only of the general business conducted. Pure copper is used in munition manufacture for only two purposes, to wit: The primer of shells and the expansion ring that follows the rifling of the gun discharging the shell. The amount used for this purpose is infinitesimally small compared to the general production. A compilation of the uses to which copper is put in the arts and industries would, and does, fill an exceedingly large volume. A mere suggestion of the general production of the mills and foundries, such as wire and bar, brass and bronze, sheet copper, tubes, etc., indicates the infinite variety of useful purposes to which these different manufactured shapes or alloys are devoted. It has been estimated that there is over a billion and a quarter pounds of copper in the telephone and telegraph mileage of the world; that in the single long distance telephone circuit established between New York and

San Francisco there is about 6,000,000 pounds of copper.

In the electrification of the Butte, Anaconda & Pacific, for instance, 11,800 lbs. of copper per mile were used; in the electrification of the St. Paul more than 24,000 lbs. per mile were used. In an ordinary steam locomotive there is more than 3000 lbs. of copper. It enters into practically every line of trade, among which principal items may be mentioned electric lighting industry, boat and ship building, heating and cooking devices, building construction, hardware and coinage. It is estimated that fully 100,000,000 lbs. of bearing metal is milled annually in the United States to take care of the demand for new journals. Of this amount probably 50,000,000 lbs. so destroyed is copper, so that the manifest injustice of taxing every pound of copper produced and classifying it as a war munition becomes readily apparent. Moreover, it is doubtful if the demand for copper during the past year and a half would not have been substantially as great, although no doubt the price would have been much less, had there been no war.

Germany and Austria constitute the principal copper customers of the world. In 1913 the United States exported to Germany and Austria alone, according to a leading authority, 587,000,000 lbs. of copper. This export business has been wholly destroyed by the war. It may be conservatively stated that the amount of copper which has gone into war munitions since the declaration of war has been considerably less than the amount which would have been furnished to the market of which the United States has been thus deprived.

Another fallacy is that the export business has tremendously increased on account of shipment of tremendous amount of copper to the allies. The figures available in the advance sheet of the United States geological survey show that the total exports of copper during the year 1915 amounted to about 682,000,000 lbs., as against 840,000,000 for 1914, 817,000,000 for 1913 and 775,000,000 for 1912. An analysis of our export figures discloses that in 1915 there was less copper exported from the United States to Europe than in any year since 1910. It is no doubt true that in addition to the raw copper exported a very large quantity was exported in the shape of manufactured munitions, the exact amount of which is unattainable.

All this merely discloses the iniquity of the proposed measure in attempting to fix a tax as a war munition on the total production of the United States, irrespective of the purpose to which it was intended. However, it is gratifying to feel that through a proper presentation of the matter, particularly by the Montana delegation, a better understanding of the situation has been arrived at and the hope may be confidently expressed that the proposed copper tax will be eliminated from the bill.

The United States Potash Corporation was incorporated at Dover, Del., with \$10,000,000 stock, to mine for gold, silver and all kinds of ores.

Ore Sampling Conditions in the West

By T. R. WOODBRIDGE.*

The success of every mining enterprise depends on accurate knowledge of the constituents of the ore taken from the mine. This knowledge may be least necessary for a placer mine or for a company producing bullion from its own ores, but it is absolutely necessary to a company selling its ore, or to a smelter, custom mill, or sampling plant buying the ore.

In spite of the importance of sampling, a large part of the ore sampling of today is not done on a scientific basis. There are many operators seeking thoroughly satisfactory methods of sampling who, nevertheless, are not doing as accurate work as the present state of the industry permits. On the other hand, investigation shows that in the majority of sampling plants there is a great lack of uniformity, and that even in individual plants several methods or combinations of methods may be found.

Discussions concerning the theory and practice of ore sampling have appeared at various times in the transactions of the engineering societies and the technical press, but have not resulted in any general uniformity of practice. Especially is this true in regard to discarding methods known to be unreliable. Doubtless some operators are satisfied with this state of affairs and are not concerned with the accuracy of the sampling of individual lots of ore, provided the total purchase price of all lots equals the total value recovered during a certain period of time. Also, a few operators have worked out the problem of sampling for their local conditions to their own satisfaction and profit, and therefore do not welcome any criticism that may result in a change of methods. Most sellers and buyers of ore, however, are frankly disgusted with the persistent use of incorrect methods and would welcome a thorough investigation and discussion of the subject.

In connection with its efforts to increase efficiency in the mineral industries, the Bureau of Mines has undertaken to investigate present methods of sampling and analyzing ores in this country and to present the facts to all who may be interested in their study and discussion.

The object is to give the facts regarding the present methods of ore sampling in the hope that there may be discussion that will ultimately result in the standardization of sampling methods. Sampling would thus be raised from the position of an art to that of an exact science, where it properly belongs.

The first step forward would be the discarding of methods known to be inaccurate and of methods that, under certain conditions, may be manipulated to give inaccurate results to the advantage of either the seller or the buyer. This would eliminate one of the chief causes of the friction that often develops between the

seller and the buyer. At any rate, each party to the transaction should be familiar with the limitations of the method that has been employed by mutual consent, so that neither party will feel that the other is obtaining an unfair advantage.

Scope of the Investigation.

The subject of ore sampling is considered under five divisions, as follows: A definition of ore sampling; the condition of the ore as affecting sampling; description of the various methods of sampling used in the West, with flow sheets showing their application, and a criticism of certain details of practice; discussion of the methods investigated; and recommendations. The report deals principally with the first three of these divisions, although it may occasionally encroach upon the other two.

An exhaustive review or criticism is not attempted, and such deductions and suggestions as are made are offered with the knowledge that there must necessarily be some difference of opinion among well-informed and honest operators. It is therefore hoped that this paper will be freely discussed by those who can offer constructive criticism.

Correct Ore Sampling Defined.

The correct sampling of a lot of ore is the process of obtaining from it a smaller quantity that contains, in unchanged percentages, all the constituents of the original lot.

The commercial object of sampling is accomplished when the ultimate sample obtained meets the above conditions within an allowable limit of error, and has been obtained with reasonable speed and at a moderate cost. The final sample should be dry and of such bulk and degree of fineness as to be immediately available for the determination by the assayer or chemist of one or more of its constituents.

The commercial sample of an ore need not be more exact than the limits of error in the methods of determination employed by the assayer or chemist.

Conditions Affecting Ore Sampling.

The obtaining of a satisfactory sample of an ore would be a comparatively simple undertaking if the constituents to be determined were uniformly distributed throughout the whole mass. In most ores, however, the constituents, particularly the gold and silver, are more or less segregated. Ore in place in the mine is rarely of uniform metal content. The process of mining generally aggravates this condition, as the more heavily mineralized parts usually break up more readily, so that the finer particles frequently contain a higher percentage of the valuable constituents than the coarser particles.

Should the ore be screened before being sampled,

*Bureau of Mines. Excerpt from advance proofs of Technical Paper 86.

the difference may be lessened but never entirely eliminated. With every crushing during the sampling process this difference will persist to a varying degree, even after the final pulp has passed through a 120-mesh screen. Occasionally the condition is reversed—that is, the gangue breaks up more readily than the more heavily mineralized ore—but this does not alter the problem that arises through the segregation of certain constituents of the ore during mining and sampling.

In either event, even after repeated crushing and rolling (crushing with rolls), there still exists an imperfect mixture of fine and coarse particles, ranging from impalpable dust to pieces several inches in diameter. Unfortunately no method for making an intimate and uniform mixture of ore particles of various sizes has ever been discovered. No amount of shoveling or coning and no form of revolving receptacle will accomplish more than to make the segregation somewhat less apparent to the eye. When such a mixture is taken up with a shovel, the coarser particles tend to roll off or to collect at the edges of the shovel; if thrown upon a cone, the coarser particles tend to roll outward to the edge of the cone; if allowed to slide to the floor from an inclined chute, the coarser particles will run ahead and will accumulate farther from the edge of the chute than the finer, slower moving particles; if the ore falls through a long spout, the larger particles will bound from side to side, while the smaller particles will proceed in a more direct course; if fed into a revolving barrel, the finer particles will be carried higher on the side of the barrel and will be discharged from a different point than the coarser particles. When the mixture is screened, the softer and finer particles pass through first.

In fact, every time that the ore is handled the particles tend to segregate according to size. This tendency to segregate is frequently mentioned, as it forms the basis for most of the schemes for favoring either the buyer or seller of ore.

In considering the reliability of any sampling method this tendency to segregation should be constantly borne in mind. For any system or any detail of a system that may tend to make possible the selection or rejection of the finer or coarser particles should be considered inaccurate. So absolutely does the accuracy of a sampling method depend on freedom from selection that one may forget that gold, silver and other metals are to be determined by the process and examine the method solely as to its ability to take from a lot of ore the same proportion of all the various sizes of particles.

Lack of Uniformity in Sampling Methods.

The success of the older systems of ore sampling is considered by many to depend on the possibility of mixing particles of ore varying widely in size and in the percentage of their various constituents, whereas in reality it depends on the uniformity with which these

particles are finally distributed around the axis of a truncated cone.

With the further study of the subject and through the comparisons resulting from repeated sampling of the same product by the use of different methods, there has been developed the so-called “automatic” or “mechanical” systems of sampling, which are founded on the principle of taking small portions from the stream of ore at frequent intervals rather than large quantities at infrequent intervals. These systems may be said to be forms of fractional mixing of the particles of an ore, in that they aim to send to the final sample many thousands of easily mixed small portions, any one of which may not seriously affect the sample but which in the aggregate will approach the average value well within the limits of accuracy required.

A study or an examination of the sampling methods used in the United States shows that, in a large proportion of the plants, the theory of sampling has been given proper consideration, and many sampling plants have been built and are being operated on correct principles. It also shows that there is great variation in the application of many methods and a general lack of uniformity in carrying out certain details, which often results in a ridiculous waste of time and money and causes ore sampling to drift far from its true scientific and technical position to one of either guesswork, a too great dependence on the law of long period averages, or, in certain instances, to a plain case of matching wits.

These conditions are indicated by the fact that a method considered reliable in one plant may be considered unreliable in another, although the two plants may belong to one company; that much resampling and reassaying is considered necessary before an agreement is reached between the buyer and the seller; and that sampling often provides merely a means of settlement rather than a correct estimate of the contents of the ore. Therefore, today, as in many years past, there is the buyer who by accident or intent impoverishes the sample with too large a proportion of the lower grade, coarser particles, and the seller who screens and remixes his ores in order that the buyer may cheat himself.

Multisampling.

In many of the sampling plants that handle the more valuable ores are men who, although they refer with satisfaction to certain marvelously close checks in some resamplings, nevertheless take for granted that a large proportion of the lots received will necessarily and unavoidably show differences that will necessitate a second or third resampling. It is the custom in many plants to divide the sample at certain points in the process, and thus make what are known as duplicate, triplicate and even quadruplicate samples, each of which receives an entirely independent but similar treatment during the latter processes and is assayed separately. This is done for several reasons, one being that it furnishes a means for checking any gross error

in the succeeding operations, and another being the possibility of using an average of the results in making a settlement. In some agreements between buyer and seller it is provided that the difference between these multisamples be used as a guide in determining whether resampling of the ore is necessary. The necessity for resampling is sometimes decided on the merits of each particular case, or, in some localities, a certain agreed percentage difference or tolerance between an original and a duplicate is allowed before a resample may be demanded. In one instance, a 20% difference is considered a satisfactory check, but in the majority of such agreements a 10% difference automatically calls for a resample, whereas any difference less than 10% precludes resampling and forces a settlement on the basis of the original or an umpire assay. For example, a buyer working under a 10% agreement is satisfied as to the correctness of the sampling of an ore containing 5 ozs. of gold if one sample, the original, assays 5 ozs. and the other, the duplicate, assays either 4.54 or 5.50 ozs. In such a case the settlement would be based on the average of the second instance. With gold at \$20 per ounce, there would be a difference of \$9.50 per ton. Such differences are neither necessary nor desirable.

To appreciate these conditions more fully it must be realized that even with a lot of ore amounting to several carloads the division into these multisamples is usually made after the quantity retained for this division has been reduced to 500 lbs. or less. It seems proper, therefore, to criticize severely a sampling method that will not check the multisampling of 200 to 500 lbs. of ore closer than 10%. It is also proper to speculate on how much greater a difference might have developed had there been used for the check sample the entire lot of ore instead of the few hundred pounds. Furthermore, it should be borne in mind that even if these original and duplicate samples check absolutely, such checking does not prove the correctness of any previous part of the sampling process.

Proportion of Ore Retained for Sample.

It is unfortunate that, owing to limited storage room and to the length of time involved, it is not feasible for other than custom sampling plants to retain intact the whole tonnage of every lot of ore until final settlement. With smelting and milling plants, therefore, it is frequently the rule that, during the sampling, the bulk of the ore, the portion rejected, is taken directly to storage bins or beds where it immediately loses its identity through being mixed with other lots of ore, only a small part of the whole being retained for resampling and the settlement of possible disputes. In the case of high-grade ores, or of special contracts, some plants retain the whole lot. However, the prevailing custom is to retain a few hundred pounds in the case of ordinary lots and one-fifth of the lot in special cases. Montana has tried to protect both parties to the sale of ore by enacting a law compelling

every sampling plant to retain intact $2\frac{1}{2}\%$ of every lot of ore until final settlement has been made.

The existence of a considerable difference between multisamples is not everywhere considered a disadvantage. It makes the matter of final settlement susceptible to delicate manipulation by both parties; at times it enables the seller to raise the price somewhat and at other times enables the buyer to pay a few cents less than he otherwise would. As the manager of one of the larger plants has aptly said, "Do not interfere much with these original and duplicate or resampling rules, as that is where we make our money."

The records of some sampling mills show that a system is possible whereby the ordinary difference between two samples will be well within the limits of the accuracy of the assay, say approximately 1%, and that a greater difference than this will be shown in less than 2% of the cases. To make such results general would mean the scrapping and rebuilding of many plants, but the annoyance and cost of such a change would be returned in many ways. Among the advantages would be that the doubt of the mine superintendent regarding the correctness of his returns would be eliminated, as would the difficulty of the smelter or mill superintendent in deciding whether his losses or gains in recovery were due to his metallurgical practice or to a careless or overzealous sampling foreman. There are few sampling-mill foremen who have not worked overtime trying to develop some system that would enable them to avoid during the current month the blame attached to the sampling department for the loss of metals in the metallurgical operations during the previous month, and frequently such foremen have been unable to locate the cause of discrepancy and have merely passed along the reprimand of the superintendent to the shovelers or other workmen with the remark: "Be careful not to get too much of the 'fines' in the sample; the superintendent says that we ran short last month."

Generally a foreman does not enjoy this state of affairs, and no one who has had experience with this hard-working and loyal class of workmen can seriously doubt that the adoption of more nearly uniform and more accurate methods of sampling will be enthusiastically welcomed by them.

(TO BE CONTINUED)

Briquet for Zinc Ores.—A special form of briquet for zinc ores, particularly suited to retort distillation, is patented by Otto Baltin, of Lipine, Germany. (U. S. patent 1,166,170.) The ore and reducing agent are formed into egg-shaped briquets which are so small that the sum of their exposed surface is many times that of the receptacle used in distillation. When charged into a retort these briquets have only one point of contact with each other, and expose practically their entire surface to the direction action of heat. Ample space is left between them for the easy escape of zinc vapors.

Present Situation in Tungsten Industry. What the Future Has in Store for Silver.

Better tungsten prices are inevitable. This was the opinion expressed yesterday by Lewis A. Jeffs, mining engineer, prominent in the tungsten properties of Idaho and Nevada. Mr. Jeffs is of the opinion that the buyers of tungsten ores have reached an agreement which has resulted in driving down the price of the concentrates and that by so doing they have put themselves in a very unfavorable position. In discussing the tungsten market Jeffs said:

"I firmly believe that better tungsten prices than those prevailing at present are inevitable and for the following reasons: To begin with there is apparently a combination among the buyers with the avowed intention of hammering down the price to be paid the producers. They have hammered down the price to such a point that at least three-fourths of the operators that have been shipping tungsten concentrates have stopped producing. I have been in touch with numerous operators recently both in Idaho and in Nevada and they are considering the advisability of suspending operations entirely.

"One of the arguments that the buyers have been making recently and which with the uninitiated has had considerable weight is the impurity argument. Tungsten concentrates contain a number of impurities. First among these is phosphorus. Just why this should be singled out and so much stress laid upon it it is hard to understand for it can be removed by smelting with lime as in the basic Bessemer process. Another impurity is copper and still another is arsenic. Tin, sulphur and bismuth are also objected to.

"Producers should not forget, however, that not all of the buyers object to the impurities and when the demand for the new tungsten was heavy no objections were raised.

"Now the peculiar feature of the present situation is that with three-fourths of the producers in Nevada and Idaho and other western states closed down and with numerous operators about to close down a very small tonnage is being produced. In answer to the law of supply and demand a decrease in the supply in the face of a constantly increasing demand means higher prices.

"I am told on good authority that one of the largest companies in Nevada, the Atkins-Kroll Co., has discontinued operations at Osceola, Nevada. This is but one of the many straws that point to what may be expected in the near future in the producing field. A number of new mills that have been completed recently in Nevada have not turned a wheel and have been practically abandoned."

In 1915, according to a Survey report, there were 166,336 short tons of talc produced and marketed in the United States, valued at \$1,401,197. This exceeded the 1914 output by 15,248 tons and \$60,323 in value. The average price of the domestic talc marketed in 1915 was \$8.42 a short ton.

In a letter to a friend in Gilpin county, Colorado, U. S. Senator Charles S. Thomas discusses the future of silver. He ventured the prediction, at the time of the breaking out of the European war, that one of its ultimate and necessary results would be the re-establishment of silver as a money metal upon some general and fixed ratio with gold.

"I did this because I believed and still believe, first, that the effect of the war upon exchange in gold using nations would be magnified by a corresponding but more desirable fluctuation between gold and silver than it ever had. Second, because gold would disappear from the currents of trade in all the warring countries, and silver would very naturally fall into the vacuum thus created, being preferable to and perhaps an equally good basis for paper currency. Third and lastly, because the enormous cost of the war represented by debt of striking proportions would necessitate resort to silver as the only means of broadening the metallic basis for money and credit. If I am correct in this forecast, the intrigues of the money interests can only retard their operation; the movement cannot be avoided.

"I do not think the moneyed interests have had anything to do with the recent rise in silver or its more recent fall to 62½ cts. This is one of the spasmodic fluctuations in the value of the commodity, which are caused by sudden and temporary demand. I think these are liable to occur from time to time, resulting in a permanent rise of the level of market quotations. It is too early to predict a close of the war, and until that arrives, little if anything will be done for silver.

"When the war ends the total public debt of the belligerent and neutral European nations (who have been obliged to be at all times on a military basis at great expense), will be far in excess of a hundred billions of dollars. The annual interest upon this sum at 5% represents \$5,000,000,000, which, added to the cost of government operations, will mean an annual tax upon their producing masses of not less than \$7,500,000,000. This is much more than the total productive wealth of the countries concerned, and means repudiation, unless silver comes to the rescue of gold. Even then, the nations will have to stagger along under an awful load for many years, if they are ever to get out from under it. Between repudiation and payment in silver, the holders of these national securities will prefer the latter. I therefore conclude that the interests heretofore responsible for silver's demonetization will be found among the champions of that metal through the stimulus of self interest."

By the systematic recovery of scrap tool steel, and following a plan of utilizing the material for the smaller sizes and shapes for which it is perfectly applicable, there is an opportunity in a mine repair and maintenance shop to save a great deal of tool steel.

Commonwealth Mine and Mill at Pearce, Ariz.

By W. A. SCOTT.

Commonwealth property at Pearce, Ariz., is producing 9000 to 10,000 tons of gold and silver ore per month, all of which is treated in the cyanide plant, illustrated herewith, which was built and equipped in 1913. The property is now under the management of A. H. Lawry, formerly of the Montana-Tonopah.

The two veins on the property have almost an east-west strike, and dip about 60° to the south, or toward the body of the isolated hill, which rises from a level plain. The Main vein, which is the best producer, is on a contact between rhyolite-breccia and andesite, although at the east end it is entirely within the andesite. The North vein is at the contact between andesite and sedimentary rock. Development and production are carried on through two incline shafts, reaching a

oil is used as fuel. The air compressor is steam driven, all other equipment about the mine and mill being driven by electric motors, current for which is produced by a generator, direct connected to a Corliss compound, condensing engine, developing 850 hp.

The ore is dumped from mine skips into a receiving bin, chutes from which discharge the ore into saddle-back, double discharge cars. These cars, operated by cable and counter balance, are hauled about 60 ft. and the ore dumped into a crusher bin of 650 tons capacity. This method of moving the ore from the shaft to the crusher bin is known as the C. W. Hunt Co. automatic railway system, which is much used at coal mines. The dry-crushing plant, below the crusher



CYANIDE AND OTHER SURFACE IMPROVEMENTS OF COMMONWEALTH MINING CO., PEARCE, ARIZ.

depth of about 1000 ft. on the dip of the veins. The work done shows a width of vein which varies considerably. It is 100 ft. wide in some parts of the mine. The ore body, which occurs in shoots and channels, is found next to the footwall in some parts and on the hanging wall in others; and the footwall itself is mineralized to a paying degree in some places. The gangue consists of quartz and calcite, carrying silver and gold in the ratio of about 1 oz. gold to 100 ozs. silver. It is said that manganese is associated with the gold and silver.

The new incline serves as the main working shaft, the old incline being used for handling tools and supplies. The pump station, on the 8th level, has triplex plunger pumps and one centrifugal, all electric driven, by which 1,000,000 to 1,500,000 gals. of water are pumped to the surface daily. This supply of water is used for mill work and other purposes. The 8th level, where the pump station is situated, is 423 ft. vertically from the surface. The 10th level is under water.

The source of power is a steam plant, for which

bin, contains a No. 6 K. Gates gyratory crusher, operated by a 100-hp. motor, by which the ore is crushed to 4-in. size; it then passes through a revolving screen, 12 ft. long, 40 in. diameter, having $1\frac{1}{2}$ -in. holes, and running 18 rpm. The oversize is recrushed to $1\frac{1}{2}$ -mesh size by two No. 4 K. gyratory crushers. This $1\frac{1}{2}$ -mesh product is now delivered to a belt conveyor, 20 ins. wide, 274 ft. long, running 250 ft. per minute, on a 20° incline, whereby it is conveyed up to the sampling plant, where the ore is sampled with standard equipment. The next step is to carry the ore by a 95-ft. belt conveyor to the battery bins, it being distributed to the several bins by a self-propelling reversing tripper. These bins have a capacity of 800 tons. the ore discharging therefrom through six suspended Challenge feeders to the three 10-stamp batteries of 1550 lbs. each. The battery discharge is through 3 and 4-mesh screens to three 5-ft. Caldecott cones. The cone overflow passes to Dorr classifiers, the bottom discharge is feed for three 8 by 30 Hardinge mills. The Hardinge product goes to Dorr classi-

fiers. The Dorr sand discharge passes to one 4 by 20-ft. and two 5 by 22-ft. tube mills, which work in closed circuit; the Dorr overflow passing to a 38 by 12-ft. Dorr thickener. Here the pulp is thickened 2 to 1, and delivered to a 38 by 12-ft. Dorr agitator, which works in continuous series with nine 38 by 12-ft. Pachuca tanks. The material is discharged from the Pachuca to four 42 by 12-ft. Dorr thickeners, in which the counter-current wash is given. The tube mill product goes to Dorr classifiers. The pulp from the last Dorr thickener is passed to two 11½ by 18-ft. Oliver continuous filters, the pulp, after solution is taken out, passing to the waste dump. The cyanide solution is introduced in the Dorr agitators, using there, about 2-3 lb. to a ton of pulp.

The rich solution is first clarified by passing it through Merrill clarifying presses, having 36 by 36-in. frames; it is then pumped by two Buffalo single acting triplex pumps, having 8½ by 8-in. cylinders, to two Merrill precipitation presses, the zinc dust used in precipitating the metals being fed by Merrill feeders. The precipitates, being first dried in a steam drier, are fluxed and melted in two Donaldson tilting crucible furnaces.

The mill superintendent is C. G. Osgood, formerly superintendent of Montana-Tonopah mill. Other members of the operating staff are P. C. Lemmons, mine foreman; J. H. Tate and R. C. McGinnis, mining engineers; Ernest Hinrichs, master mechanic. There are 200 men on the payroll.

The Commonwealth Extension Mining Co. is developing ground adjoining the Commonwealth holdings on the east and southeast. This company is controlled by Bisbee stockholders, C. W. Hicks being president. J. S. Metcalf, formerly with the Commonwealth proper, is superintendent. The point at which a shaft has been sunk is near the base of the hill, and the 230-ft. level there has the same vertical depth as the 7th level in the Commonwealth mine. This shaft was sunk in andesite; water was struck at 230 ft., and a crosscut was being driven south for the vein. The property is equipped with a steam hoist and air compressor, and the company has high hopes of opening ore on the same contact that cuts through Commonwealth hill.

Suggestions for a Revised Mineral Land Law.

In response to an inquiry from a subscriber who desires to know what has been proposed in the way of new legislation for a revision of the mining laws of the United States, we append the suggestions of a committee appointed by the Mining and Metallurgical Society of America.

The following principal changes are suggested:

I. The survey of the public lands to be completed as soon as possible and all surveyed lands to be classified as

mineral or nonmineral according to the meaning of these terms now established by the United States statute or judicial decisions; such classification, officially announced, to be final until subsequently changed by the Government, and no such subsequent change to affect the rights of location under the former classification. Lands thus designated as mineral to be open to the location of mineral claims only and lands designated as nonmineral not to be open to the location of mineral claims until proved to contain mineral.

II. Mineral claims hereafter located to be 1320 ft. square—that is, 40 acres in size and square in form—with boundaries running north and south and east and west. Such claims, when located on surveyed land, shall be subdivisions of the survey sections. (Note—The location would be, of course, subject to all prior rights, surface or underground; and in many districts claims already located may leave only remnants of area not suitable in size or shape for separate locations. In such cases the practice now authorized by the Supreme Court, of establishing "imaginary boundaries"—that is, of claiming the full area of a claim and then disclaiming the parts of that area already occupied—would be followed. If such a location has no extra-lateral rights it will cause no special trouble. The purpose of this provision is, so far as existing rights do not prevent, to make mineral claims as easy to define as agricultural one.)

III. Any number of claims to be located by one person or association; and upon lands already surveyed and officially classified as mineral, the actual discovery of a valuable deposit not to be necessary to a valid location. Existing regulations concerning the marking, notice and record of location to be continued, with the additional requirement that within one year after the date of location record thereof shall be made in the United States Land Office of the land district.

IV. The present requirement of \$100 annual work upon each claim, to be amended to \$200, providing that \$300 per claim may be paid annually into the United States Land Office in lieu of the performance of such work, if any locator does not wish or is unable to meet this requirement. A person or association holding a group of contiguous claims to be permitted to do the assessment work upon one claim and thereby hold the group, but such work to be of amount equivalent to \$200 for each claim of the group. If any person or association perform assessment work in any one year to the value of \$200, or more, in excess of what is required to be done in any one year, the excess may be applied to succeeding years, provided, however, that no fractions of \$200 shall be considered for this purpose. Proceedings for patent to remain as now.

V. Subject to the existing extra-lateral rights of mining claimants or patentees, the holder or patentee of a mining claim located hereafter to have the exclusive right of possession and enjoyment of the surface held by him and of the minerals under it, bounded by vertical planes passing through surface boundaries of said land, but not the right to follow any mineral deposit beyond said planes. And the holders or patentees of claims heretofore located to have similar exclusive possession of all the mineral in said claims not covered by any existing extra-lateral rights.

VI. Notice of location of all mining claims made after the date of the passage of this act must be filed for record with the register and receiver of the land district within which the lands are situated within one year from date of each location, and unless final entry and payment be made for such claims within seven years after date of location, exclusive of the time covered by pending adverse claims, all rights thereunder shall cease.

Italian producers of or dealers in iron, steel, copper, brass and other copper alloys, German silver, lead, aluminum and scrap are ordered by the government to sell these only to army authorities. Contracts already made with other parties can only be executed by permission of the war office, with no claim for compensation if consent is withheld. Infringement of the order is punishable by fine and imprisonment.

The Right Use of Explosives in Mining Work

By E. M. WESTON.*

The miner's work on the Rand depends almost entirely on the right use of explosives. If their nature and their right use is not properly understood, then bad work is sure to be done, and accidents are sure to happen. It is not enough to know that gelatine explodes and breaks out the rock. We need to know what exploding means and how the rock is broken. It is not enough to know that a hole was too strong. We need to know why it was too strong, and why it was the explosion could not do what we expected. It will be quite easy to show that most of the miners on the Rand have wrong ideas about these subjects, and because of this lose money for themselves and others every day. This chapter is an attempt to explain these matters in as simple language as possible.

We would define an explosive as a solid or liquid substance or mixtures of substances, capable of being suddenly and more or less completely transformed into large volumes of heated gas, by means of heat or shock (as from a detonator or by a blow from a hammer) or both. This change from solid to gas is the result of chemical change such as that which causes a candle to burn in the air and disappear as a gas completely from our sight. A gas (such as air) when confined, especially where it is hot, exerts pressure or a push in all directions on whatever is keeping it in. A gas is made up of a number of infinitely small particles, so small that we cannot see them (as in the air we breathe). These always bound about everywhere and strike anything in their way, and the hotter they are the more they move and the harder they strike anything keeping them in and the more pressure or push they set up. In a drill hole when the explosive is suddenly turned into gas we have millions of small particles, at a great heat, bombarding the sides of the hole and setting up pressure, which, as we shall see later, gets up to over one hundred tons to every square inch of surface. There is no truth in the saying that "dynamite always strikes down."

Explosives are of two kinds, slow or rending, such as gunpowder, and high or quick, as dynamite. Gunpowder, when burning, turns or changes into gas in a one-hundredth part of a second (which is not very slow, after all). One part makes 200 parts or volumes of gas. When the explosion takes place this gas is heated to 2000 deg. and expands to 1500 to 2000 volumes, and it exerts a pressure of 11 tons on every square inch, so that if we had a hole 1 in. wide in a stope filled 10 ins. deep with powder, the explosive would try to force out the rock with a kick of $10 \times 11 = 110$ tons, suddenly applied in one-hundredth part of a second.

On the Rand we mainly use high explosives, such

as blasting gelatine. This turns into gas much more quickly, taking only one-twenty to fifty-thousandth part of a second to change into a gas. This is such a short space of time we cannot imagine it. When blasting brittle hard rock the more sudden the blow the greater the effect. One volume makes 6300 volumes of gas; but these, when the explosion takes place, are heated to 6000°, or hotter than any furnace, and then they expand to 16,000 volumes. This gas exerts the wonderful pressure of 117 tons on every square inch of the hole. So that in a hand hole 1 in. wide charged with 10 ins. (say, three plugs of $\frac{7}{8}$ -in. gelatine) the rock gets a sudden kick or push of 1170 tons applied so quickly that we cannot imagine it.

There are many explosives, but only a few of interest to us. These are nitro-glycerine, dynamite, gelignite, gelatine dynamite, and blasting gelatine. Recently some substitutes for these have been introduced on the Rand. Nitro-glycerine forms the chief constituent of the other four explosives. It is a thin oily liquid one and one-half times heavier than water, and is too dangerous to use by itself. Nobel found that certain earths absorbed it (sucked it up) and made it safe to use. Dynamite was the name he gave to the explosive he thus invented.

Gelignite is a mixture of nitro-glycerine, nitro-cellulose, potassium nitrate and sawdust. That is, it is a mixture of nitro-glycerine with things that absorb it and also help it to explode, and form gas themselves. It is 12% more powerful than dynamite.

Gelatine dynamite contains 80% of nitro-cellulose, with nitrate of potash and wood meal. It is 25% stronger than dynamite.

Blasting gelatine contains about 93% nitro-glycerine, which forms a jelly with an extract from cotton called gun-cotton, itself an explosive. It is also called nitro-cellulose and is a plastic jelly and is the best and most powerful explosive known for mining work. It is 50% stronger than dynamite.

The nitro-glycerine in the other explosives begins to evaporate at about 110°, and to come out of the explosive. It can generally be detected by its staining the wrappers of the cartridges. Any explosive in this state is most dangerous to use or to handle, and should be at once given up to be destroyed. Blasting gelatine freezes at about 34°. I have had it freeze in magazines on the Rand on winter nights. In this state it becomes hard. It should never be used in this state either, as it may not be properly exploded by the detonator in the hole, and is said to be liable to explode by the shock of handling roughly. Blasting gelatine can be safely burnt in small quantities, apart from the dangerous gases it gives out, but when it burns in large quantities, or if it be heated to 356° to 423° it explodes. High explosives can then be exploded in three

*Excerpts from *Practical Mining on the Rand*.

ways: by being heated, by a direct blow, and by the use of a detonator. A direct blow such as that of a hammer on an anvil will explode blasting gelatine, and it will also sometimes explode with rough handling. Accidents have been caused by tamping too roughly. At other times it can be cut to pieces in blasting the other holes of a round without being affected. The miner must remember to be always on the safe side. He cannot afford to take any liberties or he will pay sooner or later. When blasting gelatine is exploded by heat, it is only five times more powerful than gunpowder; but when exploded by a detonator it is 10 times stronger. An incomplete explosion from shock or burning means always the formation of much dangerous gas.

Detonators are filled with fulminate of mercury and chlorate of potash. Fulminate of mercury is made by the action of nitric acid and alcohol on mercury. It is the most powerful and sudden explosive known. When blasting gelatine is exploded three separate gases are given off: Carbonic acid gas, CO_2 ; carbonic monoxide, CO ; and nitrous oxide, N_2O . When blasting gelatine is burnt very much more N_2O and CO are given off, and these are most dangerous to life. For this reason the use of cheesa sticks made of sticks of gelatine burning on a stick has been forbidden.

Carbonic acid gas is not dangerous unless present in very large quantities.

Carbon monoxide gas is most dangerous even when present in only a few volumes in ten thousand. It is the gas which causes headache and loss of control of limbs, sickness and other symptoms, and if in large quantities death by driving oxygen out of the blood.

Nitrous oxide gas is also most dangerous, as it irritates the lung tissues and often causes death even after a lapse of time during which no injury is felt. Fortunately this gas is very readily absorbed by water, and if sprays and water blasts are turned on it should never be met with in large quantities. This gas can nearly always be smelt and felt in the nose and throat, thus giving warning of its presence. I have always held that many lives are lost in gassing accidents, in winzes or drives where the air has not been turned on, by a mistake on the part of the rescuers in their methods of work. Where there is an air pipe I think it unwise to try first of all to carry the disabled man out. The first effort should be to reach the air cocks and turn them on, or to break the pipe with a hammer or other tool. If this is done and the sufferer taken and laid in the escaping air, time is gained and the danger if the rescuer collapses is reduced. I need scarcely remind the miner of the need of at once having even apparently slight cases of gassing attended to.

Returning now to the subject of the detonation of explosives, the very sudden explosion of the fulminate in the cap sends a shock through the explosive, called the wave of detonation. This causes the solid particles of the explosive to unite in new ways to form gases, explosion is only quick burning, and if we could burn a candle in a fraction of a second it would act as

an explosive. This wave, travelling down to the charge, tends to lose its strength, and under certain circumstances, such as using a damp, weak detonator, or having air spaces or tamping between the cartridges, or poor explosive, it may be too weak to explode the bottom cartridge of a hole, and thus cause poor work and accidents. The end of the detonator should point always towards the bulk of the charge. In a properly loaded hole with No. 6 or 8 detonators, there is no fear that the bottom cartridges of any hole used, on the Rand will not explode properly, and there is no advantage, and many disadvantages, in the habit some miners have of putting the detonator in the bottom of the hole. The hole should be loaded as shown in the slips in the explosive cases. A still more dangerous practice has, I believe, led to several accidents, that is, putting the detonator in on the slant through the side of the middle of the primer cartridge. Too often, I am certain, the end of the detonator has protruded from the cartridge and been rubbed on the side of the hole while tamping or loading the hole and the miner has been blown up. To show that under proper conditions this matter of the loss of strength of the wave of detonation is not worth considering, I placed 18 $\frac{7}{8}$ -in. cartridges on end with the gelatine touching on the surface of a slimes dump and not packed in a hole. They all exploded perfectly. Do not try new fashions in loading holes. If bullringing in very long holes is feared, fill the bottom half with sand and blast in two sections, the top section first.

The miner must remember that even when in their box detonators absorb moisture very readily, and as they absorb moisture they lose their power. Hence, as few detonators as possible should be kept in the damp air of the mine. No doubtful or old detonators should be used in any circumstances. This is a very common cause of poor results owing to the explosive not developing its full force.

Fuse also absorbs moisture at the ends, which should always be cut off; damp fuse may hang fire or go out. Oil, which is frequently split in fuse boxes, dissolves the tar covering, and if it reaches the power retards the burning speed.

Norway exported 9910 metric tons of ferrosilicon in 1915, against 6144 and 6323 in 1914 and 1913, respectively. Iron ore and iron-ore briquette exports were 423,400 tons last year, against 467,800 tons in 1914, and 568,800 tons in 1913. Total imports of pig iron and finished steel were 302,200 tons in 1915, as compared with 223,200 tons in 1914 and 219,700 tons in 1913. Of these totals the pig-iron imports were 33,200 tons in 1915 and 32,200 tons and 30,700 tons in 1914 and 1913 respectively.

In tamping use a wooden tamping bar and a stemming material that is free from sharp bits of rock or anything that will cut the fuse. Be careful not to kink or double it over in the holes.

Relation Between Price and Volume in the Purchase of Mine Equipment

By MINER RAYMOND.

There are many laws governing business in general which the ordinary man takes for granted, giving never a thought to the whys and wherefores behind them, or as to just how closely actual facts uphold these rules. In a recent letter to the Mining and Engineering World, the writer made the statement that "more equipment is bought when prices are high, and when manufacturers are busy, than when a dull market renders the same equipment available at a lower figure."

An active curiosity as to how far available data would go toward proving the statement, led to an investigation, the results of which are presented herewith. Any extended analysis of cause and effect on this question would involve a discussion of many primal principles of economics, involving the laws of supply and demand, labor, and monetary problems; wherefore these notes will touch only such points as are pertinent to a comparison of the costs, market values, and amounts of equipment bought under varying conditions of business in general.

Before discussing the data assembled, the point at issue can be readily illustrated by the description of an incident experienced by many readers. The scene is laid in the office of the manager of the mine, smelter, factory or whatever you may choose as most familiar. Enter the superintendent, wearing on his face that do-or-die look common to the craft when the abstraction of money for new equipment is to be attempted.

"Say, Mr. Jones, we ought to have a new set of screens. Ours are all worn out and, anyhow, they're way out of date. We can't get half out of them that we should get to keep the other machinery going full. Now, John Smith & Co. have an awfully good new design—"

The manager replies in one of two ways. If business is slow, as before the war, he says: "Can't afford them. Business is rotten. Do the best you can till things pick up a bit."

On the other hand, if the question were asked at any time during the last year, the answer most probably would be: "All right, go ahead and get them in just as soon as the Lord will let you. We want to crowd out all we can while the market is up."

Multiply that incident by a large percentage of the number of mines, mills and factories in the United States, and you have the condition of the equipment market today. A strenuous demand for metals and metal products, primarily due in the present case to the great war induced a rising market. The producers bought new equipment to increase their output at the high prices. The manufacturers of equipment further stimulated the demand by large requisitions on the

producers for raw materials wherewith to build the equipment, and so resulted an increase of business all around, with the prosperity wave rolling higher and higher, until a high water mark shall be reached.

But the increased activity of the manufacturer created an increased demand for labor as well as materials, and higher wages followed. Thus with higher wages and more expensive material, the costs of manufacturing rose, and as always, the purchaser paid the piper. Again, the increased demand for equipment and urgent appeal for quick shipments caused the manufacturer to tack on a little better profit even to his increased costs, and again, it is the purchaser who pays the piper, for the machinery must be obtained so that he too may get greater profit by an increased output at the prevailing high market price. So it seems that volume of business and percentage of profit go hand in hand, a fact that will be referred to later in this discussion.

You may say that all this is very well in theory, but what are the real facts?

While the primary impulse that stimulated the present demand has been ascribed to the war, no mention has been made of the manufacture of munitions nor the production of materials therefor. The reason for leaving this branch of present activity out of consideration is that, while the situation is exceptional in its intensity, it is following the same cycle through which previous depressions and prosperities have revolved. Furthermore, the data here presented for comparative purposes is taken from the records of a firm manufacturing equipment for American firms only, with no munitions contracts whatever. The firm has an annual capacity of about \$1,500,000 worth of equipment for the preparation and mechanical handling of ores, coal and other raw and finished products.

As a basis for comparison, four curves were plotted to approximately the same scale as regards percentage of variation. The period covered is from Jan. 1, 1913, to July 1, 1916, by quarter-year intervals. The first curve shows the successive market prices of steel bars, tank plates and beams, the amounts taken being the average market values of all three for each quarter. Similarly, in the second curve, the prices plotted are the average costs per ton of five pig irons, namely: Pittsburg Bessemer, Basic Valley, Southern No. 2 at Cincinnati, No. 2 at Chicago, and No. 2-X at Philadelphia. These curves serve to show the variations in the manufacturer's costs of material, as minor items such as rivets, bolts, and so on, follow very closely the ups and downs of the major markets.

The third curve shows the variations in the cost of

labor for the same period. The first two curves are plotted from unit costs, i. e., per pound and per ton. To conform to these, the labor curve has been drawn through points representing the average monthly wage paid to the employes of the company. The total monthly pay-roll has been divided by the number of men employed, with corrections for the short month, February, and holidays.

These three curves cover the cost side of the question. It is interesting to note that, while more irregular, due to the fact that local conditions affect labor, while basic material costs are national, the general trend of the labor curve is very close to that of the other two above it. In other words, a rising cost of raw material is here accompanied by an increase in the wages of the men who work it into a finished product. High wages usually indicate plenty of work, which means that manufacturers are busy, and low wages indicate the reverse; but again the question arises as to what our data really shows.

Turning our attention to the fourth curve, in which the successive points represent the gross values of shipments for each quarter of the period, several considerations must be borne in mind. In the first place, the figures used are not the successive unit prices of a commodity as in the first three curves but represent the gross quarterly results of an effort to market that commodity. Sales problems have their effect. With business booming, undesirable inquiries are rejected, while in dull times it is "anything to keep busy." Again we must make allowance for limitations to factory output and, too, the amount of labor available to meet the demand for increased production, or, on the other hand, men held over to preserve an organization in slack times. Here, too, local conditions enter in as they may affect each particular manufacturer.

With these things in mind, we naturally look for greater irregularities in the rise and fall of the curve, and it is the rough course of the line that counts. Irregularities do appear in the fourth curve, but there is a very marked resemblance between this fourth curve and its predecessors, showing that shipments reach a higher total value when costs are up, than when cheap materials and low wages are the rule.

In a previous paragraph it was stated that bigger percentages of profit accompany better business. Admitting the truth of this, our point is proven in the case of one manufacturer at least, for a comparison of the four curves shows that there was more equipment sold when high costs of labor and material had raised the price of the machinery, and when these high costs themselves showed a greater general prosperity with consequently better profit, than when the opposite of these conditions was true. That is our original statement in extended form.

The writer's experience furnishes one interesting sidelight on this question. While it is true that the larger part of the buying is done at or near the top of the market, certain large corporations recognize and

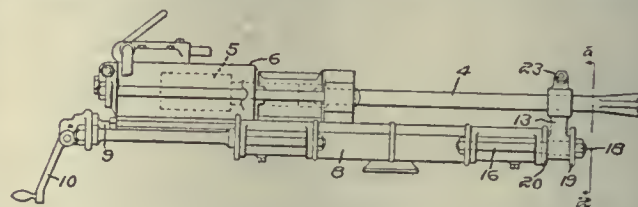
take advantage of this law by purchasing and installing much of their equipment when the market is dull and prices low. The firms referred to are the large interests commonly called "Big Buyers." It is the poor man who pays the big price. It is the case of the old Negro with the leaky shanty roof—

"When it doan rain, Ah doan need no new shingles. When de rain come, shingles am too 'sensive."

A surprising amount of equipment is purchased on just that basis.

A Remedy for Limber Drill-Shanks.

Considerable time in the drilling of blast-holes with the heavier types of mounted rock-drills is wasted in straightening the hole which has become out of line. This may be attributed to several causes, among which are the long, limber drill shanks, the sudden passing from soft to harder formation, etc. Time is also wasted in starting the hole because the drill-shank, and often the carriage, are not rigid enough to keep the drill striking in one place. Thus two disadvantages tending towards considerable inefficiency are noted and it would



SECTIONAL VIEW SHOWING SUPPORT AT END OF DRILL CARRIAGE.

not be exaggerating to say that the miner loses 10% to 15% of his time in their behalf. A recent patent (No. 1,190,387) may tend to remedy this fault some by offering a support to the drill-shank below its socket. This support will be noted in the drawing as made up of parts numbered 13, 16, 18, 19, 20 and 23, the support being bolted to the end of the drill-carriage.

Electric Furnaces at Salt Lake City.

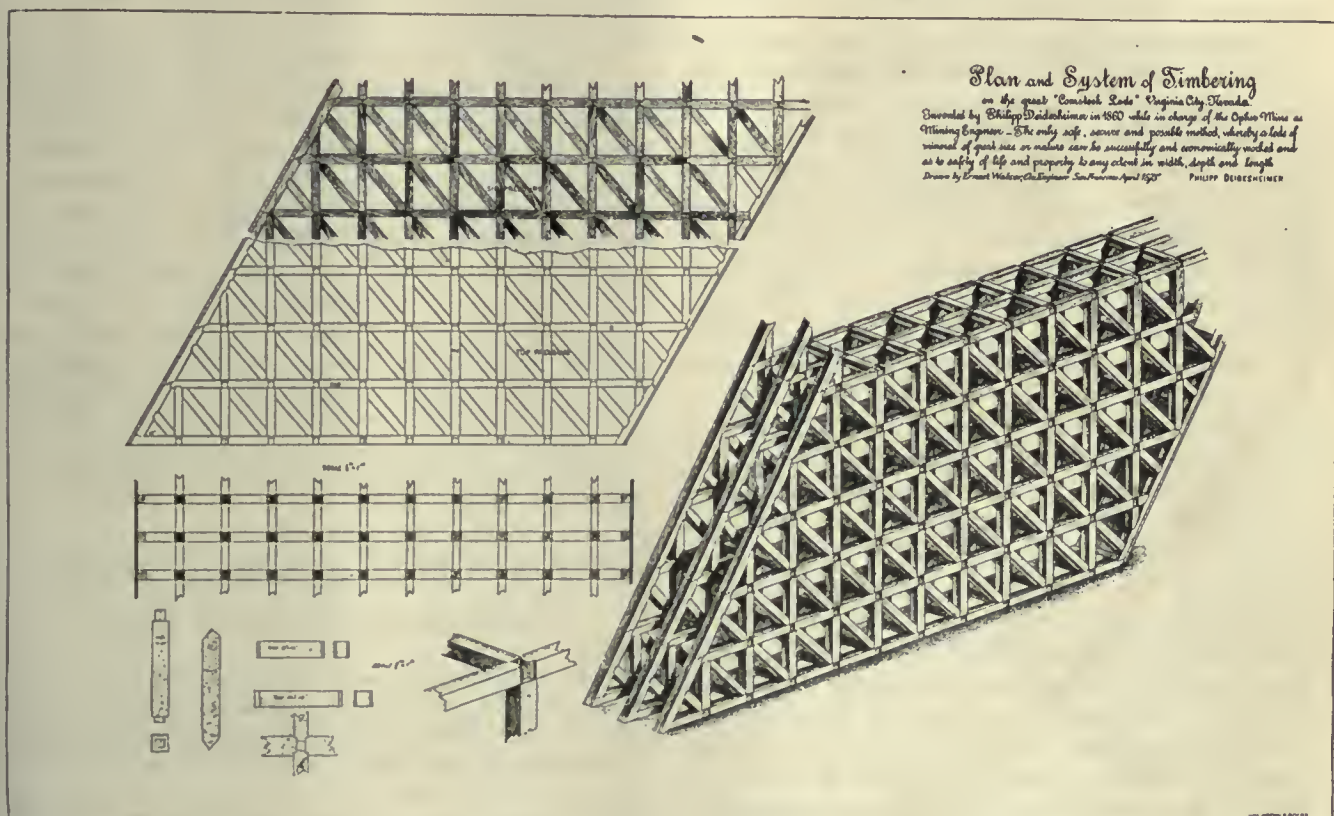
The Utah Iron & Steel Co., Salt Lake City, Utah, is considering the installation of electric furnaces chiefly for converting the scrap material available in that district into soft steel which may be rolled in its mills at Middale, near Salt Lake City. It is considering also the possibility of utilizing local ores for the manufacture of ferrotungsten and ferrochrome. It may install a furnace of as large as 12 or 15 tons' capacity, and perhaps two of the furnaces. The interests controlling the Utah Iron & Steel Co. also own the American Foundry & Machine Co., Salt Lake City, which is expanding its foundry business, and in that connection is shortly to install a 3-ton Rennerfelt electric furnace. Low-cost electricity and an abundance of scrap material make the electric furnace an attractive proposition against local high cost of suitable coke and high-cost pig iron.

Philip Dedesheimer, Inventor of the Square Set

EDITORIAL CORRESPONDENCE.

On July 21st at his home in San Francisco there passed away poor, old, almost forgotten, but hopeful that his mining claims would restore his lost fortune, Philip Deidesheimer, inventor of square set timbering. While there is some contention as to the first use of the square set in mining, it seems essentially true that the Comstock lode was the real home of the square set, and that Philip Deidesheimer was the father thereof. He met a truly great responsibility when he came to the Ophir mine on the Comstock

he was driving, rather than across it. In doing this he was following his practice at the drift mine. Then he drifted along the footwall and brought across the deposit another line of butting caps, parallel with the first. Light traces separated the two lines at the posts. Ore was in the roof, and he put the men to work on top of the sets he had stood on the level, just as he had previously done at his drift mine in those places where the ore went up above the lower sets. He had the posts of these upper sets stood in mortises cut



lode in 1860 to solve the perplexing problem that puzzled the best mining talent of the times.

An immense body of rich ore, 65 ft. wide, had been discovered in the Ophir mine, and although the best mining men in America were trying to solve the problem, they failed to get out the ore without losing more than they mined. The case was rendered all the more desperate by the remarkable richness of this large body of ore. At Georgetown, Cal., Philip Deidesheimer had been mining a drift deposit with success, carrying a face in places as wide as 125 ft. Some of the Ophir directors engaged him to go to the Comstock and solve the problem.

This problem Mr. Deidesheimer solved, as all the world now knows. Sensibly starting from the footwall he cross-cutted the deposit to the hanging, putting in two lines of butting caps, parallel with the crosscut

into the caps, directly over the posts on the lower floor. Soon the braces were made stronger and a crude square set was formed. These cross braces, or rather collar braces, were first nailed to the caps and posts. Later, bracket spikes were driven into the posts for these collar braces to rest on. Finally, the framing was changed so that the side brace rested on the post, as did the cap, resulting in a true square set, post, cap and girt.

As the stope increased in size and the ore continued to go up and up, sill timbers were used to stand the posts of the level sets on so as to give a better foundation to the structure, and then as the weight began to come, wall plates and angle braces were put in.

Complicated indeed, and some seem to think this was due to his Germanic descent. But this was not the case. Mr. Deidesheimer was solving new prob-

lems and progressing along new lines, for he was doing things that had never been done before under like conditions; in the end he accomplished a most remarkable feat, proving him to be the master miner that he was. Of course, like any one reaching into the unknown, Mr. Deidesheimer allowed himself a large factor of safety and rightly took every precaution so that this newly-devised system would not come to grief. Would not any good engineer do the same, no matter if the system did become elaborate? Mr. Deidesheimer, moreover, had rich ore to mine, and so he could not afford to lose any of it for a little less timber and a little less work. Therefore, he did things that with less rich ore could not have been done, and so no wonder that soon Deidesheimer's system of timbering was greatly simplified as it came into use under other conditions.

But think of the master mind of this miner who developed, step by step, under the stimulus of the heavy demands that the ore body was making on him, this marvelous system from the happy thought of lines of drift sets placed with their caps butting over the posts and with 2 by 4-in. sprags as collar braces between them, into a system by which he was able to carry a stope varying from 60 to 100 ft. wide and several hundred feet long, up to a height of 400 ft., without the use of any filling and without losing it. Of course, the walls along the Comstock were much less heavy than later when more ground was opened up along the lode, still the walls of the Comstock lode are none too strong at best. So it was quite a feat. The successful running of such a large and high stope for mining was not so rapid then as now and it is one that has never been repeated even in districts where the ore and the walls have been stronger, let alone under like conditions of weight. We now appreciate that it was not as good mining to use so much timber as it would have been to use waste filling concomitant with the taking out of the ore, but could any one other than a master miner have done this gigantic piece of stoping, treading new paths all the while? With a knowledge of mining, in no respect meager, we consider this the greatest mining feat ever performed in any time and in any land. It is America's real mining triumph.

Philip Deidesheimer, the man who did all this, the man who gave his great invention unfettered by a patent to mining, died in practical want at the age of 84 years. Had he patented his system of making individual timbers meet to form a series of square sets, and had the mining companies that have used his method of mining since that time paid him a royalty as meager as one-hundredth of a cent per ton for ore extracted, he would have been a millionaire years ago. Unselfish, confident in himself, engrossed with the pleasure of doing his task well, he did not patent his idea. So that during his declining years he found himself in need, although fortunes have been made time and again at mines where this mining method of his alone made successful operation possible.

Production of Bromine in the United States in 1915.

Bromine is made in connection with the manufacture of salt in the Saginaw valley in Michigan, in the Ohio valley in Ohio and West Virginia, and in the Kanawha valley in West Virginia. In Michigan bromine has been marketed in the form of fine chemicals, but as a result of the great increase in demand caused by the war in Europe, a large quantity is now being marketed as bromine itself. The bromine produced along the Ohio river, where salt and bromine occur naturally and where there is cheap rail and water transportation and an abundance of cheap coal and gas, has in part been exported to be made into fine chemicals. Here is an opportunity for the American chemist which should not be neglected.

The production of bromine in 1915 was 855,857 lbs., valued at \$856,307, an increase of 278,866 lbs. in quantity and of \$653,213 in value. The great increase in the production and especially in the value of bromine in 1915 is significant. The high price of bromine during 1915 and the first 5 months of 1916 was due, in part at least, to an unprecedentedly large demand from abroad, where it is said to be used in making asphyxiating gases. The comparatively low value per pound in 1915 indicated by the value of the total production as compared with that shown by the market quotations is due to the fact that considerable bromine was sold at prices stipulated in contracts made before the demand increased and to the further fact that the prices given are those fixed at the point of production and do not include cost of freight.

Increase in Value of Mineral Products of the United States in 1915.

The value of the mineral production of the United States in 1915, according to preliminary figures compiled by the United States Geological Survey, was approximately \$2,373,000,000, a gain of \$258,000,000, or more than 12% over 1914. The value for 1915 has been exceeded but once—in 1913—when a total of \$2,439,000,000 was recorded.

The metallic products reached the greatest value ever recorded, having advanced from \$691,000,000 in 1914 to \$987,500,000 in 1915—a gain of nearly 43%. The metals contributing most largely to this increase, their combined gains being 91% of the total, are as follows: Pig iron, increase, \$102,630,000, or 34%; copper, \$89,930,000, or 59%; and zinc, \$78,589,000, or 224%.

The value of the nonmetallic products in 1915 has been exceeded in 1913 and 1914 only, showing in 1915 a decrease of less than 3% from the preceding year. The figures for 1914 and 1915 are \$1,423,000,000 and \$1,385,000,000, respectively. The final figures for the value of the nonmetallic products in 1915 may be somewhat increased over the preliminary figures given.

The mining activities and output reported for the 6 months just ended show that 1916 promises to be a record-breaking year in the value of mineral products.

What the Mining Companies are Doing

Federal, Idaho.

Net earnings of the Federal Mining & Smelting Co. during May totaled \$174,934, as compared with \$146,709 in April and \$292,258 in the quarter year ended March 31, making the total for the first 5 months of this year \$613,901. The company is increasing the output of the Morning mine and equipping the North Star-Triumph group, on the east fork of Wood river, near Hailey, Idaho, with a 200-ton concentrator which will enable that property to begin production on a large scale. The annual report of the Federal Co. for 1915 showed an operating profit of \$455,930 in addition to income from other sources of \$352,663, a total of \$808,602. In 1914 the operating income was only \$189,093, and in 1913 it was \$419,932. Income from other sources was \$702,463 in 1914 and \$644,134 in 1913.

Standard, British Columbia.

The net profit of the Standard Silver-Lead Mining Co. for April was \$86,773, as compared with \$136,943 in March. As the operating expenses and other disbursements were practically the same both months, \$44,535 in April and \$44,000 in March, the lessened income of the company for April was entirely due to a smaller production of silver-lead ore and concentrates.

The summary of the financial statement for April, which could not be completed because smelter settlements had not been received on two cars, and which will be mailed to the shareholders of the company with their June dividend checks is as follows:

Receipts—	
Preliminary settlements, 729 tons.....	\$ 95,115
Zinc sales	26,847
Umpires	1,052
Boarding house	4,907
Store supplies	3,387
Total receipts	\$131,309
Disbursements—	
Ore production	\$ 21,586
Tramming	953
Milling	4,790
Power	489
General expense	918
Shipping and selling	1,639
Boarding house	3,351
Taxes	3,000
Insurance, etc.	1,036
Development	3,279
Aylard tunnel	2,254
Home office account.....	1,234
Total disbursements	\$ 44,535
Financial Statement—	
Net profit for April.....	\$ 86,773
Balance April 1, 1916.....	284,163
Total	\$370,936
Dividend No. 41.....	50,000
Balance April 30, 1916.....	\$320,936
Recapitulation for April—	
Cash in banks.....	\$201,263
Ore shipped, but not settled for.....	167,921
Total	\$369,184
Vouchers and payroll.....	48,247
Balance	\$320,936

Butte & Superior.

It is estimated that earnings of the Butte & Superior Co. for the 6 months ended June 30 were approximately \$6,000,000, or better than \$20 per share. Against this there was charged \$50,000 per month for sinking the new shaft. The total cost of this work will be about \$500,000.

Realizing that the spelter market for the past year or more has been abnormal, the management of Butte & Superior has been devoting much attention to the company's possibilities under 5 or 6-ct. spelter. Under normal conditions it is believed that the company can produce 150,000,000 lbs. of spelter per annum at a cost of four cents a pound or less. On 5-ct. spelter this would produce earnings of \$5 per

share; on 6-ct. spelter \$10, there being 272,500 shares outstanding.

Butte & Superior has on its books contracts for delivery of spelter at varying prices through September. On the last buying movement the company through its own sales department sold itself quite well up to Oct. 1. In addition, it has made some sales calling for shipment through December although the company has spelter available for delivery during the last quarter of the year.

In addition to spelter which the company sells direct a substantial proportion still finds outlet through the American Metal Co., to which company Butte & Superior sells concentrates.

The company has made no important sales recently. Earnings for the full year 1916 based on business actually done to date, should run close to \$40 per share.

Calumet & Hecla Outputs.

The June and 6 months outputs of the Calumet & Hecla and subsidiary mines compare as follows (in lbs. of copper):

	June.	May	April.	6 mos., 1916.
Ahmeek	2,280,923	2,070,551	2,158,451	11,461,195
Allouez	922,584	953,069	929,960	5,137,907
Calumet & Hecla..	7,217,837	6,865,907	5,709,434	38,157,582
Centennial	216,919	221,879	257,790	1,269,697
Isle Royale.....	1,138,814	1,128,461	950,580	6,035,766
La Salle.....	69,370	123,592	95,863	632,608
Oscrota	1,571,714	1,775,222	1,783,470	9,791,439
Superior	286,124	331,432	385,034	1,758,465
Tamarack	515,331	620,314	550,374	3,446,425
White Pine.....	302,448	446,607	404,587	2,190,472
Total	14,522,064	14,522,064	14,522,064	79,881,556

Utah Copper Co., Utah.

The 6 months ended with June was the most prosperous 6 months in the history of the Utah Copper Co. Except for the last 6 months of 1915 it never produced as much copper in a similar period. At present production is running at a high point as shown by the June output of 18,000 lbs.

Utah's net earnings for the half year from its own operations must have been close to \$16,000,000, a figure never before even remotely approached. The first quarter contributed \$6,500,000 on a production of 36,564,000 lbs. of copper; the second quarter showed production of 48,500,000 lbs. and net of \$9,500,000. To this should be added \$1,250,000 received in dividends from Nevada Con., bringing final net up to \$17,250,000, or about \$16 per share on Utah's 1,625,000 shares. The inclusion of Utah's equity in Nevada Con.'s undivided earnings for the 6 months would, of course, serve further to enlarge the total.

The company's production and earnings for the first half of 1916 and 1915 compare as follows:

	1st half 1916.	1st half 1915.
Production, lbs.	85,000,000	67,100,000
Cost per lb.	7½c	7½c
Net earnings	\$16,000,000	\$5,000,000
Nevada Con. dividends.....	1,250,000	625,000
Total earnings	\$17,250,000	\$5,625,000
Per share	16	4

Wolverine, Mich.

The Wolverine Copper Mining Co. ended its fiscal year on June 30 with earnings between \$12 and \$13 a share, against which there was distributed dividends of \$11 per share.

Higher wages and advances in the price of materials forced the cost of production at Wolverine up to about 10 cts. a pound for the 12 months about to end. There was a wide margin of profit, however, as the company sold its copper well ahead at high prices and received an average of about 21 cents a pound. The year's yield should approximate 6,750,000 pounds.

Labor shortage has resulted in keeping down production during the past few months. There has also been a falling

off in copper contents of the rock. In May the recovery was but 15.82 lbs. of copper per ton of rock.

Operations in detail were as follows:

	1915-16		1914-15	
	Production, lbs.	Av. yield.	Production, lbs.	Av. yield.
Six months ending Dec. 31	3,509,337	.....	3,566,338	.....
January	460,967	16.52	608,141	19.04
February	516,607	18.07	545,108	17.37
March	577,684	18.00	613,921	19.56
April	588,032	17.91	649,960	18.60
May	495,437	15.82	630,152	18.17

Wolverine has still considerable copper left in the old workings. When the bottom of the property has been reached the old stopes will be attacked.

Tonopah Belmont, Nev.

The combined condensed statement of the Tonopah Belmont Development Co. and the Belmont Milling Co. for the quarter ended May 31, 1916, shows as follows:

Received and receivable for ore, bullion, etc.	\$ 644,475.54
Mining, milling and administration expenses	322,393.20
Net earnings for quarter	\$ 322,082.34
Miscellaneous income	5,312.01
Total net income for 3 months ended May 31, 1916	\$ 327,394.35
Available Resources—	
Due from smelters and silver stored at 50 cts. per oz.	733,502.68
Due from others	9,775.04
Loans on collateral	250,000.00
Cash in banks	509,382.76
	\$1,502,660.48

Doe Run Lead Co., Mo.

The condensed balance sheet of the Doe Run Lead Co. as of Dec. 31, 1915, follows:

Assets—	
Plant property	\$14,417,547.43
Investments	18,000.00
Cash in sinking fund	1,000.00
Working and trade assets	246,805.74
Current assets	210,444.80
Due from affiliated companies	444,890.90
Deferred assets	4,500.00
Total	\$15,343,188.87
Liabilities—	
Capital stock	\$ 6,574,900.00
Gold notes	986,000.00
Current liabilities	190,253.53
Due affiliated companies	48,558.19
Reserves	303,371.88
Surplus	7,240,105.27
Total	\$15,343,188.87

Miscellaneous Company Notes.

Kerr Lake Mining Co. produced 237,942 ozs. of silver in June.

The Iron Cap Copper Co. in May produced 172,422 lbs. of copper at a cost of 12.24 cts. per pound. Net earnings were \$28,124, exclusive of construction.

Spelter can drop to 6 cts. a pound and Butte & Superior Mining Co., the world's largest individual producer of spelter, can show earnings of between \$10 and \$12 per share. These estimates have been made by officials of the company after close study of operating statistics.

The Utah-Apex Mining Co. made a new record in May with earnings of \$162,476, which is nearly \$10,000 in excess of previous estimates. Earnings for the 5 months ended May 31 compare as follows: May, \$162,476; April, \$152,307; March, \$107,936; February, \$82,036; January, \$96,009; total, \$600,764.

The June copper production of the East Butte Copper Co. was 1,639,560 lbs., a new high monthly record, compared with 1,517,000 lbs. the previous month. Production by months thus far this year follows: January, 1,060,000 lbs.; February, 1,277,160 lbs.; March, 1,306,900 lbs.; April, 1,501,000 lbs.; May, 1,517,000 lbs.; June, 1,639,560 lbs. The June output of silver was 41,503 ozs.

Directors of Mass Con. Mining Co. have declared an initial dividend of \$1 a share, payable Aug. 15 to stockholders of record Aug. 5. This dividend will call for \$100,000, there being 100,000 shares authorized, all of which are outstanding. On Jan. 1 last the company had balance of assets amounting to \$213,361 since which time operations have shown substantial profits ranging from \$17,000 in January to \$66,000 for May, the esti-

mated profits for past 6 months being \$225,000. June profits are expected to be equally as large as for the month of May. Present production is about 450,000 lbs. refined copper monthly compared with average monthly production for 1915 calendar year of 390,000 lbs., an increase of 15%.

At the first annual meeting of the Greater Miami Copper Co. at Miami, Ariz., the following directors were elected for the coming year: Thomas Wakefield, Sr., Frank Kuren, W. H. Piggott, H. W. Adams, F. E. Pearl, N. E. Milford, Joseph Perry. The officers elected were N. E. Milford, president; Joseph Perry, vice-president; W. H. Piggott, treasurer, and H. W. Adams, secretary. A contract was let to drive in 150 ft. on the new tunnel.

The bid price for the stock of the Union Sulphur Co. last week was raised to \$11,000 per share. By two successive advances of \$1000 each the price was raised from \$9000, the highest prices ever recorded for a security in the United States. The company, which is the largest individual factor in the production of sulphur in the world, has been paying dividends at the rate of 100% monthly, or 1200% per annum. It has a small capitalization—\$400,000—of which \$200,000 is outstanding.

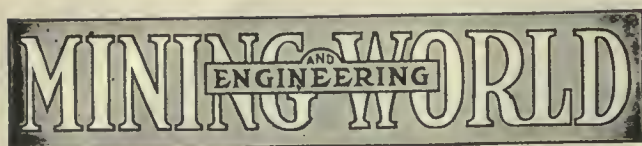
May earnings of the Eagle & Blue Bell Mining Co. were exceptionally large—\$28,000—compared with \$16,956 in previous month. Present earnings are more than double those of last year of \$143,345 and \$121,536 in 1914. The output has been sold ahead at high prices for the remainder of 1916. The company is now in a position to declare another dividend and it is probable one will be ordered within a month. In 1915 two dividends—10 cts. in August and 5 cts. in December—were paid, but no payment has been made this year.

A close estimate of the U. S. Smelting, Refining & Mining Co.'s earnings on its common stock, for the 6 months' period ending June 30, is expected to be about \$15 per share. The net earnings for May were \$1,300,000; June is expected to show net of \$1,200,000. This is expected to bring the net earnings for the second quarter in the vicinity of \$4,000,000, which, with the \$3,000,000 earned during the first quarter, will make a total for the 6 months of \$7,000,000 in round figures. The estimate for 1916 shows earnings for the first 6 months of better by \$1 than was earned on the common stock during the entire year 1915. Contrary to the general belief, less than 20% of these earnings have been derived from property in Mexico.

Ore reserves of the Granby Con. Co., B. C., at the end of the present year, it is expected, will have been increased by fully 3,000,000 tons above the 18,000,000 tons of 1.8% copper ore. From the product handled at the Anyox smelter there has been secured nearly an ounce of gold and between 20 and 30 ozs. of silver per ton. These precious metals values have been sufficient to pay the cost of the transcontinental haul of the blister copper to the Nichols refinery in New York and all eastern expenses. In brief, the only charge against the Anyox copper itself has been from mine to and through the smelter; the balance has been more than met from gold and silver receipts. In its Bonanza property Granby is understood to have a very good asset upon which, to date, only development work has been done. The Midas mine in Alaska should start shipments of ore to Anyox during the current month.

The Bingham Mines Co. earned for the months of April, May and June a trifle over \$40,000, May being high month with \$15,426. For the same quarter Eagle & Blue Bell earned about \$55,000, May also being the high month at \$27,957. Allowing for an equity in Blue Bell earnings of 75%, which is the amount of Bingham's ownership, total profits available for Bingham in the second quarter were nearly \$82,000. Although this is best showing ever made by either property, it would have been materially enhanced were it not that Eagle & Blue Bell shipments were reduced to 50 tons a day on June 15 by the American Smelting Co. A large number of bonds have recently been converted so that of the original issue there is now outstanding only \$250,000. Last year \$87,000 were purchased and since then \$250,000 have been converted. There is now \$50,000 sinking fund cash in treasury for the purpose of retiring another block of bonds.

Robert G. Jeffrey



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*Illustrated.

The Situation in Silver.

The principal factors governing the silver market of late has been the selling by China and the absence of India as a buyer. London continues to absorb all the silver offered in the market, but its stocks remain abnormally low.

The increased business of photographic goods manufacturers is responsible for an increased domestic demand, the Eastman Kodak Co. consumption totaling about 4,000,000 ozs. annually. The largest individual user is said to be the International Silver Co., whose wants total approximately 3,000,000 ozs. annually.

In his weekly discussion of silver market conditions during the past week, S. R. Wagel says:

The market during the week was dominated by other factors than the Mexican situation; as recent developments point to an amicable settlement, there is no support to the bullish attitude. Early in the week, the market advanced very slightly, but since then prices have been dropping. There is no demand in London, and the stock is comparatively heavy, the total on Thursday last being £1,300,000. There has been a slight addition to the stocks in Shanghai, because the Chinese are continuing to melt additional amounts of small coins, and adding to the stock of sycee.

The exchange markets in Shanghai and Hong Kong are very dull. The speculators are said to be fully covered for the moment. Although there is a likelihood of the additional shipment being made to Bombay, on account of the Government of India, the market has not exhibited much strength. The Bombay market was active late in the week, and fairly large amounts were sold in London. These sales have been responsible for the drop in prices.

The bank of France lost during the week, 1,649,000 francs of its silver reserve; the total of silver with the bank now amounts to 343,939,000 frs. as against 638,875,000 frs. previous to the war.

England and Zinc Smelting.

The question of zinc smelting in England is discussed in a recent issue of the London *Times*. It is a problem which the English government has shown a marked disinclination to tackle so far. The proposals recently submitted by a deputation of Australian producers are on the same general lines as those submitted to the government a year ago. They cover a proposal to erect smelting works in England to treat about 60% of the Australian output. British capitalists are quite willing to put up the works if the government will protect the new industry from German dumping after the war. Up to the present the producers have not been able to obtain any guarantees from the government on this subject because of the fiscal issues involved.

But the producers are not wedded to any particular

scheme, so long as the one adopted ensures the Empire's independence of foreign sources of spelter supply in the future. In view of the political issues involved, they would be quite prepared, if the government desires not to raise controversial fiscal questions in wartime, to entertain a proposal that the State shall erect works of its own and make a contract for the supply of concentrates with the producers over a period of years. Nearly two years have elapsed since this question was first raised, and a great deal of public money has been wasted on buying spelter at very high prices owing to the government's procrastination. It must decide the matter sooner or later, and it would be sheer folly to delay action any longer. Zinc smelting is a very technical subject, and therefore, if the best results are to be obtained, the necessary works should be erected at once, in order that German competition after the war may be satisfactorily dealt with.

A New Method of Mine Flotation.

A new method of flotation has evidently been discovered, but of a destructive rather than a constructive nature as are pneumatic and oil flotation. This was noted in the prospectus of a recently formed company in Canada, the Rognon Gold Mines, Ltd. The company is capitalized at \$2,500,000, at \$1. The promoters and vendors of the property have received 2,000,000 shares. Of the 500,000 shares of treasury stock left 100,000 are now being offered the public at par \$1, or in other words \$100,000 is going to be used for development. A company formed in May, 1916, is handling the stock of this company.

The promoters have realized that offering the public only \$1 for every \$20 they receive is not much of a drawing card. The public should be satisfied with the percentage of the profits which they receive (and which the promoters consider fabulously large); but the promoters are kind to their investors so give the investors in their stock a guarantee. They will refund their money to them at the end of 15 years, if it is not paid in dividends. This will probably be done by selling the public another 100,000 shares of the promoters' 2,000,000 shares or else the 100,000 shares will simply be deposited with the trust company as security.

In short the promoters will be out nothing but a big bluff on their guarantee. Of course the trust company may fail at any time and not be able to pay its guarantees, but that is not brought to the mind of the investor. What relation exists between the mining company, the trust company, the security company, promoters, vendors and other probable companies recently formed for benefit therein, is something considered as absolutely unnecessary for the public to know of. At least he would probably have a good time trying to break this flotation bubble and see what was inside.

Laboratory and Practice.

Experimental work carried on under the usual laboratory conditions has frequently proved an unreliable guide as to the commercial possibilities of a process. In the treatment of ores laboratory experiments are important but the results obtained from them should be corroborated by tests on a commercial scale and under the same conditions as to the details of treatment as will be met with in practice.

In commercial operations, the object sought is profit. If the process selected to treat an ore can not be operated profitably then that process is a commercial failure, no matter how successful it may be from a purely scientific point of view. Practical details affecting the cost of operation are at least of equal and sometimes greater importance than the percentage of extraction attained. In small-scale laboratory tests, not only is the item of cost on a commercial scale difficult to estimate accurately, but extraction results also are very apt not to accord with those obtained when operations are carried on under commercial conditions. It is essential, therefore, that a balance be struck between cost of operation and efficiency of operation so that the greatest possible profit may be realized. Laboratory tests and investigations may lead to the development of methods of greater efficiency, but cost of operation can usually be most accurately checked only by commercial-scale operations.

The most efficient work in the cause of safety must be done by methods which will constantly keep before the mind of every employe that upon him rests an individual and personal responsibility. It is felt that efficiency in safety can only be attained by education and constant agitation of the subject and the hearty co-operation of the employe with the management. This fact implies that the management should show its willingness to do its part in the installation of guards and appliances.

Let us be thankful that we are optimists, that we are working for the interests of the world's most unquenchable optimists—the American metal miners and prospectors. Their courage never fails them, they are undaunted by a bad run of luck. They know that night is always followed by dawn. They cheer themselves and all who come in contact with them.

The weakness in copper prices last week led to a larger demand and much more cheerful sentiment among the producers. Contracts for fairly large tonnage for last quarter delivery were closed last week at 23 cts. These sales were made by the smaller producers.

A copy of the index to Volume 44, covering the first half of 1916, has been sent to all subscribers regularly receiving it. It will be sent to all other subscribers desiring it.

PERSONAL.

Chas. Butters, Oakland, Cal., was in Tonopah, Nev., last week.

Charles H. Moyer has been re-elected president of the Western Federation of Miners.

F. J. Fohs, consulting oil geologist, has opened offices in the Gallais building, Tulsa, Okla.

Maurice W. Bacon, Spokane, Wash., president of the Hudson Bay Zinc Co., is in Salmo, B. C.

James Davis has been appointed superintendent of the Calaveras Con. Mining Co., Melones, Cal.

G. A. Gordon, superintendent of the Standard Silver-Lead Co.'s mill, is in Winnipeg, Manitoba.

Charles Knox, president of the Montana Tonopah Mining Co., Tonopah, Nev., is in Oatman, Ariz.

Waldemar Lindgren is on professional work in the western states and will return to Boston about Sept. 1.

Ernest Clifford Wood, civil and mining engineer, has reopened his office at 401 Empire State building, Spokane, Wash.

J. W. Brown is now secretary-treasurer of the Isabella Mines Co., Victor, Colo. He succeeded D. W. Thatcher.

Robert W. Wooley, director of the mint, has resigned to assume charge of President Wilson's publicity campaign committee.

Fred S. Porter is with the Canadian Klondike Mining Co., Dawson, Alaska. He was formerly located at Treadwell, Alaska.

Frank L. Sizer, mining engineer, San Francisco, Cal., has been in Kingman, Ariz., relative to inspecting some property in the Chloride district, Arizona.

F. W. Bradley, San Francisco, Cal., president of the Bunker Hill & Sullivan Co., has been inspecting the company's property and new smelter at Kellogg, Idaho.

Newton W. Emmens, northwestern representative of the Kusla Spelter Co., with zinc plants in Oklahoma and Pennsylvania, is making his headquarters in Spokane.

E. W. Klumph, mining engineer, recently graduated from the Michigan College of Mines, Houghton, Mich., is now in Butte, Mont. He is accompanied by I. T. Field.

J. R. Nicholson and E. N. Vanderlip, Globe, Ariz., have gone to Anchorage, Alaska. They will spend about a year prospecting in the Broad Pass district on Indian river and other areas.

Frank Watson, a former operator at Rossland, B. C., and more recently interested in developing the coal fields of Alaska, has removed his headquarters from Seattle, Wash., and is now in Rossland again.

Dr. A. N. Talbot, professor of Municipal and Sanitary Engineering, in charge of Theoretical and Applied Mechanics at the University of Illinois, who last year was honored by the University of Pennsylvania with the degree of Doctor of Science, has this year been made the recipient of the degree of Doctor of Engineering by the University of Michigan.

Walter Douglas, general manager of Phelps, Dodge & Co., has been made vice-president and will have offices in New York. S. W. French, former general manager of the Copper Queen, will succeed him and the offices will be moved from Bisbee, Ariz., to Douglas, Ariz. G. H. Dowell has been made general manager of the Copper Queen and A. V. Dye will be assistant general manager for Phelps, Dodge & Co.

OBITUARY.

John Francis Campion, vice-president of the Denver National Bank, Denver, and director of the Carbonate National Bank, Leadville, Colo., passed away on July 17, 1916, at Denver, Colo. He was born on Prince Edward Island, Dec. 17, 1849. In 1862 he went with his parents to Sacramento, Cal., and later joined the Union forces in the Civil war. After the war he returned to California and was interested in the White Pine mine in California. He lost there and went to Eureka, Nev., where he reclaimed his losses and then purchased the Pioche-Phoenix mine, Pioche, Nev. In 1879 he went with the rush to Leadville, Colo. The Elk and Lucy B. Hussey mines were among the first he located and developed in the district. The Ibex Mining Co. was formed by Mr. Campion, associated with A. V. Hunter, G. W. Trimble, Eben Smith and Charles Cavender. The present Little Jonny shaft was sunk and in 1893 the company began producing under the general management of Mr. Campion. He was general manager of the company at the time of his death and did much in financing many enterprises aside from mining in Colorado.

Charles William Henry Kirchhoff died in New York City July 20 at the age of 64 years. He was editor-in-chief of the *Iron Age* from 1889 until 1910. He was connected with the publication for 29 years and was prominent for years in the mining industry, being at one time president of the American Institute of Mining Engineers. Mr. Kirchhoff was born in San Francisco, Cal., and was graduated from the Royal School of Mines in Clausthal, Germany, in 1874. For the next 3 years he was chemist of the Delaware Lead Refinery in Philadelphia, and then joined the staff of *Metallurgical Review* as assistant editor. In 1878 he joined the *Iron Age*, with which he remained until 1881, when he became managing editor of the *Engineering and Mining Journal*. Three years later Mr. Kirchhoff returned to the *Iron Age*, being successively associate editor and editor-in-chief. Mr. Kirchhoff was the special agent of the U. S. Geological Survey for the collection of statistics of the production of lead, copper and zinc during 1883-1906. He was a member of the American Iron and Steel Institute of Great Britain, the American Society of Mechanical Engineers, the Verein Deutschen Eisenhuettenleute, and an honorary member of the Franklin Institute of Philadelphia.

SCHOOLS AND SOCIETIES.

American Association of Engineers.—The National Board of Directors of the American Association of Engineers has adopted a resolution as follows: "Resolved, That all applications for membership received prior to Sept. 1, 1916, be accepted (provided the applicant has the required qualifications) at the present rate of no initiation fee and \$10 per annum membership dues." According to an amendment of the Constitution adopted at the May convention an initiation fee of \$2 shall be charged after 1000 applications have been received. It is estimated that this number will be reached before Sept. 1, 1916, but it was agreed to offer all engineers an equal opportunity to join at the present rate until then. The initiation fee will be increased \$2 for each additional 500 members secured after 1000. The qualification committee of the association has under advisement a revision of the qualification record which will restrict certified membership to a greater degree than heretofore. The association has grown from 30 members to 891 in 14 months by active, aggressive effort in promoting the welfare of engineers and engineering along commercial lines.

American Electrochemical Society.—The fall meeting of the Society will be held in New York city on Sept. 28, 29 and 30, 1916, of the week of the Second National Exposition

of Chemical Industries. The outline of the program is as follows:

Wednesday, Sept. 27, evening: General reception, with registration, at the Chemical Exposition, Grand Central Palace.

Thursday, Sept. 28, forenoon: Reading and discussion of papers. General subject: "Made in America."

Afternoon: Visiting the exposition.

Evening: Complimentary smoker. An invitation will be extended to the members of the American Chemical Society and other visiting chemists and engineers.

Friday, Sept. 29, forenoon: Reading and discussion of papers.

Afternoon: Visiting the exposition.

Evening: Subscription dinner-dance.

Saturday, Sept. 30, forenoon: Reading and discussion of papers; possibly an excursion.

Afternoon: Visiting the exposition.

The arrangements for the New York meeting are in the hands of the New York Section of which Dr. Colin G. Fink is chairman and J. Malcolm Muir, 239 West Thirty-ninth street, New York, is secretary.

NEW PUBLICATIONS.

Spirit Leveling in West Virginia. By R. B. Marshall. Washington, D. C., U. S. Geological Survey. Bulletin 632; pp. 168. For sale by Mining World Co., 20 cts.

Includes a description of all bench marks and lines run since 1896. The altitude of each bench mark is given.

Talc and Soapstone in 1915. By J. S. Diller. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 11:9; pp. 4.

Prices, production, imports and general conditions are reviewed by states and countries.

New Jersey Department of Conservation and Development, Annual Report for 1915. Trenton, N. J., New Jersey Dept of Conservation and Development. Annual Report, 1915; pp. 77; illustrated.

Separate reports are given by the state geologist, forester and fire-warden.

Abrasive Materials in 1915. By Frank J. Katz. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 11:10; pp. 6.

The customary annual review of the production and market conditions during the year. Each abrasive material is considered separately.

Graphite in 1915. By Edson S. Bastin. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 11:11; pp. 13.

The production and conditions of the market are reviewed in general for the United States and also by states, with information on the world's production and imports.

Triangulation in California, 1913-1915. By R. B. Marshall. Washington, D. C., U. S. Geological Survey. Bulletin 644-C; pp. 60; illustrated.

The work is taken up by counties and the location of each triangulation station is described. In tabulated form the azimuth of each station is given with respect to other stations, as also is the distance from one station to another.

Potash Salts, 1915. By W. C. Phalen and W. B. Hicks. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 11:12; pp. 39.

Potash until the past year has been produced to practically no extent in this country. The import of this material is reviewed. For the greater part information is given on the nature of substances, including minerals, from which potash may be obtained. The occurrence of deposits of such materials is also gone into with possible methods which might be used for extracting the potash. Chemical methods for the

qualitative and quantitative analysis of potash are given in a practical manner

Microscopical Determination of the Opaque Minerals. By Joseph Murdoch. John Wiley & Sons, New York. Book; pp. 165; illustrated. For sale by Mining World Co.

A more minute investigation of substances is often necessary than can be attained with the eye, chemistry or small lens. The transparent minerals may be studied by use of polarized light and the microscope; petrography; the metals by reflected light, metallography and this third branch of studying opaque minerals is now being recognized as of importance, and the study called mineralography, in which reflected light is of necessity used with the microscope. Methods of procedure in using the microscope are first given, with the proper methods for preparing the specimen to be examined. The system of classification is then gone into and the phenomena exhibited under the microscope described. These phenomena or peculiarities are of both a micro-physical and micro-chemical nature.

Coal Miners' Pocketbook. McGraw-Hill Book Co., New York. Book; pp. 1172; illustrated. For sale by Mining World Co. \$4.

The book was formerly known as the Coal and Metal Miners' Pocketbook and consists of the usual contents of a handbook, namely, principles, rules, formulas and tables. The aforementioned information is treated under separate headings as Weights and Measures; Mathematics; Surveying; Mechanics; Strength of Materials; Concrete; Masonry; Wire Rope; Power Transmission; Specific Gravity; Weight and Other Properties of Materials; Hydrostatics; Hydraulics; Heat and Fuels; Boilers, Steam Engines; Compressed Air; Electricity; Internal Combustion Engines; Prospecting; Mining; Explosives, Supporting Excavations; Hoisting; Haulage; Ventilation; Mine Fires; Preparation of Coal; Safety and First Aid; Trigonometric and Surveying Tables and a Glossary of Mining Terms.

Making Money Make Money. By H. L. Barber. A. J. Munson & Co., Chicago. Book; pp. 315. For sale by Mining World Co. \$1.50.

A duplicate title of the book might justly be given as A Primer of Investing. It has been the intent of the author to show the wage-earning class how to invest their capital to bring more than merely a small interest amount. There are 20 separate discussions, or discourses, as they are termed. The general idea in each has been to put facts in front of the reader which will make him see the folly of putting his savings out on a loan bringing in a small amount as interest and at the same time permit the borrower to reap a much larger percentage as profit from the loan. He advocates the investment of savings in an enterprise to reap the benefit not only of the interest you obtain, but also of the profits which the borrower formerly received from the fruits of your savings and labor. In other words he advises one to invest and make your money make money and not merely interest. He further points out how this policy may be started with small sums.

PATENTS RELATING TO MINING.

Electric Furnace. Peter Eyermann, Witkowitz, Austria-Hungary. (1,189,356; filed Dec. 5, 1912.)

Process of Treating Metalliferous Materials for Roasting, Reducing, Sintering, and Like Processes. Friedrich Carl Wilhelm Timm, Hamburg, Germany. (1,189,313; filed Oct. 30, 1913.)

Titaniferous Products and Method of Producing the Same. Louis E. Barton, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Co., New York, N. Y. (1,189,229; filed Sept. 11, 1914.)

Apparatus for the Separation of the Sand and Water Raised in Dredging Gravel. Leon Désiré Drouard and Paul Armand Drouard, Rouen, France. (1,190,224; filed April 1, 1912; renewed Feb. 11, 1916.)

Progress Made in the Manufacturing Industries

Poppet Valve Engines.

Bulletin No. 28, recently published by the Nordberg Mfg. Co., covers a line of poppet valve engines which includes three types, namely, full poppet, poppet-uniflow and poppet-corriss. It is pointed out that the engine best suited for the purpose is recommended in each case. For ordinary non-condensing service, the high-speed full poppet valve engine shows the highest efficiency. For condensing service two types of engines are offered—Nordberg poppet-uniflow and Nordberg poppet-corriss, the former being an engine with uniflow cylinder design, that is, exhaust ports in the cylinder barrel and poppet steam valves, and the latter a compound engine with a full poppet high pressure cylinder and a corriss valve low-pressure cylinder. The poppet-uniflow engine is particularly adapted to widely fluctuating loads on account of its flat steam consumption characteristic. Recently two of the largest uniflow engines so far constructed in this country have been shipped to the Youngstown Sheet & Tube Co., for steel mill drive. The poppet-corriss engine is adapted to constant load or constant m.e.p. work, under which conditions it shows very high steam economy. A compound engine of this type, fitted to an ammonia compressor showed by test a steam consumption of less than 10 lbs. per indicated horsepower hour.

The bulletin is well illustrated, showing many installations of engines, and also pictures of details of construction of the valves, valve operating gear, removable cages, cylinders and head. Particular attention is drawn to the construction of the latter, which contains all cored passages and ports, the cylinder proper being a simple cylindrical casting which is free to expand and contract with temperature changes.

Following the discussion of the different types of engines and their construction, a number of pages are devoted to test results. This is followed by a short discussion of the application of poppet valve engines to compressors, pumps and ice machines. The remaining part of the bulletin is devoted to the illustration and description of the frame, bearings, rods, cranks and receiver. Copies of this bulletin are being distributed on request.

Hauling Borax in Death Valley, California.

The 20-mule teams, with their picturesque drivers and long, snake-like 50-ft. cracker whips, that have made Death Valley and the mines of the Pacific Coast Borax Co. in California famous for more than a quarter of a century, and around which romance and tragedy has been weaved by the versatile publicity agent, are giving away to the more prosaic haulage system of modernity.

Within the past year chugging gasoline industrial locomotives, with their trains of from 10 to 15 loaded cars, wind their way up and around Black mountains and over Death Valley and the dry bed of Salt lake and the famous mule teams are passing into history. This change has been brought about by the cost data expert, who with his charts and figures and the experiences of others behind him, decreed that while the 20 mules were picturesque and afforded the publicity agent good material for literary essays, they proved too expensive in the production of borax.

The gasoline industrial locomotive, he said, would not only cut down the haulage costs about one-half, but speed up the mines and cut down manufacturing and mining costs. His promise has proven true since the installation of the first two Plymouth gasoline locomotives more than a year ago, according to Supt. R. W. Sheean of the Pacific Coast Borax Co., and the change was more than warranted by the results achieved.

The full story of this interesting experience, as well as that of other mine owners in different fields, is contained in a 96-page book, "Cutting Haulage Costs in Half," issued by the J. D. Fate Co., 211 Riggs avenue, Plymouth, O., and which was printed for free distribution. Copies of this book may be had by addressing this concern, and should prove

profitable to any mine operator, because of the compilation of cost data and other information.

TRADE PUBLICATIONS.

Products de la Ingersoll-Rand. Ingersoll-Rand Co., New York. Catalog; Form No. 92075; pp. 123; illustrated.

This is an edition in Spanish in which the products of the Ingersoll-Rand Co. are summarized. Different types of pumps, rock drills, air compressors and allied equipment are covered. In as many cases as possible a small illustration is given with a brief description and specific data in tabulated form for most of the equipment.

Roller Bearings. George Automatic Roller Bearing Co., Cincinnati, Ohio. Booklet; illustrated.

Besides illustrating and describing the construction of the bearing, views are given showing the method of taking the bearing apart for cleaning and inspection. Different types of mountings are reviewed and illustrated. It is stated that one of the special features of this bearing is the use of a tapered bearing with balls at either end, thus automatically adjusting variations in the actual diameter of the rollers.

Oil Engines and Pumps. National Transit Pump & Machine Co., Oil City, Pa. Three folders; illustrated.

The first folder is relative to a line of pumps which the company now has in stock. The different types are listed and under each tabulation details are given of the sizes, etc., of pumps of different capacities. Engines for use with the same are also listed therewith. The other two folders illustrate and describe a line of engines using oil or gas for fuel. The operation of all are described in general and briefs are given on the practical use of each separately. Brief statements are also given regarding the cost of operation of the same.

Dry Concentrators. Sutton, Steele & Steele Mfg., Mining & Milling Co., Denver, Colo. Catalog; pp. 16; illustrated.

Concentrating tables, screenless sizers, deduster and dielectric separator are the equipment described. This class of machinery is of most importance, it is stated, where the water supply is costly. In the operation of this class of equipment air under a low pressure is used in place of water, the design of the equipment, of course, being in general like that of the water concentrating tables and classifiers. The machines and superior points of dry concentration are described and compared with water concentration plants. Some specific data is given and a flow sheet of a Sutton, Steele & Steele dry concentrating plant is shown on the last page.

INDUSTRIAL AND TRADE NOTES.

An interesting evidence of Detroit's increased importance as a center of steel consumption comes the announcement that Joseph T. Ryerson & Son have prepared the way for Detroit warehouse development by purchase of a suitable industrial site. The property consists of about 3 acres in the Milwaukee junction district and is one of the few remaining vacant sites having the double facilities of both Grand Trunk and Michigan Central direct trackage.

Taylor Foundry & Engineering Co., Grass Valley, Cal., recently built a 75-hp. Taylor electric hoist for the Sixteen-to-One mine, at Alleghany, Cal. It is equipped with herringbone gears, and will be operated by direct connection to a motor by flexible coupling. This company also sold one of its 22-hp. hoists to the Orleans mine, Grass Valley; and a 300-gal. triplex electric pump to the Enterprise Mines Co., for its Pennsylvania mine; also, a similar pump for Polar Star mine in Grass Valley district.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Tolovona.

According to Dan McCarthy, conditions in the new camp are better than ever and if operators could get plants on their ground the output would be surprising. In a number of places pay has been found, but operators cannot haul machinery over the trail. It will take a greater part of the good season to get it in by river. Operators are taking out pay from 2 below Livengood creek to 20 above. And about the richest ground yet discovered is that of Cub Bear and Henry Crook at the lower end of the camp. Several of the operators on Livengood who have recently struck pay are making arrangements to get plants to their property.

Fairbanks.

At the head of Dome creek a tungsten find has been made and traced over to Cleary creek, near here. George White, mining engineer in charge of the Eagle antimony mine, is reported to have investigated the find and reported it promising. The strike is supposed to have been made by Missou and Rice. Quite a stampede has been in progress to the district.

The Eagle mine produced about 1000 tons in 1915, and up to the present time has produced another 1000 tons. There is a good-sized crew of men at work and these will be added to soon. What the mine will produce during the summer is not known, but it probably will be at least 2000 tons.

J. Leach and D. Thorsón have purchased the interests of Pete Malone in 13 below, Cleary creek. The consideration for the deal is rumored at \$25,000 cash. Several years ago the property belonged to the estate of Mark Sullivan. The property was not considered good and was sold by the administrator to Malone for \$8000, with the understanding that it should be paid out of the ground. Malone has worked the ground and taken out a substantial sum. Last summer he struck very good pay.

Katalla.

A recently formed company, the St. Elias Oil Co., has purchased the property of the Alaska Oil & Refining Co. Falcon Joslyn, one of the principal interests in the company, says: "There are two routes feasible, both about the same distance, which would enable us to ship our coal, oil and lumber into the interior, where the mines and development work demand such materials. The first thing we will do is to try to get patents for more of our claims and at the same time increase the output of the refinery. We are pumping 4 wells at present, but within the month will have 9 wells. We will put in tanks at Katalla to facilitate the immediate shipment. The improvements consist of 9 wells, most of which are down at least 2000 ft.; a complete refinery, which has been in operation for 5 years; several tanks and well equipped camps on different portions of the property, together with tools and drilling equipment. The property was first taken up in 1903 by the English Co., who put down 5 wells very secretly and capped each one after reaching a certain depth. Work was discontinued. Several years passed, during which time there were internal troubles in the company, one part of which seemed trying to depreciate the value of the property, presumably to get control of it—then A. F. Gwin, taking advantage of this, secured the holdings of the Amalgamated Development Co., Vancouver, B. C. The Alaska Oil & Refining Co. succeeded, and through mismanagement went into hands of a receiver in 1913.

ARIZONA.

Oatman.

The Tom Reed Mining Co. has resumed operation of its entire battery of 20 stamps for the first time in several months. But 10 stamps have been in use during 1916 up to this time. Ore has been opened on the new 1400 level of the main workings, and the 600 level of the Black Eagle workings is showing a large tonnage of pay ore.

The Gold Road mine of the U. S. Smelting & Refining Co. continues its usual output, which is estimated at about \$75,000 per month. The mill is also handling 30 tons per day from the Gold Ore mine nearby, and it is reported that the average recovery is \$20. The Gold Ore is continually looking better according to reports of those familiar with the property, and is developing into a splendid property. A 30-ton mill is being planned by the company.

The United Eastern continues to block out ore, and at the same time its new main working shaft is being steadily driven downward. It is estimated that the shaft will be completed to the 600 point by the time the new mill is ready for operation. It is expected to start the mill by the first of November.

The Pioneer mine, handled by Keith & Keith of Boston, is the scene of an extensive development campaign, and the operators claim they now have more than \$1,000,000 worth of pay ore blocked out, with the workings but 400 ft. in depth. A mill is now projected to handle Pioneer ore and ore from the Arizona Tom Reed, adjoining, if ore should be developed. E. R. Hibbard of Chicago is reported to have purchased an interest in the Arizona Tom Reed which calls for the payment of \$25,000 into the treasury.

The Big Jim continues to show improvement as drifting to both east and west is continued on the 400 and 485 levels. Some 200 ft. of drifting on the 400 level is said to show average values of about \$40 for the full width of the drifts; while a smaller amount of drifting on the 485 level shows pay ore but not so high in value. The vein is more than 30 ft. in width on both these levels.

Officials of the Sunnyside state that work of refinancing the company has been successfully completed and that operations will be resumed within a short time.

Lucky Boy officials state that they expect to resume operations within 2 or 3 weeks. They believe that they were but a short distance from ore when work was discontinued to allow their plant to be overhauled. Crosscutting will be started on the 350 level as the first work.

Gilt Edge has resumed operations and is continuing its shaft downward from the 300 point. The heavy flow of water which caused suspension of work is now being taken care of by a new sinking pump. Notwithstanding reports which had been circulated to the effect that the company was in financial difficulties, the officials state that both cash and stock reserves are in good condition.

The Gold Dust Co. is planning to make alterations in the equipment of the old Orion mill, and start operating it on ores which are being developed on its 2d and 5th levels. It is stated that a large tonnage of medium-grade ore is being developed.

The Boundary Cone has at last encountered its expected ore shoot in the west drift on the 750 level. The width and extent of the ore body is not known as yet, but the operators say that it is better than the ore on the 550 level at the same distance away from the main crosscut from the shaft. It is

said that the east drift on the 750 level is also getting into ore. On the 550 level fine milling ore was opened in drifts both to east and west, and then the shaft was carried to 750-ft. depth before lateral work was resumed. Conditions now existing are very satisfactory.

On the 500 level of the Fessenden drifting has been started on a 3-ft. feeder vein which was penetrated by the south crosscut. The vein is quartz, showing high mineralization and fair pan values in gold. The operators expect to drift on it to its junction with the main vein.

The Sun Dial is steadily sinking, with its shaft now down about 150 ft.

Oatman United is steadily sinking, and Engineer J. K. Turner reports satisfactory progress and encouraging formation.

The shaft of the United Northern is now down 370 ft., and will be continued to 500 before lateral work is started.

North Star has started crosscutting on the 400 level and is reported to have cut several quartz stringers showing high values.

Gold Road Bonanza has its shaft down 300 ft. and will sink to the 500 ft. Arrangements are being made with the Gold Road Co., adjoining, whereby the Bonanza will be given permission to drive a crosscut into its ground from one of the deeper workings of the Gold Road mine, for exploration purposes.

Prescott.

During the last few days, several important deals and much unusual development has taken place in the mines of Yavapai county. Probably the most important deal, to Prescott was the transfer of 50 claims on Copper creek, owned by C. J. McNulty and Mike McBride, to the Daly-Crawford-Lewisohn syndicate. The 50 claims are believed by mining men to be in a region which is a continuation of the rich Copper Basin field. Approximately \$300,000 is involved in the deal, to be made in payments as development progresses.

D. R. Finlayson, former superintendent of the Copper Chief mill, has taken charge of the Green Monster property, and is pushing development. While commercial ore has not as yet been struck, officials of the company say the development has been all that could be expected and that they look for important determinations to be made in the near future. A. P. Thompson, geologist, is assembling geological data on the various outcrops and contacts. Road building will be commenced at once. By the time the machinery, which has been ordered, arrives, the foundations and buildings will be ready for installation. The site for the camp on the property is ideal, both from a standpoint of sanitation and comfort. The buildings will all be permanent and completely protected; will be completed and ready for occupancy as soon as the machinery arrives.

The old Sunnyside group of gold mines, 11 miles south-east of Prescott, has been taken over under option by H. A. Groom, of Phoenix, who plans to begin operating soon. This group was discovered in the early 80's by Enoch Williams and a considerable amount of ore taken out and treated by an arastra. Williams also did placer work in the gulches leading to the vein of the group. A tunnel, 383 ft. long, is already on the property, extending about 40 ft. below the surface at a depth where the sulphide zone begins. The Sunnyside vein is traceable on the surface for about a mile, and Groom is confident that it extends to great depth.

Announcement has been made by Supt. William Ellingford, of the Gold Blossom Mining Co., of the striking of a high-grade lead-silver ore body at a depth of 185 ft. Sinking will be continued until the 200 level is reached, when drifting will begin. The property is situated 6 miles south of Prescott and was originally patented for farming purposes.

One of the biggest strikes in the history of the Walker district was made this week on the old Homestead mine, recently acquired by J. J. Shockley and associates, of New York. A 3 ft. gold ore body was encountered, carrying a good milling grade in the loose formation. The strike was made at a depth of 75 ft. in the main shaft. The Homestead lies in the center of the Walker and was first operated in the 60's by J. J. Milliken, when its free product was treated by an arastra. The old mine was abandoned when base ores

came in and until its recent re-opening, the property had lain idle for almost a third of a century. The strike in the Homestead has encouraged many other operators in the Walker and adjacent districts.

Extensive exploration and development is being planned on the New State property in the Hassayampa district, following a strike made several weeks ago. The Elk holdings are to be worked at once. A force of men is now employed in cleaning out and retimbering the old 525-ft. tunnel.

Jerome.

The Jerome-Victor Extension shaft at Jerome is to be sunk about 500 ft. below the present level, 1200 ft., work to start within a few weeks. The 700 station has been reached in unwatering the property, formerly known as the Haynes property, and as there is no lateral work below this level, the unwatering will from now on proceed rapidly. After sinking is started, it is expected that the shaft will be put down at the rate of 100 ft. per month. Only 120 ft. of cross-cutting and drifting was done on the 1200 level and it is believed that prospecting of the lower levels on the mine will disclose new leads that will change the plan of operation.

The main shaft of the Pittsburg-Jerome mine has been sunk 195 ft. below the 500 level, and considerable copper is showing on the face of the ledge, with a soft formation in the bottom of the shaft. Indications of water encountered on drifting in the south crosscut have led to the construction of a dam across a drift run from the 500 level at a point 160 ft. north of the shaft. The road to the property is being built by a force of 75 men. An extra crew has been put at work at the mine. The new road, although longer than the old one, will have a much less grade and will make the hauling of ore and supplies an easy task.

CALIFORNIA.

Grass Valley.

Close to 400 tons of ore per day is hoisted from the central shaft of the North Star mines. The ore, after being dumped, passes over grizzlies, the undersize, amounting to over 200 tons, passes direct into the mill bins; the oversize, amounting to 170 tons per day, passes through mechanical feeders to two sorting tables, where 6 men and a foreman, working one 8-hour shift, pick out 70 tons of waste, consisting of diabase and granodiorite. The picking tables are given a longitudinal shaking motion, by which the ore is moved forward and fed to a jaw crusher by which it is reduced to a size required for the stamp mill. By this arrangement the sorters handle an average of 11½ tons of waste per man in 8 hours.

Weimar.

New York capitalists have taken under bond and option the Big John gold mine, 8 miles east of Weimar, and also bonded the holdings of J. D. Nelson and Joe Snyder. It is stated work will commence within 30 days. The Big John has produced some rich ore and is stated to contain much profitable quartz.

Alleghany.

The Morning Glory Gold Mines Co., whose affairs are managed by A. A. Codd, is building a 5-stamp mill. Amalgamating plates and a table will serve to recover the gold.

A 75-h.p. electric hoist has been purchased by the Sixteen-to-One Mining Co. and it is probable a stamp-mill will be acquired within the next few months. An excellent tonnage of milling ore has been exposed in the lower workings, with occasional seams of specimen quartz found.

The Croesus Mining Co., of Chicago, is adding 5 stamps to its 15-stamp mill at the Plumbago mine, increasing its capacity to 70 tons daily. The main ore body has been opened at widely divergent points and shows quartz of uniformly good grade. W. E. Pearson is manager.

Recent work in the Twenty-One, adjoining the Tightner, has been of such a satisfactory character that the management is arranging to install a 50-ton Hendy mill, which will operate in conjunction with the Lane mill now in commission. The Morning Glory is to be equipped with a compres-

sor, hoist and 5-stamp mill. Much good ore has been recently opened in virgin territory.

Arrangements have been made for installation of a compressor at the Louise Con., and an Allis-Chalmers ball mill is being placed in position at the Irelan. Other companies are planning improvements to their plants. Completion of the new mills will increase the output of this district to from 350 to 400 tons per day.

Jackson.

The Argonaut Co. has completed its impounding dam for restraint of mill tailings and will divert them into the basin in the early fall. The dam is approximately 500 ft. long and 40 ft. high. Construction of the new 40-stamp mill is making good progress. The rock crusher is in place and considerable machinery for the main plant has been installed. Ore of splendid grade is coming from below the 3800 level for reduction in the old 40-stamp plant.

The Kennedy Mining Co. has arranged to increase the height of its restraining dam from the present 40 ft. to 60 ft. Shaft sinking is proceeding rapidly and ore of excellent grade is being drawn from the 3700-ft. workings. As soon as the 3900-ft. point has been gained extensive lateral workings will be driven from this level. The company is paying good quarterly dividends.

Nevada City.

The Delhi mine, in the Columbia Hill section, has been taken under bond by Colorado capitalists. Unwatering has commenced and it is expected to start mine examination within a few weeks. The Delhi has been idle about 10 years, but formerly produced well. W. D. Griffiths is in charge of operations.

The Columbia Con. Mining Co., with headquarters at Nevada City, has arranged for the building of a 20-stamp mill at its Ocean Star mine in the Ormonde district. A 200-h.p. electric generator has been installed and will deliver power to the Ocean Star and Columbia properties. A ball mill and mine machinery are also to be installed at the Ocean Star. At the Columbia 10 stamps are falling on good ore. The company has augmented its holdings by the purchase of upward of 100 acres of patented ground. E. C. Klinker is manager.

Amador City.

The new mill at the Treasure mine is making a high-gold extraction, according to late advices from the property. Hardinge ball mills are employed in place of stamps, with the resultant product treated on Willsley concentrators, Deister-Overstrom tables and Frue vanners. The ore shoot in the new shaft has widened into a strong vein.

Independence.

The Reward group of gold mines, including the noted old Eclipse, has been acquired by English capitalists for a reputed cash price of \$50,000. The property is a large, low-grade, gold proposition and was operated over 60 years ago. The Eclipse is credited with an output in excess of \$3,000,000 and was equipped in 1853 with a stamp mill, shipped from England. It is stated the new owners will install a large flotation plant. The main ore body assays around \$8. The syndicate is represented locally by A. Burnett and J. A. Summers.

The Keane Wonder mine in Death Valley is to be extensively operated, according to present plans. The company will be reorganized and endeavors made to open a large tonnage of ore below the present workings. The cyanide plant is operating at present on tailings. The Keane Wonder is owned by the Frances McHawk Co. of Goldfield. F. N. Fletcher, of Reno, Nev., is manager.

Slatington.

The Sierra Slate Corporation of New York has acquired the Eureka slate quarry and has started work. It is stated 50 men will be employed within a few weeks and from 1000 to 3000 squares of slate will be sent to eastern points. The slate is of splendid quality, particularly for roofing purposes.

Nashville.

Developments on the 500 and 600 levels of the Montezuma mine are disclosing wide bodies of milling ore, in places over 40 ft. wide. Assays range from \$5 to \$30. Sinking of the shaft to the 1000-ft. point has been completed and

drifts and crosscuts have been started to pick up and develop the main ledge. The Montezuma is being worked under bond and option by the Wingfield interests of Nevada and eastern people headed by W. J. Loring. The same people hold a bond on the Havilla, an adjoining property, and will probably work it through the Montezuma shaft.

Portola.

The 100-ton flotation unit at the Walker copper mine is operating on excellent ore and shipment of concentrates will start within 20 days; 150 men are on the payroll and a large amount of new underground work is proceeding. Motor trucks are operated between the mine and Portola delivering supplies, etc.

COLORADO.

Cripple Creek.

The Rex Mining & Milling Co. has put the Ironclad mill again in commission, Thomas Kavanaugh, manager of the plant, having set the machinery in motion on July 18. The plant has a capacity of 100 tons daily. This tonnage will be mined from the open cut on the Magna Charta property adjacent to the mill. Kavanaugh has miners prospecting by adit tunnel driven into the Newton Hill spur of Ironclad, on the Annex lode. The dirt from this tunnel pans freely.

Margie M. Gold Mining Co., an eastern corporation, will reopen the Little Daisy mine. F. F. Eddy of Boston is in the district purchasing mining supplies and arranging for the starting. The property is located near the Midland Terminal tracks, a short distance from the shaft house of the School Section Leasing Co., on Block 8 of School Section 16, on the west side of the railroad.

Below the 650 level of the Jerry Johnson main shaft the Cripple Creek Deep Leasing Co. has loaded out 2 cars of ore, mined from the vein under development at the 850 level, making 5 cars shipped since operations were resumed on June 25. The ore is averaging \$20 a ton. The Deep Leasing Co. is driving a crosscut to the contact east of the shaft, from the 750 level. It has been carried 100 ft. and is nearing the contact when it is expected ore will be encountered, as the ore at the deeper level is found in the granite-schist contact.

The Isabella Mines Co. made about \$12,000 net profit during June from a production valued at \$37,000. This included lessees and company account operations. This profit is good, considering that the company shipments totaled but 15 cars mined from the rich shoot on the Buena Vista vein, under development at the bottom level of the Lee shaft, at a depth of 1275 ft. This ore is high-grade, 2 cars shipped during the month having netted \$1749. Lessees who were accredited with the shipment of between 50 and 60 cars shipped considerable low-grade ore, lowering the general average value of the June production, which, however, will not fall below \$20 a ton.

Leadville.

S. Marshall Carlton states that he believes the Pendery fault, which was first encountered in the Judge Pendery property on Carbonate hill in the early days and later traced north into the Augusta and Clipper claims where it was found through the workings of the Northern shaft, has again been cut in the Alright property on Poverty Flats. The lessees on the Alright recently encountered granite in their drifts at 260 ft. and 40 ft. east of the shaft. Here the face of the granite is exposed for several feet, both above and below the level of the drift and undoubtedly is the east side or upper bench of the Pendery fault. Should this prove to be the case, one of the important faults in the Leadville district has been traced between 2500 and 3000 ft. further north than it has been known to exist. Such properties as the Alright, Jason, Northern and Coronado, which are on the west side of the fault, will have to be greatly increased in depth before reaching the ore zone, which was encountered at a depth of 260 to 300 ft. in the Hibsche and M. E. C. properties on the east side of the fault. The theory is that before the faulting, the Fryer hill basin continued west as far

as the D. & R. G. depot and encompassed the greater part of the territory throughout Poverty Flats and North and South Fryer hills, including that portion of Evans gulch. The upheaval is assumed to have broken the basin nearly in half, bringing the granite close to the surface at the east side of the fault, from which point it pitches rapidly to the east under Fryer hill. The west side, broken by the upheaval, shows the formations slightly upturned at the line of faulting, leaving them in place further west. Mining close to the fault on the east side will be shallow, but the dip of the formations to the east again leaves most of the upper zones in place under Fryer hill.

Rico.

The Rico Wellington property is now out of debt for the first time in several years. It has \$96 in cash on hand and between \$15,000 and \$20,000 worth of ore in transit and unsettled for. The property is shipping 35 cars a month, which are netting about \$600 each. The lower workings are beginning to open up ore on the other side of the fault that was believed to have been the end of the ore. The ore body was cut off by the fault, but it is again being picked up and will be as good as the ore that has been taken from the old workings. The ore that is being opened shows a low grade ore in the upper part of the face, while the lower part of the face looks like shipping ore. At the time the control of the property was taken over by the Jesse Knight interests of Utah there was a bond of \$150,000 on it. There was also expended \$75,000 for a mill and other equipment. Since then \$250,000 has been spent in development, which was quite expensive, as it was hand work. Debt now has been cleared from the company's accounts by the present management.

IDAHO.

Burke.

The Marsh Mining Co. has secured from the Federal Mining & Smelting Co. a favorable lease on claims adjoining its property, forming a portion of the Tiger-Poorman mine. The lease runs for 10 years at a royalty of 35 cts. a ton, while lead sells at 5½ cts. or less, with an additional royalty of 30 cts. for each cent above that figure. This lease ends all threatened litigation between the Marsh and Federal companies and settles all claims for damages by the latter company for alleged trespass by the Marsh. The Marsh is to be reorganized soon as the Marsh Mines Con., capitalized for 2,000,000 shares at \$1 each, of which 500,000 shares are to be held in the treasury, subject to subscription by stockholders of the Marsh Co. of record Aug. 10, at 15 cts. a share, payable in three 5-ct. installments; that remaining unsubscribed to be taken over by a stockholders' syndicate that has underwritten the entire block. Exchange will be made share for share of new issue for the old, and the Spokane & Eastern Trust Co., Spokane, the company's transfer agent, will exchange the certificates free of charge, and at the same time receive subscriptions for the treasury shares of the reorganized corporation.

Kingston.

Additional equipment is being installed in the mill of the Hypotheek Mining Co. and when the enlarged plant is ready to operate the capacity will be increased from 100 to 200 tons daily, according to Otto A. Olson, secretary and assistant manager. "While these improvements are being made we are operating the mill about half time," said Olson. "Since the plant was put in service a few weeks ago we have shipped to the Northport smelter 3 cars of concentrates and 3 cars of mixed concentrates and crude ore, but hereafter the shipments of concentrates and crude ore will be kept separate. The crude ore averaged 75% lead and a car of concentrates went 55% lead, while the remainder ran 65%. Recent development in the mine has resulted in opening some good ore bodies. On the intermediate level between the 700 and 900 levels the ore shoot has now been drifted on for 120 ft. and still shows 6 ft. of fine milling ore in the face. On the 1100 level the first ore shoot proved to be 70 ft. long, and the drift now looks as if it were breaking into a second. The

ledge in which these ore bodies occur is parallel to the vein, which was so extensively developed during a long period of years by the old management, and between 500 and 600 ft. south of it."

LAKE SUPERIOR.

COPPER.

Houghton.

New Arcadian has found that the shaft, which is being carried down to the new lode on the 6th level, about 315 ft. from the exploratory shaft 1800 ft. south of the working shaft, is mostly in the foot-wall side of the lode, but that the part of the lode that is laid bare is well mineralized. It will not take long to extend the pit and then to cut through the remaining 23 ft.; and then the drifting which is proceeding rather slowly in the same kind of coarse stamp rock first found by the crosscut will be driven along rapidly in both drifts. The ground is looking particularly good in the 900 level north, almost over to the New Baltic boundary. The shaft is down about 70 ft. from the 1250 level on its way to the 1400, with the usual speed.

Calumet & Hecla is shipping to the mills a daily average of about 10,400 tons of rock, a rate that was not lessened a particle by two holidays.

Hancock is increasing its yield up to about 21 to 22 lbs. of refined copper from richer ground at its own No. 2 shaft and by closer selection, and it is expected that if the present prices continue, that the profit for the year will be \$300,000 to \$400,000. This will be enough to pay indebtedness and leave a good surplus. Hancock knows now after a long exploration of the five lodes the average that can be depended on from them, and that it will give a good profit. The local feeling concerning the Hancock has wavered, it is true, it would naturally over so long a period of development, but now the belief in the future of this mine is becoming very strong. The management will raise the increase over the normal pay of all its employees that is now prevailing from 10 to 15% and will also pay 25 cts. a day from July to all employees on the payroll of Dec. 31, as has been announced by the Calumet & Hecla, Mohawk, Wolverine and Quincy.

New Baltic this week set men to work breaking ground on property owned by the Johnson heirs, for the purpose of starting a shaft, as the management believe that by their deeds they have a legal right, but the owners had the men arrested. It is likely that this is only the first step towards ascertaining what authorization the company possesses. The company has endeavored to purchase the land they desire, but it and the Johnson heirs have been unable to agree, and this has led the company to believe that it has a legal right to take steps to bring the matter to a head.

Indiana will very soon commence to explore the Knowlton and Butler lodes and probably a shaft will be sunk after the proper data has been gathered concerning the outcrops. There is every reason to believe that these lodes persist through this mine and that they carry their usual mineralization. They will have a strike of over three-quarters of a mile and a very great depth. The search for the felsite bed that caused the stock to sky-rocket about 6 years ago still continues and though it has been fruitless so far, the chances are considered good from the geological data.

North Lake is expected at almost any time to cut into a lode that made a very good showing in the diamond drill cores obtained about 3 or 4 years ago, and there are two or three other lodes beyond to the southeast that also disclosed encouraging rock. These lodes have not been identified so far and their opening will give valuable geological data even if they should not reveal any copper. A distance of 650 ft. will have to be covered before the lodes to the northwest, Nos. 1, 2, and 3 of the North lodes of the South Lake, can be reached by the crosscut that is now being driven in that direction.

Cherokee last week began mining operations and blasted out in two cuts a showing of copper that fulfills the promise of that entered at the top of the lode. There is much heavy

copper both mass and stamp, but the former predominates. The new Lidgerwood hoisting engine is now running and the exploration will be pushed; the small exploratory shaft will be sunk far enough to ascertain if the mineral contents warrant the opening of the property as a mine. There is an ample amount of money in the treasury.

IRON.

Iron Mountain.

New work is being commenced by the Oliver Co. in this vicinity. There has been a fire in the Dober mine for several years and as it continually keeps growing worse it has been decided to flood the mine and quench the fire. The fire is supposed to be between the 4th and 6th levels. For the purpose of flooding a flume has been built from the mine to the river. Later the mine will be pumped out and efforts will be made to keep the fire from starting again.

The closing temporarily of the Dober will not put any men out of work, as work will commence at once on the new shaft on Section 2, directly west of the old shaft. The new shaft will be concrete and one of the best on the range. Very few miners have been employed at the Dober since it filled with gas several months ago, only trammers remaining at work getting out the ore that was broken down. The new shaft will be pushed to completion at the earliest possible date. It will be a 4-compartment shaft and when finished will serve three mines, the Dober, Isabella and Section 2. After the Dober filled with gas experts were employed to ventilate the mine. A blower was installed and the gas driven out to an open pit. Since that time sulphur fumes have been pouring out of the open pit to the discomfiture of residents on the windward side of the pit and the destruction of gardens, trees, lawns and vegetation. It was to abate this nuisance as well as bettering conditions for the men underground that the management decided to flood the mine and drown out the fire.

Ishpeming.

Work started by the Cleveland-Cliffs Co. at the Holmes mine is going ahead rapidly. The shaft being sunk through diorite is going down at the rate of 125 ft. a month. A hoisting system has been devised by Supt. L. C. Eaton. Two buckets are used for hoisting the rock and other material and are operated in such a manner that they cannot dump while being hoisted, nor can any rock fall back into the shaft, even after they reach surface. As the buckets come out of the shaft the openings close behind them. The buckets are operated as effectively as skips or cages are usually handled. Oliver is driving a drift from Section 16 to the Holmes mine, to be used as an opening for the workmen in case of fire or other trouble underground. As soon as the Holmes shaft reaches a point directly opposite the Oliver drift Cleveland-Cliffs will start a drift to meet it. The brick combination office and warehouse, which is the first of the permanent buildings to be erected, is about complete. The foundation for the engine house has been completed and work has been started on the concrete base for the ore crusher. The concrete portion of the crusher plant will be 80 ft. high. There will be 3 crushers in all and the plant will be one of the largest on the range. The air compressor and hoisting engine are on hand, ready to be put in place, though it will be some time before any of the buildings for the machinery will be ready.

House & Person have the contract to strip for the stockpile ground, the tracks leading to the shaft and crusher. They will complete their work in a few days.

MISSOURI-KANSAS.

Joplin, Mo.

Among the mine operators of the Joplin district the consensus of opinion is that the zinc market has reached the bottom, and that a reaction may be expected within a short time, owing both to the decreased production on various accounts. Production is off probably in excess of 2000 tons. Among the mines reported down are, the four plants of the A. W. C., Ramage, Once More, Airedale, Rebecca, Sparkler,

Liberty Bell, Cygni at Prosperity, three of the Carmean & Squires plants at Webb City, and a number of smaller mills.

A rich blende ore strike near Belville has been made which promises the development of a big mine in the near future. The land is owned by J. H. Stephens, and the company is composed of Roy Clayton, Harry Stephens and W. T. Penniman. The new Bonnie Bell Mining Co. has sunk a shaft northwest of the original one on the Mexico-Joplin land at Thoms Station, and has an excellent run of ore at 160 level. Further development is to be pushed.

The completion of the new \$100,000 concentrating plant on the Chapman land by Chapman & Longacre gives to the Joplin district one of the larger mills, its capacity being 1000 tons per 20 hours, and is thoroughly modern throughout. The new Cumberland plant replacing the one burned down in May has been completed. This plant is owned by F. C. Wallower and is much larger than the old one.

Jess Breigel and associates have started up their new Mary C mine at Prosperity and expect to have it going full capacity in a few days. The new mill owned by George J. Kusterer, Thomas H. Noonan, Courtney G. Talcott and eastern capitalists is about ready for operation at Duenweg. A new sludge plant is being erected by the A. W. C. Mining Co. on its tract on West Seventh street, located some distance to the east of the No. 2 mill.

Miami, Okla.

An unsuspected body of ore was opened up recently by the Admiralty Zinc Co. on its leases. The new mill is located west of the first mill which was erected by the Century Zinc Co. before the sale to the Admiralty Zinc Co. was consummated. The combined output of the two plants will not be less than 3 carloads per week. The power plant of the King Jack mine was lost by a cave-in recently, entailing a loss of from \$4000 to \$5000. The King Jack is owned by the Commerce Mining & Royalty Co. and it has not yet been decided by that company whether to abandon the mill or to build the ground up near it and install a new power plant on the other side from the cave.

MONTANA.

Butte.

The Anaconda Copper Mining Co. has awarded a contract for the sinking of the Nettie shaft from the 500 to the 1500 level and work on it has already started. This means that the necessary work to show what can be expected in the lower levels of all the western Butte mining district is to be done. The Nettie is proving to be an exceptionally rich mine in silver values and some picked samples of ore are said to run as high as 600 ozs., while the average now being taken from the 500 level is very high in silver. The Davis-Daly, Butte & London and several other companies have mining claims in the western district and the development of the Nettie to the 1500 level will give the owners of those properties some idea of the values at that depth in their own properties. The work of completing the shaft from the 500 to the 1500-foot level will take about a year. The shaft is to be 3-compartment. The only other deep mining planned at present west of the central Butte district is that at the Butte & Zenith City, which is some miles beyond the Nettie. The showing in both of these shafts as they go down will be watched, as it is possible a new mining district covering a big extent of ground in the entire section will be opened up.

The North Butte Mining Co. had the best month in the past year in production of metals in June. With both the Granite Mountain and Speculator shafts in use for hoisting the total tonnage for the month was 44,136, or about 1500 tons per day. From this was realized 2,096,326 lbs. copper, 90,713 ozs. silver and 142.23 ozs. gold. This was the largest metal reduction and by far the largest production in point of value that the North Butte Co. has had in some years. Supt. Braley hopes to reach soon the production point of 2,250,000 lbs. of copper per month that he has been striving for.

The report of the Barnes-King Co. for June, just issued by President Goodale, shows that very little gold was taken

out at any of the properties during the month, as shutdowns had been necessary to prepare for the increase in output at all of them. At the North Moccasin the plant was closed down from June 15 to July 1 for needed repairs. It had been expected that the work could be done in a week or 10 days, but it took over 2 weeks. The mining and milling operations were resumed July 1 so that the present month will doubtless show a normal production. The mill ran during the first 14 days of June and treated 945 tons, and from this the cleanup amounted to \$7800, or a little over \$8.25 per ton. This was a big improvement on the ore showing in April and May. At the Piegan-Gloster the mill was in operation 8 days and was then shut down without a cleanup of resulting bullion from the treatment of 700 tons of ore. The installation of new machinery, required for the treatment of Shannon ore, made this shutdown necessary. The pumping equipment for the Gloster shaft, which was promised for March 15, has not yet arrived. The mine is now drained, however, to the 500 level and it is expected that there will not be much further delay in unwatering the winze below the 500. When this is done it will be possible to begin mining the good ore which it is believed exists below the 500. At the Shannon there has been some vexatious delays also. The delivery of material has been slow and bad weather in the last few months was responsible for delaying the construction of the aerial tramway. The work at the present time is going forward and the management expects soon to have the aerial tramway completed. Shipment of the Shannon ores which are already on the dump will then begin and the ore treated at the Gloster mill. The Shannon vein on the tunnel level is being explored to the west, but has not yet discovered a new ore shoot. At the Woodrow Wilson work was continued during June on tunnels Nos. 2 and 3, and a distance of 105 ft. was driven. No 1 tunnel was timbered where it was beginning to cave.

NEVADA.

Goldfield.

Seams of \$15 ore are being opened in the big vein on the 225 level of the Lone Star, now being drifted on in a southerly direction from the Nelligan shaft. Driving is proceeding in hopes of intersecting the vein which yielded rich ore when worked several years ago by the Patrick lease.

The Goldfield Oro has resumed work on the 800 level at a point where seams of good ore were recently encountered. The work is advancing in the great Columbia Mountain faulted zone, where some of the richest ore in the district has been mined in nearby properties. The company is also preparing to start work at other points on the 700 and 800 levels.

Fully 20 companies are operating in Goldfield, in addition to several individual owners and lessees. The success of the flotation process at the Goldfield Con. has instilled new life into the field and many properties long idle are undergoing development. The Goldfield Con. Co. is now sending about 800 tons daily through the flotation units and will have the plant operating at its full capacity of 1000 tons in a short time. June net earnings are estimated at \$40,000. It is stated July earnings will probably be the best of several months.

Rochester.

Native silver discovered in the bottom of the Codd winze below the 800 point on the dip of the East vein, together with the shipment of \$16,700 in gold and silver bullion representing the first half of the month's mill run, are the two most important happenings in connection with the Rochester Mines Co. during the past week. In north territory, Raise 166 from the 250 level on the East vein, is being carried up 30 ft. wide, breaking from 5 to 7 ft. of ore averaging \$25. The entire bottom of the Codd winze is in ore of better than average milling grade. Occasional pieces of native silver are found which are the richest specimens ever found in the camp. The Codd winze will be connected with the raise from the Friedman tunnel at an early date, furnishing a new outlet for ore from all portions of the mine, to move by gravity

from the stopes to the mill. Connections have been made in the north portion of the mine with the old Tero raise of the Four J workings in Block 3, and the drift is continuing, soon to enter Block 4 of the Crown Point claim. As has been previously reported, it is now believed that the ore shoots already encountered in both the East and West veins in Block 3 are the downward extension of the rich apexes formerly mined by the lessees, and which produced in Block 4 some of the best ore ever found on the hill. Preparations are going forward rapidly in the mill for additional equipment which is counted upon to nearly double present capacity.

Seven Troughs.

The bottom of the Bird Winze in the Seven Troughs Coalition which has reached the 1740 point has just cut a 6-in. stringer of ore running nearly \$500. A larger streak of almost the same richness has been passed through, and no hanging wall yet in sight. The winze is cutting diagonally through the vein at this point, exposing a large body of mineralized matter with the high-grade streaks running through. The ground is heavy and the progress slow, but more important announcements are looked for at any time. In the north drift on the 1700, three streaks of high grade are now exposed, giving greater indication of being the same ore shoot exposed in the deep winze.

National.

N. P. R. Hatch, Chicago, who has a lease on the Buckskin National Gold mine, is building a 10-stamp mill on the property. The gold will be saved on plates and tables. This mine belongs to Senator Bell and associates of Winnemucca.

The Indian Valley No. 2 mine, in charge of F. R. O'Leary, has cut the National vein by driving an 800-ft. cross-cut, the vein having been cut at a depth of 300 ft.

Maney brothers, railroad contractors, have secured a lease on the Auto Hill group and have commenced sinking a shaft.

Gerlock.

Tohoqua Mining Co., controlled by John Harman and associates, is operating a mine and mill and shipping silver-lead concentrates, running 165 to 170 ozs. silver and 40% lead. The property is 40 miles from Gerlock, on the Western Pacific railroad. The June shipments amounted to 3 car loads, which were sent to Salt Lake smelters. The mine is developed through tunnels and one 550-ft. shaft. A 2135-ft. tunnel level, through which all ore is now taken out, taps the main workings at the bottom of the shaft. Greater depth on the ore is gained by a 200-ft. winze from the tunnel level. The workings in ore extend about 900 ft. along the strike of the vein, which has a width of 2 to 3 ft. The ore is a sulphide, in a gangue of andesite and lime. All the ore is concentrated in a 60-ton mill, equipped with a crusher, three sets of rolls and seven tables and vanners. Water for mill work is pumped from the lower workings up to the tunnel level, through which it drains out. The pump is driven by compressed air.

Yerington.

Pittsburg Dolores Mining Co., for which E. J. Schrader is general manager, is mining and milling about 70 tons per day of gold and silver ore, running \$9, making an extraction of 92% by cyanidation. The property is located 25 miles south of Yerington. The ore body has an average width of 2½ ft., and is contained in a vein that occurs between a grano-diorite foot wall and a rhyolite hanging wall, the basic formation being grano-diorite. The gold and silver are associated with iron sulphide, accompanied by some arseno-pyrite and antimony. A small percentage of the silver is argentite. The mine is opened by adit levels on the vein and by crosscuts to the vein, and a winze is being sunk from the lowest tunnel level. The underground workings aggregate 14,000 lineal feet. The ore is transported from the main tunnel level over a 1500-ft. surface tramway to the mill. The mill equipment for pulverizing consists of one crusher, 2 sets 14 by 27 Colorado Iron Works rolls, one 5 by 18-ft. Allis-Chalmers tube mill. The rolls reduce to 4 mesh, and 70% of the tube mill product will pass 200 mesh. Cyanide solution is introduced in the trommel ahead of the coarse rolls. In the leaching process that follows fine grinding, the Dorr system of counter-current decantation is used. The metals are precipitated in zinc boxes. They use 1½ lbs. of cyanide per ton of ore, and 14 lbs. of

lime. In milling ore running \$9, there is \$7 gold and \$2 silver. The mill tailings run 60 to 70 cts. The matter of installing a ball mill to replace the rolls is being considered. Mining costs are given at \$1.50 ton; milling costs, \$2; transportation, 20 cts., and general expenses, 70 cts. C. R. Olson is mill superintendent, J. B. Perry being mine superintendent.

NEW MEXICO.

Mogollon.

A. H. G. Palmer, manager of the Alberta Mining & Development Co., is in camp arranging to start work on the Alberta group of claims. This company owns some of the best located mineral land in the district, with a considerable tonnage of mill-grade ore blocked out ready for mining. The property is opened by a 300-ft. tunnel which cuts the main ledge, on which drifts both east and west have encountered bodies of good ore.

The main shaft on the Eberle mine, operated by the Oaks Co., has been unwatered and timbers repaired. Both north and south drifts from bottom are being advanced, yielding a grade of ore practically all of which is being shipped to custom mill. This work is on the Queen vein or Mother lode of the district, which in places has a width of 50 ft.

Retimbering of shaft to 500 level on the Pacific mine has been completed and electric power is delivered from the central plant of Socorro Mining & Milling Co. The property will be operated electrically throughout. Extensive developments will now be actively conducted and regular ore shipments started to the Socorro Co.'s mill as soon as the aerial wire rope tramway is completed.

The last semi-monthly bullion shipment by Mogollon Mines Co. amounted to 1500 lbs. of gold and silver.

Abundant rains in the mountains the past week have assured a continuous ample water supply for mine and mill and all plants are running at full capacity. The economic importance of utilizing one of the locally available sites for a hydro-electric installation is becoming more and more apparent, and it is confidently believed some definite steps to this end will be taken in the early future on a scale sufficiently large to meet the growing power consumption of the district.

Santa Fe.

Charles W. Henderson in his report to the U. S. Geological Survey for the first half of 1916 shows small increases in the production of gold and silver and large increases for lead, copper and zinc. In the Mogollon district, which in 1915 produced 40% of the gold and 65% of the silver output of the state, the Fanny and the Last Chance cyanidation mills were operated continuously, and the Cleaveland-Weatherhead mill, idle in 1915, was placed in operation in April. Gold bullion and concentrates continued to be shipped from the Elizabethtown district, Colfax county, and gold bullion from the Whiteoaks district, Lincoln county. The output of silver was affected considerably by the idleness of the Cosak cyanidation mill, in the Cochiti (Bland) district, Sandoval county. Gold-copper ore continued to be shipped from the Orogrande district, Otero county. The purchase by the Phelps-Dodge & Co. of a large area in the Organ Mountain district, Dona Ana county, promises a future production of all five metals. Silicious and copper ores carrying gold were shipped from the Lordsburg district in quantities that indicate an output nearly double that of 1915. The Santa Fe Gold & Copper Co.'s matting plant at San Pedro was operated continuously. The Burro Mountain Copper Co.'s flotation mill in the Burro Mountain district, was placed in operation in April, 1916. The Chino Copper Co.'s mill, which in 1915 produced concentrates containing 68,293,893 lbs. of copper, yielded during the first quarter of 1916 a total of 16,267,150 lbs., the total quantity of ore treated for the three months being 714,400 tons, an average of 7850 tons a day, the highest average tonnage treated by the mill since it began operations. Shipments of copper from the Magdalena district increased. Lead ore was shipped from Cooks Peak and Tres Hermanas districts, Luna county; from the Central and San Simon districts, Grant county; and from the Mag-

dalena district, Socorro county. Increased shipments of zinc carbonate and zinc sulphide concentrates were made from Magdalena, Hanover, Cooks Peak, Florida, Tres Hermanas, and Pinos Altos districts. A mill was erected in the revived Steeplerock district, Grant county, and some shipments were made.

OREGON.

Baker.

Charles G. Yale, reporting to the U. S. Geological Survey on Oregon for the first half of 1916, says: "The bullion receipts of the mint and smelters at San Francisco show that the output of gold has increased \$107,000 and that of silver 14,000 ozs. in the first part of 1916 over the output of the corresponding period of 1915. The increase in gold is due entirely to dredging operations. The Powder River Gold Dredging Co., which in the first half of 1915 had but one dredge operating, near Sumpter, has been working with two dredges during the first half of 1916. With the exception of three deep mines, all in Baker county, this is the largest gold mining enterprise in Oregon. The properties of the Cougar Mining Co., near Sumpter, have been placed under lease and bond to the United Gold Mining Co. of Spokane, Wash. In addition to the 200-ton mill, tube mills and a cyanide plant are to be installed. The Queen of Bronze copper mine, which ships its ore from Waldo by team to Grant's Pass and thence by rail to smelters at Gennett and Tacoma has been sold to men who intend to extend a railroad to Waldo. After years of idleness work has been resumed on the Iron Dyke mine at Copperfield, which is shipping ore to Colorado for reduction. The Black Eagle property, near Grant's Pass, has been sold to men who are to erect a 50-ton mill. There is a notable activity in the hydraulic mining industry of the state, particularly in the counties along the northwest border of California. Many old properties have been reopened, and new ones have been put in shape for working. The most productive deep mines in the state continue to be those of the Cornucopia Mines Co. and Baker Mines Co., in the Cornucopia district, Baker county; Commercial Mines Co., in the Mormon Basin district; Homestead, Iron Dyke district, and Humboldt Con. Gold Mines, in Malheur county. The largest producers among the placer mines are the Powder River Gold Dredging Co., Baker county; Columbia mines placer, in the placer district, Josephine county; Sterling hydraulic, in the Forest Creek district, Josephine county, and Layton, in the Applegate district, Jackson county. Baker continues to be the most productive county in the state, containing nearly all the larger mines."

SOUTH DAKOTA.

Lead.

The Custer Peake Copper Co. is installing a new 100-h. p. boiler and compressor, and about Aug. 1 the shaft will be unwatered and development work started. The shaft is now down 250 ft. and will be continued to 500 ft., followed by lateral work. It is the intention to thoroughly develop the deposits. It is also probable that a concentrator plant will be erected later.

The Deadwood Standard at Ragged Top has been turned over to leasers and the 100-ton cyanide plant is being put in shape for operation. Local parties are in charge and it is expected that the property will again become a regular producer.

Announcement is made that the New Puritan Co. will commence work soon. For some time past the plants on the property have undergone repairs so everything will soon be in readiness for active operations. The property is equipped with a modern cyanide plant.

Development funds to the extent of about \$100,000 are in the hands of the Custer Peak Mining Co. and preliminary work has been commenced to sink the shaft to the 500-ft.

level. A new 100-hp. boiler is being installed, at the side of one of equal capacity, which served to furnish power when past operations were in progress. A 5-drill Norwalk air compressor has been delivered at the hoist and is ready to be set on its concrete base, which is being constructed. The repairing of the upper 75 ft. of the 2-compartment shaft is completed and it is expected that the removal of the water from the 250-ft. shaft will commence soon. A skip and a No. 5 Cameron pump will be used for the purpose. John H. O'Brien, general manager, estimates that \$25,000 will be sufficient to put the shaft down from its present level, 250 ft., to 500 ft., leaving a surplus of \$75,000 for the construction of plants as may be necessary for the treatment of ore. The property has developed from a gold and silver prospect at the surface to a promising copper mine at 250 ft. The first discovery which was sampled showed a 6-ft. vein which assayed \$7 in gold and silver. It was regarded as sufficient for the investment of \$60,000 which was expended to bring about the present development. The vein widened as it was sunk on and at 100 ft. had changed into a solid body of iron sulphide. At 150 ft. indications of copper appeared and these gradually increased until, at 250 ft., there is a formation vein about 100 ft. wide which will sample between 1½ to 2% copper and carries \$2 in gold and silver. The confidence at present is based on the theory that the copper content of the rock will increase in the next 250 ft. at the same ratio shown in the last 150 ft.

Custer.

In the vicinity of Custer, individuals and companies continue to take out both scrap and plate mica. The Old Mike mine, which was closed down for a time while disputes as to ownership were settled, is again a steady producer and regular shipments are being made.

The Cuyahago Co. has recently shipped a car of ore, which carries a high per cent of sulphur and some copper. Preparations are now under way for the installation of a new hoist and the deepening of the shaft. After this has been completed regular shipments of the ore will be made.

Hill City.

The Hill City Producer's Co. is busy developing its numerous leases and getting the plant in shape for the treatment of the tungsten ores. It is expected that the mill will be ready to handle ore by Aug. 15. The properties throughout this district are being thoroughly developed and as soon as the mill is ready considerable custom ore will be treated.

B. C. Yates, assistant superintendent, and A. J. M. Ross, general foreman of the Homestake mines, are visiting mines in Alaska.

TENNESSEE.

Del Rio.

E. D. Stone, formerly mineral agent Southern railway, and J. H. and W. F. Aldrich of Birmingham, Ala., have associated themselves as copartners operating as the Pond Ridge Barytes Co. for the purpose of mining extensive deposits of barium sulphate in this vicinity. Their output is about 100 tons per day.

UTAH.

Antelope.

The Jeanette Copper Mining & Milling Co. has recently been formed and with about \$57,000 are now developing property located in the north backbone of the Uintah basin, and is reached by a good automobile line from Rock Springs, Wyo., south 55 miles. The company owns an outcropping ledge of 22% copper. The officials are: J. Tom Fitch of Helper, president; F. B. Hammond of Moab, vice-president; C. R. Jones, secretary-treasurer, who with Arthur Gibson, ex-Sheriff George A. Storrs and W. H. Griffin, Jr., make up the directorate. The company has 1,000,000 shares, 20 cts. par value. The treasury stock has all been sold and there

is a cash surplus of \$57,000. It owns 34 unpatented claims. The property has been opened by 1000 ft. of tunnels, shafts and open cuts. Upwards of \$10,000 has been expended in work. The main ledge stands up from the surrounding country rock 30 ft. What were considered fair samples gave average returns of 22% copper, 20 ozs. silver and \$3.20 in gold to the ton. This ledge is persistent and is 15 to 20 ft. wide. Some time ago a lot of 23 sacks from the ledge was shipped and carried 22% copper. A force of 7 men has been working since last April. The expectation is to at once increase the force. It is the expectation to at once plan for a flotation mill with a capacity of 150 to 200 tons. Probably 5 tons will be put into 2 by concentration. Owing to the long haul the ore must be concentrated to be handled profitably. It is likely that a line of trucks will be put on. The road is excellent to Rock Springs, the nearest railroad point. There is a shaft 100 ft. deep from which there is a 100-ft. drift, a tunnel in 95 ft., with only 40 ft. to the ledge, an incline down 35 ft., another shaft 20 ft. with a 30-ft. drift, besides 10 to 35 ft. of work on all the other 34 claims.

Park City.

Recently returning from inspecting the Silver King Con. R. R. Morris says: "The ore is developed in a bedding plane between the 1550 and the 1700 levels. The first-class ore is developed there for about 400 ft. along the strike. The ore will average 4 to 5 ft. wide. The ore is averaging \$60 to \$65 a ton, gross, as it is broken and shipped. The present output is 70 tons a day. The new tramway is making progress. It will be 10,000 ft. long and should be completed by Aug. 15. Most of the towers are up. The mill will be ready about Sept. 1. It will work over an old second-class dump of 25,000 to 30,000 tons. The present production of ore is from development. There is no effort whatever being made to stope the ore. When the tramway is completed the company will ship 75 tons daily of first-class, in addition to 50 tons of second-class. Recently the sulphide ores have been averaging near 45 ozs. silver and 30% lead, the carbonates, 50 to 57 ozs. silver and 30 to 36% lead.

Beaver.

The shaft at the Moscow mine has been completed to the 1000 level. The work of drifting out and connecting up with the old productive workings to the west will be taken up immediately. All during this piece of work the old stopes have been made to produce about enough ore to meet expenses. During the month of June the company shipped a total of 6 cars. Considerable of this was cleanup ore and carried only about \$700 to \$1000 a carload of 50 tons. However, some of the better grades of copper ore brought net as high as \$2550 a car. Cars averaged more than 9% copper. The new shaft was first sunk to the 800-ft. level. Here connection was made with the old workings. Later the sinking was resumed, and now this task has been accomplished. This new shaft on the east side does away with unnecessary wagon hauling and will add greatly to the profits of the company. It has been completely electrified. At present a force of 30 men are employed. It will take some little time to connect up on the 1000-level with the old workings. This will give additional depth under the old stopes.

H. S. Joseph, managing director of the Cedar-Talisman, states: "We have 50 tons of lead ore in the bins and 50 tons at the Salt Lake markets. In addition to this we are extracting some high-grade zinc ore." Joseph now has 10 men at the property, 6 of whom are working on ore. Lead ore has been found on the 100 level, the 225, 600, 700 and 800 levels. That on the 800 is the deepest that lead has yet been opened in the Cedar. This makes a continuous lead showing for 800 ft. on the strike of a regular fissure vein. The ore varies from 1 ft. to 2½ ft. There is a winze from the 225 level which has been sunk 50 ft. in ore. Recently the mine has been wired for electric lighting.

Cottonwood

A compressor and drills have been installed at the Reed's Peak property. Two shifts are working in the tunnel. It is headed for the intersection of the Birthday No. 1 fissure, with the main north-south fissure and according to the calculation of the management it should be reached with a few shifts' work. In and near the intersection is where a

big ore body is expected to be found. The holdings consist of 21 claims situated in South Fork canyon, Big Cottonwood district, about 2 miles north of the Cardiff mine. The property is well situated for being thoroughly developed by the tunnel that is being driven and which has penetrated the mountain for 850 ft. A depth of 500 to 600 ft. has been gained in that distance.

WASHINGTON.

Spokane.

According to James A. Welch, president, the Norman Mines Co., operating the Last Chance and Great Western groups, 6 miles from Northport, will construct a mill this fall to handle the lower-grade ores from both properties. Experiments have been conducted for some time by Harry W. Newton, the company's assayer, and it is recommended that a plant be erected that will cost \$6000 and recover from \$15,000 to \$20,000 from the large dump at the lower terminal of the tramway. No crushing machinery will be necessary at this time, but the company plans to increase the milling efficiency with funds derived from treatment of this dump. It is also announced that the company has just entered into a contract with the Ozark Smelting & Mining Co. at Coffeyville, Kan., by which it will forward 1000 tons of lead zinc ore at a net profit of \$22.50 the ton. This ore is now being loaded at Northport and the entire consignment will be out before the end of August. Shipment of ore of higher grade than heretofore forwarded will necessitate sorting and storage of low grade. The latter will, however, be put through the new mill at a profit, as it carries an average of around 9% lead. About 30 men are now on the payroll, of whom perhaps 10 are engaged in sorting over the old Last Chance dumps. A new 15-h. p. gasoline hoist, just installed at the Great Western, is running smoothly and the winze is down to the 85 level in a fine body of ore. At the 100 level drifts will be run each way and stoping commenced.

"The reorganized company that recently took over the Copper King mine, adjoining the United Copper, announce that shipments of the ore already broken down in the stopes will begin soon. The tonnage available is not definitely known, but it is considerable and, basing an estimate on the first 5000 tons shipped from this property by the old management, it should run about 2.5% copper and some gold and silver. This should leave a fair margin of profit after defraying all expenses.

"The Security Copper, also adjoining the United Copper group, and situated about 2 miles from Chewelah, comprising a surface area of approximately 200 acres, is being steadily developed. The 2-compartment shaft now is down 350 ft. and, with the top work all kept up, good roads established, the camp is well equipped and in fine condition and the company's determination to put the property on a producing basis as soon as possible, it is quite likely that the shaft will be sunk to the 550 level and a crosscut run from the 500 station to and across the No. 4 vein before November. There are six veins known to exist in the Security Copper, five of which are very large, and it is believed that these all will be opened by the proposed crosscut.

"Development by contract is under way on the Chewelah Con. group—a lead-silver proposition—while the others produce copper principally, with some gold and silver, with the exception of the Blue Star, a high-grade lead-silver producer, now being operated under lease, from which shipments have been made recently. At the White Cat a force of miners is employed sinking on the vein, and more extended development will depend upon the results of the present work. The holdings cover several hundred feet of the United Copper vein and are regarded as among the most promising in the district.

"At the Lookout, lying south of the White Cat, which also is believed to cover an extension of the United Copper vein system, a shaft now is being sunk and already is down to the 200 level. Recent operations at the Hecla have been confined to drifting on the vein encountered in the shaft and

some excellent ore has been opened. The management intends to continue development, however, and it is probable that the crosscut will be extended to the second vein toward which the level originally was directed. The equipment is actuated by an excellent steam power plant, and good progress is being made.

"A faulty pump resulted in the flooding of the workings at the Juno-Echo property recently, but a new pump has been ordered and as soon as it is installed work will be resumed in the crosscut toward the vein, begun a short time ago. The shaft on this property is being sunk by two shifts. A heavy flow of water has been encountered in the tunnel being driven to cut the vein of the Copper Cliff holdings, on the east slope of Quartzite mountain. The bore now is in several hundred feet, and the influx of water, together with marked changes in the character of the formation showing in the face, indicates the proximity of an ore body.

"The outlook for practically all the companies, both development and operating, in the Chewelah district is decidedly promising, and within the next year there undoubtedly will be a number of new shipping properties added to the list. Lack of capital to properly finance development and exploration is all that has prevented the camp from becoming recognized as one of the important copper regions of the west, but this difficulty gradually is being overcome, and nearly all the interests represented there have funds to carry their plans to a successful conclusion."

The Electric Point Mining Co., which owns and operates the Electric Point mine, near Northport, has closed a 1-year contract for its entire output with the Consolidated Mining & Smelting Co. of Canada, the ore to be treated at the smelter at Trail. Shipments are to be made at the rate of 75 to 100 tons daily, and the clean sulphide ore is to be kept separate as much as possible from the carbonates. All ore running less than 60% lead in car lots is to be classed as carbonates and will take the lower freight and treatment rate provided in the contract. Settlements are to be based on the New York price for silver and the American Smelting & Refining Co.'s quotations for lead. "Developments at the Electric Point property have been very encouraging lately," said Jesse M. Hall, field representative for Walter Nicholls of Spokane, head of the local syndicate that recently acquired a fourth interest in the Electric Point Co. "The No. 2 ore chimney is proving to have all the characteristics of an ordinary ore shoot instead of being a chimney of ore. Where crosscut on the 225 level it shows a width of 33 ft. and a drift has been run in both directions at nearly right angles to the crosscut, which is now 65 ft. long, and with both faces still in ore. The bulk of the vein filling throughout these workings is a mixture of carbonates and crystallized lead running from 30 to 58% in lead, according to the percentage of crystallized lead disseminated through the carbonates. The clean galena and crystallized lead, which together constitute 25 to 30% of the vein matter, average 75% in lead. The drift to the No. 3 chimney is nearing that ore body and is following a streak of fine carbonates containing occasional bunches of solid galena. When I left the mine a 5-ton motor truck with a trailer was hauling ore from the mine to the bunkers at the foot of the hill and nine 4-horse teams were hauling from the bunkers to the ore bins on the railroad at Boundary. We have started work on the Gladstone adjoining group with 5 men, which will be increased to 10 in 2 or 3 days. We have opened several showings of iron ore and lead carbonates containing boulders of galena. These veins vary in width between 2 and 4 ft."

WISCONSIN-ILLINOIS.

Highland.

The 100-ton power and concentrating plant built for the Saxe-Lampe Co. by the Galena Iron Works Co. will be given a trial run next week. Arrangements have been made with buying interests to take all output. Another 200-ton milling plant is nearing completion for the New Jersey Zinc Co. and it is expected to be going before Aug. 15. Two-compartment shaft 8 by 18, with cages, is in an immense ore body

extensively proven with drills. Recent shipments of carbonate zinc ore is coming from waste heaps thrown up by the miners of two generations ago. The lands now owned by the New Jersey Zinc Co. are being swept clean in this manner. The Minter, Lynch, Franklin, Edwards, Leuke and Kennedy lands owned by this company remain to be mined underground, following mainly the workings left by the former owners. Drills are at work upon the Hying land for the New Jersey Zinc Co. Blue River Bottoms Co. is another operating concern turning bottom lands, where years ago miners discarded as worthless, the ore now is in excellent demand for the manufacture of oxide zinc. Several cars of carbonate and complex ores are ready for shipment. Waters-Fecht Co. hold 2 cars awaiting bids. Burrichter Mining Co. hold 1 car of each, carbonate, lead ore and blende. Winkers Mining Co. offered 3 cars of high-grade carbonate zinc ore last week. Several small operating companies, sub-lessees of the St. Anthony Mining Co. on Sec. 5, hold 1 or 2 cars each of carbonate zinc ore. Pusch, Hudek, Topp Co., local producers, offer 3 cars of top-grade carbonate zinc ore and 1 of blende. Kroll Mining Co., recently incorporated, capital stock \$25,000, is raising zinc ore under new management.

Linden.

New York mining men have secured a 90-day extension of option on the producers operated here by the Saxe-Pollard Co. of Milwaukee. In the deal are listed the Gilman, Glanville, Hinkle, Weigle-Jacobs and Jewell properties, the consideration being \$300,000. The extension was granted to enable the exercise of the option with Campbell-Boston type of magnetic zinc ore separator plant which is to be supplied immediately, agents of the manufacturer having been on the ground. Low-grade zinc ore producers of this field, and they are many, have received serious set-backs recently on account of prices, and the magnetic zinc ore separating plant is coming to be recognized as indispensable. The Gilman and Glanville mines alone recover 2 cars of zinc concentrates daily. Contract with the Linden Zinc Co. on this production up to 46% assay zinc content, expired 2 weeks ago and has not been renewed. All other low-grade producers, and in this class are assigned producers whose output assays below 50% zinc content, have been without a market for nearly 2 months, and a conservative estimate of ore held in bin exceeds at this time 3000 tons; and for the entire field in excess of 10,000 tons. Drilling machines resumed work of exploration on the option on the Saxe-Pollard mines, meeting with exceptionally rich strikes on the Gilman mine. A new producer is being brought in on the Wickes land, where a company recently incorporated is building a new power and milling plant. The output is protected, the promoters having practically concluded to deliver the entire output to one of the leading zinc ore refineries now engaged in the Cuba district.

Platteville.

A new producer is the Block-House mine. The leasehold obtains on lands formerly known as the Cruson-Kistler-Stephens Co. Incorporators have a fine 200-ton electrically driven plant on this land. At present an output of 1 car daily is maintained, the crude ore being provided with separator facilities at two points locally, one the Enterprise Separating Works and an independent Mathey type of separating plant installed years ago at the Homestead mine, owned by the Shepherds. The efficiency of the plant was raised considerably by the additional installation of Dings machines. The Climax Mining Co., another of the recent developments of the Kistler-Stephens combination, has in operation the Homestead mine and plant, and has also resurrected the Grant County mine in which a score of different incorporations have lost their capital madly endeavoring to pick up the giant Empire range noted for its richness some 10 years ago. It is now declared that the Grant County has opened up on this range and will become a wonderful producer. The same combination, all local, have purchased 113 acres of land known as the W. F. Weigle farm, and big ore bodies are being cut for active mining. Another producer has been developed for this company on the Alderson farm. A new producer for another company known as the Bell Mining Co. is developed and producing ore and a plant is being supplied

from second-hand material taken from the Enterprise mill. Several new incorporations are at work with good results, drills are in operation on five leaseholds near the zinc bearing areas and new companies have been organized, leaving this district in the best shape it has ever known to become a really great zinc producing center.

Cuba.

An improved tone in the spelter market rejuvenated zinc ore prices, substantial gains being recorded early in the week. This was shown in heavier shipments to zinc ore refineries, proving that low-grade independent producers were given a little more consideration, while mines affiliated with these refineries unloaded heavier shipments than reported for last week. The Linden Zinc Co., zinc ore refiners, have taken over the Campbell Magnetic Zinc Ore refinery at this point, with two relays of men to operate the plant, and 2 cars of low-grade ore came from the Standard Metals Co. for a try-out. The plant has been operated off and on for the past 5 years and is now under the management of Chas. Singer, an expert in the dressing of ores, who was in charge of the same type of plant at Linden, where ore values have been brought up to premium grades.

The National Separating Works have discarded the old coal-firing method and have put in a gas producer that is operating perfectly for heating low-grade ores preparatory to crushing and separating. Much time is saved and a gain in output of the high-grade finished product is claimed.

Utt-Thorne Co., operating the Lawrence mine, have been shipping regularly to the Benton Roasters. Standard Metals Co. is negotiating with a local foundry for the early construction of a zinc ore separating plant at the Anthony mine. Nearly all the mining companies in this field are beginning to realize conclusively that the only solution of low-grade zinc ore production to meet the markets at all times is the magnetic separating plant. Current is now available at all points in the field through two exclusive power projects, one at Galena, and the other at Mineral Point. Another 6 months, it is believed, will witness the shipment out of the field entirely of high-grade refinery product.

WYOMING.

Casper.

With the expectation of finding oil when the Wall creek sand is reached, interest in the partially developed Muddy field is increasing. Well No. 1, section 3, which was brought in by the Standard Exploration Co. for the Merritt Oil & Gas Co., is being cleaned out. Drillers will go deeper into the oil sand. They were only down 70 ft. when oil was struck. The well is now flowing about 25 bbls. daily and the head comes off at about the same time each morning. For 2 weeks it flowed for about 20 minutes starting at 7:30 a. m. and quitting for the day. Considerable tankage has been made ready to hold the oil when the well is deepened into the sand formation.

The Whitesides Co. has completed the erection of the new wooden rig to take the place of the steel one which collapsed about July 3 on their deep test well. It has resumed work. This is the first attempt to be made to reach the lower, or Wall creek sand, from which the geologists expect much in the way of production. They think that the oil found in the Big Muddy sand is but a seepage from the lower sands and that when these are reached the main oil body will be tapped.

CANADA.

BRITISH COLUMBIA

Salmo.

The Emerald mine, in the Sheep creek district, idle since June, 1915, has been reopened under the management of John Waldbeser, with 10 men, and the force soon will be

increased to 20. It is the intention of the management to resume shipments of high-grade lead ore to the Trail smelter. About 5 tons a day will be shipped, most of this coming from development work, while the second-grade ore encountered in course of development will be left in the mine to be removed for milling at a later date. Last May an option was given covering the stock of Iron Mountain, Ltd., which company owns the Emerald mine, to Spokane parties. The time limit on this option has expired and Waldbeser and his associates express their satisfaction over the fact that the option was not exercised. Mining men who have examined the property are agreed that the Emerald is one of the most promising mines in the district, a contention that is amply borne out by its reputation as a steady shipper during the past 10 years.

J. L. Bruce of Butte, Mont., spent a few days in this district looking over the Hudson Bay mine which is controlled by the Hayden-Stone-Jackling and Butte-Superior interests, last week.

M. W. Bacon of Spokane inspected work at the Hudson Bay mine last week in company with R. K. Neil. Bacon returned to Spokane while Neil expects to spend some time in and around Salmo. He expects to make a trip into the Bayonne district soon to examine some promising prospects in that section.

The Hudson Bay mine is now shipping lead-zinc ore to Mineral Point, Wis. W. R. Salisbury, who has the contract for hauling the ore from the mine to the point of shipment, Salmo, has 36 head of heavy horses and a Yuba traction engine hauling ore now.

Wm. Barbour, an old time prospector of this camp, just brought in some samples of high-grade silver-lead ore from Summit creek in the Bayonne district. Only for lack of transportation facilities it is said there would be some good shippers from that district.

There are on the way from Spokane now due to arrive soon in Salmo, 15 pack mules to be used in packing ore from the Spokane group of claims owned by Laib Bros. This group is situated on the east side of the summit between Sheep creek and Kootenay lake, about 9 miles from the Motherlode mill, to which point the ore will be packed and from where it will be hauled on wagons to Salmo and shipped to the smelter at Trail. About 2 tons of ore a day will be brought out. The ore is a high-grade silver-lead containing some gold values.

Trail.

The zinc output at the Consolidated Co.'s electrolytic plant in connection with its smelter, soon will be increased from 15 to 20 tons a day, and by Aug. 1 it will reach 30. Recently the company shipped 250 tons of pure zinc to Great Britain. Two other departments which were recently added to the Trail smelter were copper converters and a copper refinery. The former have been in operation for some time turning matte into blister copper, and now the refinery also has been put in operation. President J. J. Warren announced that the company would be shipping refined copper at the rate of 35 tons daily by August, at latest. Manufacture of hydro-fluosilic acid also has been begun by the company. The plant is operated in connection with that recently established for the manufacture of sulphuric acid. Both acids are being manufactured, primarily, for the company's own use, large quantities being required in its zinc, silver-lead and copper refineries. Hydro-fluosilic acid was formerly purchased by the smelter at Pittsburgh. Sulphuric acid was obtained in Victoria.

Silverton.

The Standard Silver-Lead Mining Co. on Aug. 10 will pay the regular monthly dividend of $2\frac{1}{2}$ cts., or \$50,000, to stockholders of record Aug. 1. This will make the disbursement for the current year \$400,000, and will increase the grand total to \$2,200,000, or 10 cts. a share more than the par value of the stock. Encouraging news is received from the mine about the disclosure of ore bodies carrying considerable galena in the new workings in the Alpha ground above the No. 1 level of the Standard mine proper. No change of significance has occurred recently in the lower workings of the Standard itself.

ONTARIO.

Cobalt.

During June Nipissing mined ore of an estimated value of \$294,669 and shipped bullion from Nipissing and Custom ores of an estimated value of \$193,403, according to the monthly report. Development was principally sinking at three points for opening the ground for exploration at lower levels. Sinking the winze on vein 102 in 96 tunnel was continued to a depth of 170 ft., at which point keewatin was encountered. A station was put in at 155 ft. and crosscutting to the vein is now in progress. Future work in connection with veins 102 and 96 will be done from the 90-ft. and 155-ft. levels. At 81 shaft, the station and preliminary crosscuts were completed at the 520-ft. level and sinking was resumed to 575 ft., at which point the shaft encountered keewatin. The character of the rock between 520 and 575 ft. does not appear favorable for deposition of ore. Crosscutting to the Cobalt Lake fault-vein is now progressing at the 425 and 520-ft. levels. The vein will be reached at the 425-ft. level before the end of July. Work at 80 shaft was mainly confined to sinking the new winze at the 200 level, from which a large area of favorable ground in the southern portion of the lot will be explored. The present depth of the winze is 186 ft. The 2nd level is now being put in at 180 ft. Keewatin is expected at 193 ft. The first level station is in at 115 ft. and as soon as sinking has been completed crosscutting at both levels will be started. Some stoping was done on a branch vein.

Boston Creek.

The shaft has been completed to the 200 level and drifting started at the R. A. P. Syndicate property. Two shifts are drilling and three mucking. The intention is to drift 300 ft. west, after which a crosscut will be started to cut a parallel vein about 200 ft. distant, in the swamp, to the south, and a showing 12 ins. wide on surface. It is proposed to raise a vertical shaft from this crosscut for ventilation. At a depth of 35 ft. the main ore shoot was first located in sinking. The width at that point was 10 ins., but assays from it gave as high as \$530 gold. The shoot cut off to the east and was again picked up in a drift on the 100 level. Assay values as high as \$61 were obtained at the latter level and at this point the ore shoot was found to have widened out to 6 ft. It is hoped to again locate this at the 200 level in the east drift. On the west drift at the 100 level an ore shoot 12 ins. wide and of a good grade was found and it is hoped to pick this up also on the 200 level in the west drift. Drifting will go on east and west as on the upper level. On the 100 level 175 ft. of drifting has been done to the west and 225 to the east. The syndicate will ship some of the high grade ore and a bumping table is being put in for separating it. It is expected that shipments will be started about Sept. 1. Nothing definite has been decided upon regarding a mill as yet, because the ore body has not been investigated thoroughly enough.

Porcupine.

The Triumph Mining Co. is operating the Success Gold Mines, Ltd., on an option. Three shifts are working and about 60 ft. of crosscutting each way has been done from the 300 level, the lowest point reached. The Triumph began operations on March 3 last. Free gold was found at several points in the sinking of the shaft and in many places assays of as high as \$1.25 a ton in gold have been obtained from the country rock adjacent to the vein. The indications are of the best, and with good showings at upper levels it was considered advisable to go deeper and carry on exploratory work from the 200. The company has a steam-driven compressor plant, purchased from the Jupiter. Two drills are being used, crosscutting both ways from the shaft, north and south. The 100-ft. level assays of \$8.80 were obtained. The vein there was broken up, however, and the crosscut now being continued from it is hoped to pick this up in the lower level. The rock has been giving low assays all the way down. The shaft was sunk at an incline of 62°. The vein followed the latter for 49 ft., when it cut out. At a depth of 10 ft. one assay as high as \$23.80 was obtained. A number of narrow stringers or bands have been cut in crosscutting and these seem to give fairly high assays.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Anrep, Aleph.—*Investigation of the Peat Bogs and Peat Industry of Canada, 1913-1914*. [Each bog-area is described separately and grouped by provinces in which they are located. Notes on foreign peat production are given].—Canada Dept. of Mines, Mines Branch Bull. 11; pp 185*.

Dominian, Leon.—*Fuel in Turkey*. [Coal and petroleum are reviewed separately by the places in which they occur. The production, location and nature of the deposits are given].—Bull. A. I. M. E. June 1916; p 1011; pp 20*; 35c.

Glenn, L. C.—*The General Features of the Tennessee Coal Field North of the Tennessee Central Railroad*. [A review of the geology of the formation, coals and mining operations in the area].—Res. of Tenn. July 1916; p 127; pp 28*.

Johnson, R. H.; Huntley, L. G.—*Principles of Oil and Gas Production*. [Treats on the nature and genesis of the deposits, methods of drilling and prospecting, methods of operating and last an economic geological review of oil and gas].—Wiley & Sons; book; pp 371*; \$3.75.

Nelson, W. A.—*The Tennessee Coal Field South of the Tennessee Central Railroad*. [Describes the geology, mining and nature of the coals in general for the entire area and separately for the different districts].—Res. of Tenn. July 1916; p 155; pp 29*.

Palmer, L. A.—*The Yellow Pine District, Nev.* [Describes the district, its geology and nature of the ore deposits found there. The systems of mining and milling are then reviewed and some details given].—E. & M. J. July 15 1916; p 123; pp 3*; 25c.

Phalen, W. C.; Hicks, W. B.—*Potash Salts in 1915*. [Chemical qualitative tests and methods of analysis are also given. The economic geology and occurrence of this mineral are reviewed with an account of the progress made in developing the resources in this country].—Min. Res. of U. S. II:12; pp 39.

Probert, Frank H.—*Surficial Indications of Copper*. [Information on the physical and chemical properties of outcrops indicating copper deposits].—M. & S. P. July 15 1916; p 81; pp 7*; 20c.

Reid, J. H.—*Sundown Tin and Copper Mine, Ballandean, Queensland, Australia*. [On the geology of the deposit, working of the mine and concentrating of the ores].—Queen. Govt. Mg. Jnl. June 15 1916; p 260; pp 134*; 35c.

Reid, J. H.—*The Comet Mine, Sundown, Ballandean, Queensland, Australia*. [A geological description of the ore deposits and ore].—Queen. Govt. Mg. Jnl. June 15 1916; p 258; pp 2*; 35c.

II. ORES AND METALS

(1) METALS AND ORES

Alloys

Cain, J. R.; Schramm, E.; Cleaves, H. E.—*Preparation of Pure Iron and Iron Carbon Alloys*. [Laboratory investigations the results of which may be used in large plant operation].—U. S. Bur. of Stand. Sci. Paper 266; pp 25*; 20c.

Corse, W. M.; Comstock, G. F.—*Tests of Aluminum Bronze*. [Abst. from a paper read before the American Soc. for Testing Materials. Curves are shown and it is stated that a double heat treatment increases the resistance to alternating stresses].—Iron Age July 13 1916; p 80; pp 134*; 30c.

Fahrenwald, Frank A.—*The System Tungsten-Molybdenum*. [Treats on the metallography, physical characters and thermic properties of tungsten-molybdenum alloys].—Bull. A. I. M. E. June 1916; p 1049; pp 7*; 35c.

Jeffries, Zay.—*Tungsten-Molybdenum Equilibrium Diagram and System of Crystallization*. [A method for the determination of the melting point of metals and alloys with high fusion points].—Bull. A. I. M. E. July 1916; p 1225; pp 12*; 35c.

Aluminum

Corse, W. M.; Comstock, G. F.—*Tests of Aluminum Bronze*. [Abst. from a paper read before the American Soc. for

Testing Materials. Curves are shown and it is stated that a double heat treatment increases the resistance to alternating stresses].—Iron Age July 13 1916; p 80; pp 134*; 30c.

Strong, William.—*Electro-Metallurgical Uses of Surplus Power*. [On the possible uses to which the excess hydro-electric power of our western states might be put].—Jnl. Elect. Power & Gas July 15 1916; p 43; pp 3*; 35c.

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Guess, G. A.; Lathe, F. E.—*An Investigation Into the Flowing Temperatures of Copper Mattes and of Copper-Nickel Mattes*. [A number of tests and investigations to determine the temperature at which the two mattes will flow].—Bull. A. I. M. E. June 1916; p 1067; pp 6*; 35c.

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Reid, J. H.—*Sundown Tin and Copper Mine, Ballandean, Queensland, Australia*. [On the geology of the deposit, working of the mine and concentrating of the ores].—Queen. Govt. Mg. Jnl. June 15 1916; p 260; pp 134*; 35c.

Reid, J. H.—*The Comet Mine, Sundown, Ballandean, Queensland, Australia*. [A geological description of the ore deposits and ore].—Queen. Govt. Mg. Jnl. June 15 1916; p 258; pp 2*; 35c.

Samuel, J. Moore.—*Determination of Dust Losses at the Copper Queen Reduction Works*. [Methods of testing and formulas used in computation are given].—Bull. A. I. M. E. June 1916; p 1079; pp 20*; 35c.

Scott, W. A.—*Plant Construction of the New Cornelia Copper Co., Arizona*. [Electric power is used and the ores are refined by electrolysis and leaching].—Mg. World July 15 1916; p 89; pp 334*; 10c.

Scott, David B.—*Stoping Methods of the Miami Copper Co., Arizona*. [On the methods of haulage and stoping used in extracting this large body. Several stoping methods are being used].—Bull. A. I. M. E. June 1916; p 1031; pp 17*; 35c.

Thum, E. E.—*Cost Accounting in the Construction and Operation of a Copper*

Smelter. [From experience at the Anaconda Copper Co.'s plant].—Met. & Chem. Engg. July 15 1916; p 96; pp 4¾; 30c.

——— *Japanese Mining Expansion.*—E. & M. J. July 15 1916; p 143; pp 1; 25c.

Gold Fields and Mining

Ball, L. C.—*Maxwellton Goldfield.* [Reviews mining operations and production in the district].—Queen. Govt. Mg. Jnl. June 15 1916; p 261; pp 1¾*; 35c.

Blackstone, Richard.—*A History of the Homestake Mine, S. D.* [Abst. from *Pasasapa Quarterly*. Reviews the progress of the company, mill and mines].—Mg. World July 15 1916; p 99; pp 3¾*; 10c.

——— *Rhodesia Chamber of Mines Executive Committee Report and Output of Gold and Other Minerals in April, 1916.* [The output of separate producers is given].—Rhodesia Chamber of Mines Report April 1916; pp 5.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron and Steel

Becker, A. J.—*The Strength and Stiffness of Steel Under Biaxial Loading.* [Shows curves and gives the results of many tests in tabulated form with discussion].—Univ. of Ill. Bull. 85; pp 65*.

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Sherry, Ralph H.—*Crystallization in Cold Worked Steel.* [A paper read before the Society of Automobile Engineers].—Iron Age July 13 1916; p 76; pp 3*; 30c.

Lead

Palmer, L. A.—*The Yellow Pine District, Nev.* [Describes the district, its geology and nature of the ore deposits found there. The system of mining and milling are then reviewed and some details given].—E. & M. J. July 15 1916; p 123; pp 3*; 25c.

Tournay-Hinde, A. W.—*The Flow of Air in Lead Blast Furnaces.* [A paper read before the Engg. Assn. of New South Wales. Reviews investigations made along this line in Australia].—Mg. & Engg. Rev. June 5 1916; p 229; pp 1¾; 35c.

——— *Concentration and Flotation of Lead Ores in Southeast Missouri.* [Editorial correspondence].—Met. & Chem. Engg. July 15 1916; p 93; pp 3; 30c.

Molybdenum

Fahrenwald, Frank.—*The System Tungsten-Molybdenum.* [Treats on the metallography, physical characters and thermic properties of tungsten-molybdenum alloys].—Bull. A. I. M. E. June 1916; p 1049; pp 7*; 35c.

Robertson, A. J.—*Tungsten-Molybdenum Ore Concentration.* [Abst. of an article in a bulletin of the Geol. Surv. of West Australia].—E. & M. J. July 15 1916; p 126; pp 1¾; 25c.

Silver

Palmer, L. A.—*The Yellow Pine District, Nev.* [Describes the district, its geology and nature of the ore deposits found there. The systems of mining and milling are then reviewed and some details given].—E. & M. J. July 15 1916; p 123; pp 3*; 25c.

Reid, J. H.—*The Comet Mine, Sundown, Ballandean, Queensland, Australia.* [A geological description of the ore deposits and ore].—Queen. Govt. Mg. Jnl. June 15 1916; p 258; pp 2*; 35c.

Silver, Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Grossberg, Alexander.—*Separating Wolframite from Tin in Bolivia.* [Details of the operations are given].—E. & M. J. July 15 1916; p 139; pp ¾; 25c.

Matheson, A. M.—*Notes on the Chemical Assay of Tin Ores.* [From the proceedings of the Aust. Inst. of Mg. Engg. Details of procedure for wet methods and fire assay are given].—Mg. & Engg. Rev. June 5 1916; p 221; pp 2½; 35c.

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Reid, J. H.—*The Comet Mine, Sundown, Ballandean, Queensland, Australia.* [A geological description of the ore deposits and ore].—Queen. Govt. Mg. Jnl. June 15 1916; p 258; pp 2*; 35c.

Tungsten

Fahrenwald, Frank A.—*The System Tungsten-Molybdenum.* [Treats on the metallography, physical characters and thermic properties of tungsten-molybdenum alloys].—Bull. A. I. M. E. June 1916; p 1049; pp 7*; 35c.

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Zinc

Palmer, L. A.—*The Yellow Pine District, Nev.* [Describes the district, its geology and nature of the ore deposits found there. The systems of mining and milling are then reviewed and some details given].—E. & M. J. July 15 1916; p 123; pp 3*; 25c.

——— *Japanese Mining Expansion.*—E. & M. J. July 15 1916; p 143; pp 1; 25c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Dominian Leon.—*Fuel in Turkey.* [Coal and petroleum are reviewed separately by the places in which they occur. The production, location and nature of the deposits are given].—Bull. A. I. M. E. June 1916; p 1011; pp 20*; 35c.

Glenn, L. C.—*The General Features of the Tennessee Coal Field North of the Tennessee Central Railroad.* [A review of the geology of the formation, coals and mining operations in the area].—Res. of Tenn. July 1916; p 127; pp 28*.

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Warden-Stevens, F. J.—*Coal Shipping*

from South Africa. [Describes several shipping appliances and arrangements].—Colly Guard. June 30 1916; p 1229; pp 2¾*; 35c.

Warren, H. M.—*Electrical Distribution and Application in Mines.* [On the fastening and placing of cables underground in coal mines].—Coal Age July 15 1916; p 98; pp 5¾*; 20c.

Petroleum

Dominian, Leon.—*Fuel in Turkey.* [Coal and petroleum are reviewed separately by the places in which they occur. The production, location and nature of the deposits are given].—Bull. A. I. M. E. June 1916; p 1011; pp 20*; 35c.

Hamilton, W. R.—*The California Gasoline Industry.*—Bull. A. I. M. E. June 1916; p 1073; pp 5; 35c.

Johnson, R. H.; Huntley, L. G.—*Principles of Oil and Gas Production.* [Treats on the nature and genesis of the deposits, methods of drilling and prospecting, methods of operating and last an economic geological review of oil and gas].—Wiley & Sons; book; pp 371*; \$3.75.

Fuels Miscellaneous

Cooper, Stanley, G.—*The Production and Use of Power and Its Relation to Fuel Economy.*—I. & C. Tr. Rev. June 30 1916; p 743; pp 1½*; 35c.

Johnson, J. E., Jr.—*Blast Furnace Irregularities and Their Treatment.* [Tells of remedies for and discusses many things unusual in furnace operation, such as a chilled hearth].—Met. & Chem. Engg. July 15 1916; p 69; pp 8*; 30c.

Peabody, E. H.—*Oil Fuel.* [A paper read before the International Engineering Congress].—Pract. Eng. July 15 1916; p 607; pp 6¾; 20c.

III. TECHNOLOGY

MINES AND MINING

Prospecting

Bowles, Oliver.—*The Technology of Marble Quarrying.* [Takes up methods of operation and accounting with a study of the mineralogical constituents of the rock which tend to vary its properties and grade].—U. S. Bur. of Mines Bull. 106; pp 174*; 40c.

Dunstan, B.—*Queensland Mineral Deposits.* [A review of occurrence, production, values and prospects of mica in Queensland, Australia].—Queen. Govt. Mg. Jnl. June 15 1916; p 263; pp 2; 35c.

Johnson, R. H.; Huntley, L. G.—*Principles of Oil and Gas Production.* [Treats on the nature and genesis of the deposits, methods of drilling and prospecting, methods of operating and last an economic geological review of oil and gas].—Wiley & Sons; book; pp 371*; \$3.75.

Probert, Frank H.—*Surficial Indications of Copper.* [Information on the physical and chemical properties of outcrops indicating copper deposits].—M. & S. P. July 15 1916; p 81; pp 7*; 20c.

——— *Coal Miners' Pocketbook.* [Gives rules, principles, formulas and tables].—McGraw-Hill Co.; book; pp 1172*; \$1.

Surveying and Drafting

Burton, George E.—*Dip and Strike Calculations from Drill-Hole Data.* [Formulas and graphic illustrations of the same

are derived and described].—E. & M. J. July 15 1916; p 136; pp 1½*; 25c

Jakins, G. F.; Coulter, L. J.—*Slope Surveying at Mount Lyell, Australia*. [A paper read before the Australian Inst. of Mg. Eng.].—E. & M. J. July 15 1916; p 129; pp 4¼*; 25c.

Marshall, R. B.—*Triangulation in California, 1913-1915*. [Gives the location and data on triangulation stations established].—U. S. G. S. Bull. 644-C; pp 60*.

Drilling and Boring

Bowles, Oliver.—*The Technology of Marble Quarrying*. [Takes up methods of operation and accounting, with a study of the mineralogical constituents of the rock which tend to vary its properties and grade].—U. S. Bur. of Mines Bull. 106; pp 174*; 40c.

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Explosives and Blasting

Burrell, G. A.; Robertson, I. W.—*Effects of Temperature and Pressure on the Explosibility of Methane-Air Mixtures*. [A review of the results of experimental work].—U. S. Bur. of Mines Tech. Paper 121; pp 14*; 15c.

Johnson, J. E., Jr.—*Blast Furnace Irregularities and Their Treatment*. [Tells of remedies for and discusses many things unusual in furnace operation, such as a chilled hearth].—Met. & Chem. Engg. July 15 1916; p 69; pp 8*; 30c.

Weston, E. M.—*Explosives and Their Use*. [Abst. from Practical Mining on the Rand].—Mg. & Engg. Rev. June 5 1916; p 216; pp 4¾*; 35c.

Supports: Timbers, Props, Stowing

Scott, David B.—*Stopping Methods of the Miami Copper Co., Arizona*. [On the methods of haulage and stowing used in extracting this large body. Several stopping methods are being used].—Bull. A. I. M. E. June 1916; p 1031; pp 17*; 35c.

Hoists and Hoisting

Bowles, Oliver.—*The Technology of Marble Quarrying*. [Takes up methods of operation and accounting, with a study of the mineralogical constituents of the rock, which tend to vary its properties and grade].—U. S. Bur. of Mines Bull. 106; pp 174*; 40c.

Haulage and Conveying

Blackstone, Richard.—*A History of the Homestake Mine, S. D.* [Abst. from Pahasapa Quarterly. Reviews the progress of the company, mill and mines].—Mg. World July 15 1916; p 99; pp 3¼*; 10c.

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Warren, H. M.—*Electrical Distribution and Application in Mines*. [On the fastening and placing of cables underground in coal mines].—Coal Age July 15 1916; p 98; pp 5¼*; 20c.

—*The Plant of the Dolomite Products Co., Narlo, Ohio*. [The plant description includes excavating in the open-pit, on surface and haulage of the broken materials].—Excavating Eng. July 1916; p 371; pp 4*; 20c.

Production

Anrep, Aleph.—*Investigation of the Peat Bogs and Peat Industry of Canada, 1913-1914*. Each bog-area is described separately and grouped by provinces in which they are located. Notes on foreign peat production are given].—Canada Dept. of Mines, Mines Branch Bull. 11; pp 185*.

Ball, L. C.—*Marxwellton Goldfields*. [Reviews mining operations and production in the district].—Queen. Govt. Mg. Jnl. June 15 1916; p 261; pp 1¾*; 35c.

Bastin, Edson S.—*Graphite in 1915*. [A general review is made, as well as one by states for production. The market and prices are reviewed separately].—Min. Res. of U. S. II:11; pp 13.

Diller, J. S.—*Talc and Soapstone in 1915*. [The usual account of production and conditions of the trade for the year].—Min. Res. of U. S. II:9; pp 4.

Dominian, Leon.—*Fuel in Turkey*. [Coal and petroleum are reviewed separately by the places in which they occur. The production, location and nature of the deposits are given].—Bull. A. I. M. E. June 1916; p 1011; pp 20*; 35c.

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—*Japanese Mining Expansion*.—E. & M. J. July 15 1916; p 143; pp 1; 25c.

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Accounts and Bookkeeping.

Bowles, Oliver.—*The Technology of Marble Quarrying*. [Takes up methods of operation and accounting, with a study of the mineralogical constituents of the rock which tend to vary its properties and grade].—U. S. Bur. of Mines Bull. 106; pp 174*; 40c.

Thum, E. E.—*Cost Accounting in the Construction and Operation of a Copper Smelter*. [From experience at the Anaconda Copper Co.'s plant].—Met. & Chem. Engg. July 15 1916; p 96; pp 4¼; 30c.

—*Accounting and Engineering Show Results*. [Argues that the accounting, executive and engineering departments should work in harmony].—Coal Age July 15 1916; p 104; pp 2¼; 20c.

MILL AND MILLING

Sampling

Shaw, Edmund N.—*Discrepancies in Cyanidation*. [Speaks of discrepancies from theft, leakage, waste, estimation of tonnage, sampling and assaying].—M. & S. P. July 15 1916; p 92; pp 2¼; 20c.

Crushing, Grinding, Etc.

Blackstone, Richard.—*A History of the Homestake Mine, S. D.* [Abst. from Pahasapa Quarterly. Reviews the progress of the company, mill and mines].—Mg. World July 15 1916; p 99; pp 3¼*; 10c.

Flotation:

Anderson, R. J.—*The Flotation of Min-*

erals. [A paper read before the A. I. M. E., discussing the phenomena and operations of flotation].—Met. & Chem. Engg. July 15 1916; p 82; pp 4¼; 30c.

—*Concentration and Flotation of Lead Ores in Southeast Missouri*. [Editorial correspondence].—Met. & Chem. Engg. July 15 1916; p 93; pp 3; 30c.

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Grossberg, Alexander.—*Separating Wolframite from Tin in Bolivia*. [Details of the operations are given].—E. & M. J. July 15 1916; p 139; pp ¾; 25c.

Palmer, L. A.—*The Yellow Pine District, Nev.* [Describes the district, its geology and nature of the ore deposits found there. The systems of mining and milling are then reviewed and some details given].—E. & M. J. July 15 1916; p 123; pp 3*; 25c.

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Blackstone, Richard.—*A History of the Homestake Mine, S. D.* [Abst. from Pahasapa Quarterly. Reviews the progress of the company, mill and mines].—Mg. World July 15 1916; p 99; pp 3¼*; 10c.

Cyaniding

Blackstone, Richard.—*A History of the Homestake Mine, S. D.* [Abst. from Pahasapa Quarterly. Reviews the progress of the company, mill and mines].—Mg. World July 15 1916; p 99; pp 3¼*; 10c.

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Shaw, Edmund N.—*Discrepancies in Cyanidation*. [Speaks of discrepancies from theft, leakage, waste, estimation of tonnage, sampling and assaying].—M. & S. P. July 15 1916; p 92; pp 2¼; 20c.

Mill and Smelter Costs

Thum, E. E.—*Cost Accounting in the Construction and Operation of a Copper Smelter*. [From experience at the Anaconda Copper Co.'s plant].—Met. & Chem. Engg. July 15 1916; p 96; pp 4¼; 30c.

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Chemistry

Howry, H. W.—*A New Method of Expressing Protective Alkalinity*. [The chemistry of the same is gone into and a chart reproduced].—E. & M. J. July 15 1916; p 139; pp ¾*; 25c.

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Anrep, Aleph.—*Investigation of the Peat Bogs and Peat Industry of Canada, 1913-1914*. [Each bog-area is described separately and grouped by provinces in which they are located. Notes on foreign peat production are given].—Canada Dept. of Mines, Mines Branch Bull. 11; pp 185*.

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Electrometallurgy

Johnson, J. E., Jr.—*Blast Furnace Irregularities and Their Treatment*. [Tells of remedies for and discusses many things unusual in furnace operation, such as a chilled hearth].—Met. & Chem. Engg. July 15 1916; p 69; pp 8*; 30c.

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Scott, W. A.—*Plant Construction of the New Cornelia Copper Co., Arizona*. [Electric power is used and the ores are refined by electrolysis and leaching].—Mg. World July 15 1916; p 89; pp 3½*; 10c.

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Guess, G. A.; Lathe, F. E.—*An Investigation Into the Flowing Temperatures of Copper Mattes and of Copper-Nickel Mattes*. [A number of tests and investigations to determine the temperature at which the two mattes will flow].—Bull. A. I. M. E. June 1916; p 1067; pp 6*; 35c.

Samuel, J. Moore.—*Determination of Dust Losses at the Copper Queen Reduction Works*. [Methods of testing and formulas used in computation are given].—Bull. A. I. M. E. June 1916; p 1079; pp 20*; 35c.

Thum, E. E.—*Cost Accounting in the*

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Pierce, H. J.—*Necessity for Water Power Development*. [A discussion of the question of hydro-electric installations which are today being held back some].—Mg. World July 15 1916; p 103; pp 1½; 10c.

Strong, William.—*Electro-Metallurgical Uses of Surplus Power*. [On the possible uses to which the excess hydro-electric power of our western states might be put].—Jnl. Elect. Power & Gas July 15 1916; p 43; pp 3*; 35c.

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IV. MISCELLANEOUS

MISCELLANEOUS

Testing

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Guess, G. A.; Lathe, F. E.—*An Investigation Into the Flowing Temperatures of Copper Mattes and of Copper-Nickel Mattes*. [A number of tests and investigations to determine the temperature at which the two mattes will flow].—Bull. A. I. M. E. June 1916; p 1067; pp 6*; 35c.

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Phalen, W. C.; Hicks, W. B.—*Potash Salts in 1915*. [Chemical qualitative tests and methods of analysis are also given. The economic geology and occurrence of this mineral are reviewed, with an account of the progress made in developing the resource in this country].—Min. Res. of U. S. II:12; pp 39.

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General Miscellany

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Ore and Metal Markets; Prices-Current

New York, July 27, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended July 26 were as follows:

		New York. Cts.	London. Pence.
July 21.....	63½	30 3/16	
22.....	63½	30 3/16	
24.....	63¼	30½	
25.....	62½	29 15/16	
26.....	63¼	30½	

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York—1916			London—1915	
	High.	Low.	Avg.	Avg.	Avg.
January	57½	55½	56.775	48.890	26.875
February	57	56½	56.755	48.477	27.000
March	60¾	56½	57.935	49.926	27.080
April	73½	60½	64.415	50.034	31.375
May	77¼	68¾	73	49.915	34.182
June	68¾	62¾	64.175	49.072	31.038
July .....	.....	.....	.....	47.519	22.950
August .....	.....	.....	.....	47.178	22.750
September .....	.....	.....	.....	48.68	23.600
October .....	.....	.....	.....	49.285	23.923
November .....	.....	.....	.....	51.713	24.640
December .....	.....	.....	.....	55.038	26.232
Year .....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Until the past day or two the situation in copper presented nothing of a noteworthy character. Business was wholly lacking, neither resellers nor first hands reporting even inquiries from consumers. There has come a change that may mark the beginning of a renewal of activity. Some good inquiries are said now to be in this market and at least one of the larger selling interests has been offered business on the condition that concessions are made. Up to the present time this dealer has rejected the bids, and, as middle class of producers seems more inclined to put their prices nearer the views of consumers, the business tendered may be secured by them. Although the leading producers and sellers continue to quote 29¼ cts. for October and 29 cts. for November-December, these are merely nominal quotations, as no contracts have been closed at them for weeks past. Among resellers there is a well defined appearance of weakness which finds expression in current reports of offerings for forward delivery at price concessions.

It is contended, however, by usually well informed authorities that a really large order could only be covered by the principal interest, and if such business is placed it would be on the basis of the figures now quoted by that factor. The view prevailing with consumers is that the chief sellers are maintaining their prices at the present high level because they sold larger quantities of copper months ago at or near the figures now quoted, and that their present attitude is assumed as much for the protection of the buyers of those lots of the metal as for any other reason. But the continued dullness of the market seems to have got on the nerves of second hands, with the result that offerings have been heard of at 24½@25 cts. for spot and nearby electrolytic.

At the same time there are reports that some of the producers are ready to close July-August contracts in fairly large lots at 26½ cts., and later months at 26¼@27 cts. To consumers in general, however, such offerings do not appeal and although a considerable amount of buying remains to be done by them they display no inclination to hasten purchases, except in the instance above noted. A reason for this is found in the belief quite widely entertained that the continued absence of the foreign buying interest which has hitherto been the dominant sustaining factor is inevitably making for a decline in market values of the red metal.

Among certain observers the apparent weakness of resellers is attributed to the usual end of the month influences, which are apt to operate even in normal times, namely, the desire of those who have overbought to liquidate some of

their holdings. These second hands, who are consumers, have come into the market to sell their surplus, is the contention, so that the abnormal condition of spot copper selling under futures is the result.

A representative of one of the principal dealers in commenting on the prevailing abnormal price conditions, said that, in view of the large buying movement which ended some 2 months ago, he did not consider it as unusual. "These are abnormal times," he continued, "and we must look for extraordinary conditions to prevail. The larger interests, because of their sold up condition, as indicated by their bookings, do not feel that any change is necessary at this time. There is much business in sight and this must come sooner or later."

"When a buying movement actually starts again it is not at all unlikely that another rush in prices will be witnessed. Some of the users of copper in this country have been holding off, it is true, but they are gradually getting into a position where they will be forced to buy regardless of prices. Whether they will purchase sparingly on the hand-to-mouth basis or for some time in advance will depend in my opinion by the condition of the market at the time they begin their activities."

In London electrolytic copper displayed marked weakness during the earlier part of the week, but later recovered somewhat, going from £121 back to £122. Standard copper in the English market has further advanced 10/- within the week, closing firm.

Quotations for copper per pound at New York for the week ending July 26 were as follows:

(For Third Quarter Delivery.)

		Lake.	Electrolytic.
July 21.....	25	25	25
22.....	25	25	25
24.....	24½	24½	24½
25.....	24½	24½	24½
26.....	24½	24½	24½

Quotations for copper per ton in London for the week ending July 26 were as follows:

July	21.....	Standard		Futures.	Electrolytic.
		Spot.	.....	
21.....	21.....	£91 0 0	£89 0 0	£122 0 0	£122 0 0
22.....	22.....	91 0 0	89 0 0	122 0 0	122 0 0
24.....	24.....	94 0 0	91 0 0	122 0 0	122 0 0
25.....	25.....	94 0 0	91 0 0	122 0 0	122 0 0
26.....	26.....	94 0 0	91 0 0	122 0 0	122 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July .....	.....	.....	.....	19.423
August .....	.....	.....	.....	17.472
September .....	.....	.....	.....	17.758
October .....	.....	.....	.....	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July .....	.....	.....	.....	19.08
August .....	.....	.....	.....	17.222
September .....	.....	.....	.....	17.705
October .....	.....	.....	.....	17.859
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York—1916			London—1915	
	High.	Low.	Avg.	1916.	1915.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	24.00	25.25	24.38	94.316	82.350
July .....	.....	.....	.....	.....	74.807
August .....	.....	.....	.....	.....	67.850
September .....	.....	.....	.....	.....	68.560
October .....	.....	.....	.....	.....	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—A somewhat brighter hue has been imparted to the prospect by a renewal of buying interest the past week. A fair amount of business in futures has been consummated and some sales of spot tin have also been put through. Buyers were attracted by the lower range of values reached after the recently protracted decline, but holders were prompt to raise their quotations on receipt of orders, while London and Singapore followed with a proportionate advance. In some quarters the belief is entertained that the end of the bear raid has been seen, but on the other hand, while the market may remain firm, consumers have indicated that they will not go much above the present quotation in the condition of affairs now obtaining. It is pointed out that tin is arriving freely, as a result, no doubt, of absence of difficulties encountered in the securing of export permits, while users are insured against a sudden shortage by their substantial holdings bought a while back. On this basis it is held that they are in a position to keep prices from advancing unduly.

As a matter of fact, prices have receded a little from the high point of the week. Futures have advanced during the interval to 38¼ cts. for August, 38 cts. for September, 37½ cts. for October, 37¼ cts. for November and December. The premium on spot over the late months is now only ½ ct., which is asserted by sellers to indicate the firmness of the latter.

The advance in the foreign market has not fully covered the losses sustained on last week's slump. Singapore closed with week at £171 10s, showing a net gain of £6, while London advanced £2 5s on spot tin.

Quotations on tin per pound at New York and per ton at London for the week ending July 26 were as follows:

Month.	New York—1916		London—1915	
	Spot.	July.	Straits, spot.	Singapore.
July 20.....	41.00c	.....	£169 10 0	£166 0 0
21.....	38.75c	.....	168 5 0	170 0 0
22.....	38.75c	.....	168 5 0	171 0 0
24.....	38.25c	.....	166 5 0	171 10 0
25.....	38.25c	.....	166 0 0	171 0 0
26.....	38.25c	.....	165 0 0	171 10 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July .....	.....	.....	.....	37.498
August .....	.....	.....	.....	34.386
September .....	.....	.....	.....	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.756
Year .....	.....	.....	.....	38.664

Lead.—The dullness in the spot market has been relieved somewhat by business on export account, but at the expense of much cutting of prices by outside sellers. The domestic consumers are well covered for this month and are waiting for a readjustment of prices in August, which they believe to be inevitable. The absence of new munition business that would require the use of lead is counter to the hopes of sellers, who had expected a renewal of buying for war purposes. Statistically the position of lead is held to be excellent. Stocks are at a low point and are now accumulating, according to all accounts, for producers are averse to letting them accumulate. When consumers do not come forward producers go after them and cut prices to the necessary extent to bring business. That is indicated by the fact that on the late buying Missouri producers were the cheap sellers. But when consumers are in need of lead for prompt delivery

they are likely to have to pay stiffer prices, at least on anything other than Missouri brands. All of which reflects the limited extent of stocks on hand.

The recent export transactions, according to some accounts, covered a considerable amount of lead, Canada, as well as Europe, doing the buying. The fact that the American Smelting & Refining Co. has not changed its quotation is accepted as an indication that its present price of 6.50 will be continued during the balance of the month.

Quotations for lead per pound at New York and per ton at London for the week ended July 26 were as follows:

Month.	New York—1916			London—1915		
	Indpts.	A. S. & R. Co.	6.50c	Spot.	7 6	Futures.
July 20.....	6.30c	6.50c	.....	£31 7 6	£30 17 6	.....
21.....	6.35c	6.50c	.....	31 0 0	30 12 0	.....
22.....	6.30c	6.50c	.....	28 12 0	26 10 0	.....
24.....	6.30c	6.50c	.....	27 15 0	26 0 0	.....
25.....	6.50c	6.50c	.....	28 12 0	26 0 0	.....
26.....	6.50c	6.50c	.....	27 0 0	26 0 0	.....

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York—1916			London—1915	
	High.	Low.	Avg.	1916.	1915.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July .....	.....	.....	.....	5.738	25.611
August .....	.....	.....	.....	4.750	22.160
September .....	.....	.....	.....	4.627	22.953
October .....	.....	.....	.....	4.612	23.932
November .....	.....	.....	.....	5.152	26.240
December .....	.....	.....	.....	5.346	28.884
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—Production in the Missouri-Kansas-Oklahoma district was a little off last week, because of a breakdown at the plant of the Empire District Electric Co. The market was a little weaker than during the previous week and \$70 was the price at which most ore went, though a very small amount brought \$73. There were produced in the district during the week ended July 22 1,835,950 lbs. of concentrates, bringing the total for the year to 60,867,592 lbs., and these amounts had respective values of \$64,166 and \$2,670,681.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916		1915.	
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	43.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July .....	.....	.....	.....	59.00
August .....	.....	.....	.....	47.50
September .....	.....	.....	.....	48.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—With the spelter market again coming to its own, ores in the Missouri-Kansas-Oklahoma district were selling at better prices during the week ended July 22. The top price remained at \$75, as during the previous week, but the lower grades showed strength in that they were in strong demand at \$50 and in general were bringing better prices than during the previous week. There were produced 9,221,150 lbs. during the week and 393,703,693 lbs. for the year to date. The week's production was valued at \$302,092 and the year's at \$18,336,790.

Calamine.—As during the previous week, this ore remained steady at \$40 to \$50 and there were produced 63,470 lbs. of concentrates, with the total for the year given at 19,027,500 lbs. Total values were given at \$1395 for the week and \$704,348 for the year to date.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916		1915.	
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	109.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July .....	.....	.....	.....	111.00
August .....	.....	.....	.....	60.25
September .....	.....	.....	.....	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—A rather active demand has developed within the past week. In addition to purchases made by consumers France and Great Britain are reported to be seeking larger quantities of spelter here. As a result prices have taken a pronounced upturn. Today's quotation for spot spelter is 10½ cts. St. Louis, while 10¼ cts. is asked for July, 10 cts. for August, 9½ cts. for September and 9¼ cts. for delivery over the last 3 months of the year. Authorities who thought that short covering in St. Louis might cause an advance to 10 cts. a pound, St. Louis, and did not believe that price would be exceeded in the near future, have revised their opinion since the appearance of export buyers in the market. They are now inclined to believe that future prices will be determined wholly by the extent to which foreign governments make their needs felt in this market.

It is noticeable that in the inquiries from abroad the higher grades of spelter are inquired for. At the close, while 10½ cts. St. Louis is the generally prevailing market price, some sellers are refusing to accept less than 11 cts. per pound, and they show little desire to fill any large orders for delivery over the fourth quarter at 9¼ cts. per pound.

Quotations for spelter per pound at New York and per ton at London for the week ending July 26 were as follows:

	New York.		London.	
	Spot.		Spot.	Futures.
July 21.....	9.75c		£54 0 0	£50 0 0
22.....	10.00c		54 0 0	50 0 0
24.....	10.50c		56 0 0	52 0 0
25.....	10.37½c		60 0 0	50 0 0
26.....	10.37½c		59 0 0	53 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York—			London—		
	1916.	1915.		1916.	1915.	
	High.	Low.	Avg.	Avg.	Avg.	
January	19.42½	17.30	18.801	6.519	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	43.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July				20.803		98.150
August				16.110		68.250
September				14.493		64.400
October				14.196		64.196
November				16.875		88.240
December				16.675		89.153
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—The market has remained nominally steady at \$80 a flask since the decline from \$83 a week ago. The situation appears to be that sellers are ready to take advantage of any renewal of demand to advance their pretension, but as the ammunition makers keep out of the market and other classes of consumers are buying no more, if as much as nominally, a further recession of price in the near future would cause no surprise, since there have been some pretty large arrivals recently and second hands are tired of waiting for a higher market.

Antimony.—Although 400 tons have been bought, according to report, by a munition maker, the fact has been without influence to improve the tone of the market, depressed as it is by the heavy stock on hand, and a further decline in prices must be recorded. There are sellers at 14¼ cts. and even that figure might be shaded in some quarters. Offerings at 12½ cts. for shipment in bond from China within a few days are reported to be making.

Nickel.—The situation is without new features. There is a little inquiry for export, but the movement into home consumption continues very slow. Ordinary forms are quoted at 45@50 cts. per pound, as to size and terms of order, while electrolytic commands a premium of 5 cts. per pound.

Aluminum.—Rather more activity has developed and a firmer feeling prevails, with 59@61 cts. per pound asked for No. 1 ingots, New York.

Platinum.—Prices have continued to move downward the closing quotation being \$90, a loss for the week of \$3 to \$5 an ounce, according to seller.

Pig Iron.—The leading feature of the market con-

tinues to be the European demand for bessemer iron, between 20,000 and 30,000 tons having been taken within the past few days, with additional business in sight. The market is very firm, but no higher. Foundry grades remain steady, but are without animation.

Ferromanganese.—There has been no further change in the contract price, the market closing steady at \$1.75 for spot and nearby deliveries. Little business is being done. Spiegeleisen is offered more freely, but is in better demand at \$45@50 at the furnace for 20%.

PRICES-CURRENT.

Acids —Muriatic, 18 deg.....	3.00	to	3.25
Muriatic, 20 deg.....	3.25	to	3.50
Nitric, 36 deg.....	.07½	to	.08
Nitric, 40 deg.....	.08½	to	.08¾
Alcohol —U. S. P., gal. grain.....	2.70	to	2.72
Denatured 133 proof, gal.....	2.68	to	2.70
Wood, 87 p. c.....	.70	to	.71
Alum —Powdered, lb.....	.05½	to	.06
Lump, lb.....	.04	to	.06½
Ground, lbs.....	.041	to	.07½
Ammonia —			
Muriate, white grain, lb.....	.08½	to	.08¾
Muriate, lump.....	.17	to	.18
Arsenic —White, lb.....	.06½	to	.06½
Red, lb.....	.55	to	.60
Barium Chloride —Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.14	to	.15
Bismuth —Metallic, lb.....	3.11	to	3.20
Subnitrate.....	3.10	to	3.15
Blanching Powder —			
Drums, 100 lbs.....	5.00	to	5.75
Brax —100 lbs., car lots.....	8.00	to	8.25
Coke —Connellsville furnace.....	2.50	to	2.75
Foundry.....	3.00	to	3.50
Cepperas —Spot, lb.....	1.50	to	2.00
Ferromanganese —Spot.....	175.00	to	.....
Last half.....	175.00	to	.....
Ferrosilicon , 50%.....			85.00
Ferrotitanium , per lb.....	.08	to	.12½
Fuller's Earth , 100 lbs.....	.80	to	1.05
Glaucous Salts , bags.....	.60	to	.70
Calcined.....			2.50
Iron Ore —			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
White crystals.....	.15%	to	.15%
Broken, cakes.....	.14%	to	.15
Powdered.....	.17	to	.17½
Lead —Granulated, lb.....	.15	to	.15%
Brown sugar.....	.13%	to	.14
Litharge , American, lb.....	.09	to	.09½
Mineral Lubricants —			
Black summer.....	.13	to	.14
20 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 20 gr.....	.37½	to	.38
Wood grade, 30 gr.....	.19½	to	.20
Paraffin —High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.32%	to	.33½
Benzine, 59 to 62°, gal.....	.29	to	.29½
Nickel Salt , double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum —			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum —Oz. ref.....	80.00	to	\$4 00
Potash Fertilizer Salts —			
Kainit, min, 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium —			
Bichromate.....	.39	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.48	to	.50
Prussiate, yellow.....	.95	to	1.00
Prussiate, red.....	3.50	to	4.00
Saltpeter —Crude, lb.....	.15	to	.15½
Refined.....	.27	to	.29½
Soda —Ash, 58% (43% basis), bbl.....	1.25	to	1.50
Strentia Nitrate , casks, lb.....	.48	to	.50
Sulphur —			
Crude, ton.....	28.50	to	29.00
Flowers, 100 lbs.....	2.50	to	2.70
Roll, 100 lbs.....	1.95	to	2.25
Tin —Bichloride, 50°, 100 lbs.....	.13%	to	.14½
Crystals, bbls., lb.....	.30	to	.30½
Oxide, lb.....	.44	to	.46
Zinc Chloride.....	.14	to	.20

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

Dividends on Issued Capitalization.										Dividends on Issued Capitalization.									
NAME OF COMPANY		Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest		NAME OF COMPANY		Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest					
						Date	Amt.							Date	Amt.				
Acacia, g.	Colo.	1,438,989	\$1		\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,916	\$1		\$98,916	Sept.	\$0.01				
Adams, s. l. c.	Colo.	80,000	10		778,000	Dec. 18, '09	.04	Golden Star, g.	Ariz.	400,000	5		120,000	Mar. 15, '10	.05				
Almeek, c.	Mich.	200,000	25		4,650,000	Apr. 10, '16	3.00	Gold' Com. Fra. g.	Nev.	922,000	1		92,111	Oct. 15, '09	.10				
Alaska Goldfields.	Alaska	250,000	5		403,250	Jan. 10, '15	.15	Goldfield Com.	Nev.	2,559,148	10		28,999,831	Oct. 31, '15	.10				
Alaska Mexican, g.	Alaska	180,000	5		3,507,381	Nov. 28, '15	.10	Good Hope, g. s.	Colo.	500	100		941,250	Jan. ....	.25			
Alaska Mines Sec.	U. S.	600,000	25		90,000	Nov. 1, '06	.50	Good Sp. Anchor, z. a.	Nev.	650,000	1	33,000	119,755	June 15, '16	.01				
Alaska Treadwell, g.	Alaska	200,000	25	250,000	15,780,000	May 19, '16	.50	Grand Central, g.	Utah	600,000	1		1,645,200	Dec. 23, '15	.02				
Alaska United, g.	Alaska	180,200	5	54,060	2,045,270	Feb. 28, '16	.30	Grand Gulch, c. s.	Nev.	239,845	2.50	9,594	11,992	June 1, '16	.03				
Alhauze,	Mich.	100,000	25	250,000	350,000	Apr. 10, '16	1.50	Granite, g.	Alaska	430,000	1	17,200	17,200	May 10, '16	.02				
Amalgamated, g.	Mont.	1,538,829	100		103,444,983	Aug. 30, '15	3.77	Gwin, g.	Cal.	100,000	10		481,600	Feb. ....	.25			
Am. Sm. & R. com.	U. S.	600,000	100	1,500,000	30,333,333	June 1, '16	1.50	Hazel, g.	Cal.	900,000	1		1,114,000	Jan. 5, '15	.01				
Am. Sm. & R. pf.	U. S.	600,000	100	1,750,000	56,546,386	June 1, '16	1.75	Hecla, s. l.	Idaho	1,000,000	0.25	650,000	4,405,000	June 20, '16	.16				
Am. Sm. Sec. A pf.	U. S.	300,000	100	510,000	11,210,000	Apr. 1, '16	1.50	Hercules,	Idaho	1,000,000	1	1,450,000	12,200,000	June 15, '16	.20				
Am. Sm. Sec. B pf.	U. S.	300,000	100	750,000	16,360,000	Apr. 3, '16	1.25	Hidden Treasure, g.	Cal.	30,000	10		47,452	Sept. ....	.10			
Am. Zinc, L. & Sm.	Mont.	193,120	25	2,414,000	3,622,825	June 10, '16	12.50	Holy Terror, g.	S. D.	600,000	1		172,000	Jan. ....	.01			
Anacoda, c.	Mont.	2,331,250	50	6,993,750	171,351,771	May 20, '16	1.50	Homestake, g.	S. D.	251,160	100	979,524	36,635,232	June 25, '16	.55				
Annie Laurie, g.	Utah	25,000	100		439,561	Apr. 22, '05	.50	Hope Dev.	Cal.	500,000	1		6,000	Dec. 31, '15	.01				
Argonaut, g.	Cal.	200,000	5	20,000	1,640,000	Mar. 27, '16	.10	Horn Silver, l. s. z.	Utah	400,000	1	40,000	6,182,000	June 30, '16	.05				
Arizona, c.	Ariz.	100,000	25	629,550	20,220,434	Apr. 1, '16	.30	Imperial, c.	Ariz.	600,000	10		300,000	June 24, '07	.20				
Atlantic, c.	Mich.	100,000	25		990,000	Feb. 21, '05	.50	Independence Con., g.	Colo.	2,000,000	1		281,376	Apr. ....	.01			
Bagdad-Chase, g. pf.	Cal.	84,819	6	202,394	Jan. 1, '09	.10	Inspiration Con., g.	Ariz.	920,637	20	1,149,859	1,149,859	May 1, '16	1.25					
Bald Butte, g. s.	Mont.	250,000	25		1,354,648	Nov. 1, '07	.04	Inter'l Nickel, com.	U. S.	1,673,384	25	5,438,438	30,941,333	June 1, '16	2.00				
Baltic, c.	Mich.	100,000	25		7,950,000	Dec. 31, '13	2.00	Inter'l Nickel, pf.	U. S.	89,126	100	267,378	5,614,824	May 1, '16	1.50				
Barnes-King, g.	Mont.	40,000	5	60,000	60,000	June 1, '16	.07	Intern'l Sm. & Ref.	U. S.	100,000	100		4,100,000	May 2, '14	2.00				
Beck Tunnel Con.	Utah	1,000,000	0.10		940,000	July 1, '07	.02	Interstate-Calahan	Idaho	464,930	10	1,394,970	3,952,415	June 30, '16	1.50				
Big Four Expl.	Utah	400,000	1	40,000	50,000	June 15, '16	.05	Iowa, g.	Colo.	1,666,667	1		270,167	Dec. 31, '15	.00				
Bingham-N. Haven	Utah	228,689	6		960,493	Dec. 20, '16	.20	Iowa Tiger, g. s. l.	Colo.	3,000	1		25,179	Jan. 15, '16	.60				
Board of Trade, z.	Wis.	120,000	1	78,000	Jan. 16, '11	.06	Iron Blossom, l. s. g.	Utah	1,000,000	1	150,000	2,650,000	Apr. 15, '16	.10					
Bonanza Dev.	Colo.	300,000	1	1,425,000	Oct. 28, '11	.20	Iron Cap pf. c.	Ariz.	33,481	10		23,381	Dec. 31, '15	.17					
Booth (Reorganized)	Nev.	998,296	5	349,949	349,949	June 25, '16	.05	Iron Clad, g.	Colo.	1,000,000	1		50,000	Nov. ....	.06			
Boss, g.	Nev.	408,500	1	40,850	Dec. 10, '14	.10	Iron Silver,	Colo.	500,000	20		5,050,000	Dec. 31, '15	.10					
Boston & Colo. Sm.	Colo.	15,000	10	402,350	Oct. ....	.75	Isabella, g.	Colo.	2,250,000	1		742,500	Mar. ....	.01			
Bost. & Mont. Con.	Mont.	100,000	25	63,225,000	May 16, '11	4.00	Isle Royale, c.	Mich.	150,000	25		150,000	Mar. 31, '13	1.00					
Brecon, l. s.	Colo.	200,000	25	220,000	Dec. 15, '13	.05	Jamison, g.	Cal.	390,000	10		373,000	Jan. ....	.02				
Brunswick Con. g.	Cal.	300,000	1	203,315	Sept. 15, '15	.05	Jerry Johnson, g.	Colo.	2,500,000	10		187,500	Nov. 5, '14	.00					
Bullion-B. & Champ	Utah	100,000	10	2,768,400	July 11, '08	.10	Jim Butler,	Nev.	1,713,020	1	171,802	34,004	Feb. 2, '16	.10					
Bullwhacker, c.	Mont.	450,000	1	10,000	June 1, '07	.01	Joplin Ore & Spelter	Mo.	400,000	6	44,008	41,008	June 22, '16	.05					
Bunker Hill Con.	Cal.	200,000	1	30,000	851,000	June 4, '18	.02	Jumbo Ext. g.	Nev.	1,550,000	1	13,000	684,398	June 30, '16	.05				
Bunker Hill & Sulph.	Idaho	327,000	10	827,500	17,590,500	June 4, '16	.40	Kendall, g.	Mont.	600,000	5	50,000	1,555,000	Apr. ....	.10			
Butte Alex Scott,	Mont.	75,000	10	844,662	1,064,119	Apr. 10, '16	10.50	Kenebec Zinc,	Mo.	200,000	....	60,000	60,000	June 30, '16	.10			
Butte-Ballaklava, c.	Mont.	250,000	10	125,000	Aug. 1, '10	.50	Kennecott,	Alas.	250,000	10	7,000,000	12,000,000	June 30, '16	1.50					
Butte Coalition, c.	Mont.	1,000,000	15	4,700,000	Dec. 1, '11	.25	Kennedy, g.	Cal.	100,000	100		1,801,001	June ....	.06				
Butte & Superior, z.	Mont.	272,687	10	6,862,933	11,383,017	June 30, '16	10.75	King of Arizona, g.	Ariz.	200,000	1		396,001	Aug. 2, '09	.12				
Caledonia, l. s. c.	Idaho	2,608,000	1	463,900	1,351,631	June 1, '16	.03	Klar Piquet, z.	Wis.	20,000	1		157,500	Dec. 18, '12	.25				
Calumet & Ariz., c.	Ariz.	641,923	10	2,569,676	25,714,031	June 20, '16	2.00	Knob Hill, g.	Wash.	1,000,000	1		70,000	Aug. 1, '13	.00				
Calumet & Hecla, c.	Mich.	100,000	25	3,000,000	132,250,000	June 23, '16	15.00	La Fortuna, g.	Ariz.	250,000	1		1,200,000	Oct. ....	.02			
Camp Bird, g.	Colo.	1,750,000	25	113,684	10,243,964	Jan. 1, '16	.17	Lake View,	Utah	600,000	.05	66,250	102,500	May 10, '16	.02				
Cardiff, l.	Utah	600,000	1	125,000	60,000	June 1, '16	.25	Last Dollar, g.	Colo.	1,500,000	1		180,000	Feb. 23, '03	.02				
Carissa, g. s. c.	Utah	600,000	1	60,000	Dec. ....	.08	Liberty Bell, g.	Colo.	133,551	6		1,752,795	Jan. 31, '16	.05				
Cashier, g.	Colo.	900,000	1	26,160	Apr. ....	.04	Lightner, g.	Cal.	102,255	1		331,179	June ....	.06			
Centennial Eureka,	Utah	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Linden, z.	Wis.	1,020	10		11,200	Dec. 31, '15	.30				
Center Creek, l. z.	Mo.	100,000	10	30,000	580,000	Apr. 1, '16	.25	Little Bell, s. l.	Utah	300,000	1	15,000	75,000	Apr. 22, '16	.06				
Central Eureka, g.	Cal.	100,000	1	799,159	Mar. 5, '06	.05	Little Florence,	Nev.	1,000,000	1		430,000	Jan. ....	.08				
Century, g. s. l.	Utah	1,000,000	1	44,000	392,087	Feb. 15, '16	.06	Lost Packer,	Idaho	160,000	1		37,600	Oct. 23, '13	.26				
Champion, c.	Mich.	100,000	25	3,720,000	13,727,000	June 7, '16	6.40	Lower Mammoth,	Utah	1,000,000	1		67,000	Dec. 15, '15	.01				
Chile Con.	Utah	892,960	1	89,175	439,212	May 15, '16	.05	MacNamara, g. s.	Nev.	734,576	1		46,800	Apr. 23, '06	12.00				
Chino Copper c.	N. M.	800,000	6	3,044,930	9,742,929	June 30, '16	2.25	Magma, c.	Ariz.	240,000	6.00	240,000	450,000	June 30, '16	.50				
C. K. & N. g.	Colo.	1,431,900	1	115,000	Nov. ....	.01	Mannett, g. s. c.	Utah	400,000	10	40,000	2,380,000	Apr. 20, '16	.06				
Cliff, g.	Utah	300,000	10	90,000	Feb. 6, '14	.05	Manhattan-Big 4, g.	Nev.	762,400	1		30,248	Aug. 15, '11	.02					
Clinton, g. s.	Colo.	1,000	100	60,000	Dec. ....	.30	Mary McKinney, g.	Colo.	1,309,252	1		1,169,306	July 28, '16	.02				
Colo. O. Dredging,	Colo.	200,000	10	100,000	425,000	Feb. 23, '16	1.00	May Day,	Utah	800,000	0.25	40,000	284,000	May 28, '16	.02				
Colorado, s. l.	Utah	1,000,000	0.20	2,600,000	Mar. 15, '13	.03	Mary Murphy, g. a. j. z.	Colo.	370,000	5	25,067	93,106	May 1, '16	.07					
Columbus Con. l. z. c.	Utah																		

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid In 1916	Total to Date	Latest						Paid In 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah	600,000	\$ 1	\$	\$85,000	Aug. 9, '06	\$0.04	Success	Ida.	1,600,000	\$1	\$300,000	\$1,080,000	June 23, '16	\$0.03
Pharmacia, g.	Colo.	1,500,000	1		91,600	Feb. 1, '10	.00%	Superior & Pitts. c.	Ariz.	1,499,792	10		10,318,568	Dec. 21, '15	.38
Phelps, Dodge & Co	U. S.	450,000	100	6,400,000	53,771,627	June 30, '16	6.00	Swansea, s. l.	Utah	100,000	5		334,500	Apr. 29, '07	.06
Pioneer, g.	Alaska	5,000,000	1		2,041,626	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25		9,420,000	July 23, '07	4.00
Pittsburg, l. z.	Mo.	1,000,000	1		20,000	July 15, '07	.02	Tamarack-Custer	Idaho	2,000,000	1	80,000	80,000	June 1, '16	.02
Pittsburg-Idaho, l.	Ida.	1,000,000	1		249,104	July 15, '14	.04	Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75
Pitts Silver Peak	Nev.	2,790,000	1		840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100		160,000	Jan. 3, '14	.24
Platteville, l. z.	Wis.	500	60		179,600	June 16, '07	10.00	Tomboy, g. z.	Colo.	310,000	6		3,689,000	Dec. 31, '16	.12
Plumas Eureka, g.	Cal.	160,250	10		2,831,294	Apr. 9, '01	.06	Tom Reed, g.	Ariz.	909,555	1		2,655,934	Sept. 6, '16	.01
Plymouth Con.	Cal.	240,000	6	68,250	231,050	Apr. 10, '18	.24	Ton. Belmont, g.	Nev.	1,500,000	1	375,008	8,018,026	Apr. 1, '16	.12
Portland, g.	Colo.	3,000,000	1	180,000	10,357,080	Apr. 20, '16	.03	Ton. Extension, g. s.	Nev.	1,272,901	1	190,888	1,178,084	Apr. 1, '16	.10
Prince Con, a. l.	Nev.	1,000,000	2	75,000	200,000	Apr. 1, '16	.06	Tonopah, g. s.	Nev.	1,000,000	1	300,000	13,300,000	Apr. 21, '16	.15
Quartette, g. s.	Nev.	100,000	10		376,000	July 31, '07	.20	Tonopah Midway, g.	Nev.	1,000,000	1		250,000	Jan. 1, '07	.06
Quicksilver, pf.	Cal.	43,000	100		1,981,411	Apr. 8, '03	.60	Tremma, l.	Cal.	200,000	2.50		234,000	Apr. 28, '15	.02
Quilp, g.	Wash.	1,500,000	1		67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25		1,100,000	Oct. 30, '12	3.00
Quincy, c.	Mich.	110,000	26	770,000	22,547,600	June 30, '16	4.00	Tuolumne, c.	Mont.	800,000	1		495,525	Apr. 15, '13	.10
Ray Con, c.	Ariz.	1,671,279	10	1,571,273	5,144,406	June 30, '16	.60	Uncle Sam Con, s.	Utah	600,000	1		470,000	Sept. 20, '11	.06
Red Bird, g. s. c. l.	Mont.	300,000	5		72,000	Oct. 9, '04	.10	Union, g.	Colo.	1,250,000	1		444,244	Jan. 27, '03	.02
Red Metal, c.	Mont.	100,000	10		1,200,000	Apr. 1, '07	.40	Union Basin, z.	Ariz.	835,350	1		167,070	Nov. 16, '15	.10
Red Top, g.	Nev.	1,000,000	1		128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	80,000	100		1,600,000	Apr. 16, '07	3.00
Republic, g.	Wash.	1,000,000	1		85,000	Dec. 28, '10	.01	United, c. com.	Mont.	450,000	100		5,125,000	Aug. 6, '07	1.75
Richmond, g. s. l.	Nev.	54,000	1		4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25		211,627	Oct. 15, '07	.60
Rocco Home, l. s.	Nev.	300,000	1		152,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1		40,000	Dec. 21, '12	.01
Rochester Ld. & L.	Mo.	4,900	100		190,846	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1		440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev.	889,018	1		363,864	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	759,000	3,335,000	June 30, '16	19.00
Sacramento, g.	Utah	1,000,000	6		335,000	Oct. 22, '06	.10	United Metals Sell.	U. S.	60,000	100		11,000,000	Sept. 23, '10	6.00
St. Joseph, l.	Mo.	1,464,798	10	704,733	10,972,631	June 20, '16	.25	United Verde, c.	Ariz.	300,000	10	1,396,000	37,820,000	June 3, '06	1.50
St. Mary's M. L.	Mich.	160,000	25	1,440,000	6,240,000	June 28, '16	2.00	U. S. Red & R. com.	Colo.	69,188	100		414,675	Oct. 9, '03	1.00
Schoenbr-Wal'n. z. l.	Mo.	10,000	10		90,000	Sept. 20, '11	.20	U. S. Red & R. pf.	Colo.	39,458	100		1,775,396	Oct. 1, '07	1.50
Scratch Gravel	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. S. R. & M. com	USMx	351,115	60	614,451	7,239,630	Apr. 15, '16	1.00
Seven Tro. Ch. g. s.	Nev.	1,443,077	1	36,076	252,532	Apr. 1, '15	.02	U. S. S. R. & M. pf.	USMx	486,350	50	859,112	17,654,810	Apr. 15, '16	.87
Shannon, c.	Ariz.	300,000	10		750,000	Jan. 30, '13	.16	Utah, c.	Utah	1,624,490	10	8,934,695	41,656,582	June 30, '16	3.00
Shattuck-Ariz, c.	Ariz.	350,000	10	787,500	3,762,600	Apr. 20, '16	1.26	Utah, s. l. (Fish Sp.)	Utah	93,000	10		283,720	Oct. 21, '10	.02
Silver Hill, g. s.	Nev.	108,000	1		88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	628,200	6	132,050	198,075	Apr. 1, '18	.12
*Silver King Coal'n	Utah	1,250,000	6	876,000	13,969,885	Apr. 1, '16	.15	Utah Con, c.	Utah	300,000	6	450,000	9,600,000	June 26, '16	.75
Silver King Con.	Utah	637,582	1	63,768	878,615	Apr. 22, '15	.10	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00
Silver Mines Expl.	N. Y.	10,000	100		250,000	June 16, '10	2.00	Victoria, g. s. l.	Utah	250,000	1		207,500	Apr. 23, '10	.04
Sioux Cons, l. s. c.	Utah	745,339	1		972,108	July 20, '11	.04	Vindicator Con, g.	Colo.	1,600,000	1	90,000	3,352,500	Apr. 25, '16	.03
Skidoo, g.	Cal.	1,000,000	6		365,000	Oct. 22, '06	.10	Wasp No. 2, g.	S. D.	500,000	1	100,000	649,466	May 15, '16	.02
Smugler, s. l. z.	Colo.	1,000,000	1		2,235,000	Nov. 22, '06	.03	Wellington, l. z.	Colo.	10,000,000	1	200,000	850,000	Jan. 15, '16	.02
Snowstorm, c.	Idaho	1,600,000	1		1,169,610	Oct. 10, '13	.01	West End Con.	Nev.	1,788,488	1		636,455	Jan. 15, '16	.05
Socorro, g.	N. M.	377,342	5	37,734	177,206	June 1, '16	.05	West Hill	Wis.	20,000	1	8,000	40,000	June 29, '16	.20
South Eureka, g.	Cal.	299,981	1	126,940	1,367,774	June 15, '16	.07	White Knob, g. pf.	Cal.	200,000	10	40,000	370,000	May 29, '16	.10
So. Swansea, g. s. l.	Utah	300,000	1		287,600	Apr. 3, '04	.01	Wilbert	Ida.	1,000,000	1		20,000	May 1, '16	.01
Spears, g.	S. D.	1,600,000	1		165,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	360,000	8,760,000	Apr. 1, '16	6.00
Standard Con., g. s.	Cal.	178,394	10		5,274,408	Nov. 17, '13	.26	Wolverine & Ariz. c	Ariz.	118,674	16		53,403	Jan. 1, '16	.25
Standard, c.	Ariz.	425,000	1		69,600	Sept. 8, '05	.60	Work, g.	Colo.	1,500,000	1		1,697,655	Apr. 31, '12	.02
Stewart, l. z.	Idaho	1,238,362	1		2,043,297	Dec. 31, '16	.05	Yak.	Colo.	1,000,000	1	120,000	2,127,685	June 30, '16	.07
Stratton's Crip. Ck.	Colo.	2,000,000	6		300,000	Sept. 5, '08	.02	Yankee Con, g. s. l.	Utah	1,000,000	1		167,500	Feb. 1, '13	.01
Stratton's Ind.	Colo.	1,000,000	6		5,029,568	Dec. 23, '06	.12	Yellow Aster, g.	Cal.	100,000	10	13,000	1,185,789	June 6, '16	.02
Str'n's Ind. (new) g.	Colo.	1,000,000	.30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine	Cal.	1,000,000	1	500,000	1,393,000	June 25, '16	.15
Strong, g.	Colo.	1,000,000	1		2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10		102,583	July 15, '14	.10

Corrected to July 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675,000

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid In 1916	Total to Date	Latest Date	Amt.					Paid In 1916	Total to Date	Latest Date	Amt.
Ajuchitlan	Mex.	50,000	\$ 5	\$237,500	July 1, '13	\$0.25	Las Cabrilas	Mex.	1,040	\$10	\$591,400	June 3, '12	10.00		
Amistad y Concordia g. s.	Mex.	9,600	50	429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25	36,450	Mar. 16, '16	\$0.30		
Amparo, s. g.	Mex.	2,000,000	1	2,132,176	May 10, '16	.06	Lucky Tiger	Mex.	715,337	10	207,445	3,470,839	June 20, '16	.03	
Bartolo de Medina Mill	Mex.	2,000	25	108,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	\$247,692	1	134,861	4,742,630	Apr. 1, '16	.03	
Batopilas, s.	Mex.	446,268	20	55,870	Dec. 31, '07	.12	Mexican, l. pf.	Mex.	12,600	100	1,018,750	May 1, '12	3.50		
Beaver Con, s.	Ont.	2,000,000	1	710,000	Apr. 29, '16	.03	Mexico Con.	Mex.	240,000	10	680,000	Mar. 10, '08	2.50		
Boleo, g.	Mex.	120,000	20	721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex.	180,000	5	4,478,500	June 26, '14	.96		
British Columbia, c.	B. C.	591,709	6	615,399	Jan. 30, '15	.15	Minas Pedrazzini	Mex.	1,000,000	1	497,500	Jan. 23, '11	.06		
Buena Tierra	Mex.	330,000	6	160,380	Jan. 30, '15	.24	Mines Co. of Am.	Mex.	900,000	10	4,988,600	July 25, '13	.12		
Bufo, Ont.	Ont.	1,000,000	1	2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can.	2,075,000	1	259,375	1,037,600	Mar. 30, '16	.12	
Canadian Goldfields	Can.	600,000	10	327,099	July 15, '14	.01	Montezuma, l. pf.	Mex.	5,000	100	402,600	Nov. 16, '12	3.50		
Cananea Central, c.	Mex.	1,000,000	10	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex.	500,000	1	87,000	July 20, '08	.04		
Cariboo-Cobalt	Ont.	1,000,000	1	295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	Jan. 3, '16	.11		
Cariboo-McKinney, g.	B. C.	1,250,000	1	56,250	Dec. 1, '09	.00	Naica, s. l.	Mex.	100	300	3,190,000	Oct. 11, '09	\$2.53		
City of Cobalt	Ont.	600,000	1	138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	140,000	3,890,000	Apr. 25, '16	.50	
Cobalt Central, s.	Ont.	4,761,500	1	192,845	Aug. 24, '09	.01	Nipissing, s.	Ont.	1,200,000	6	609,000	14,040,000	Apr. 20, '16	.25	
Cobalt Lake, s.	Ont.	3,000,000	1	465,000	May 29, '14	.02	North Star, s. l.	B. C.	1,300,000	1	533,000	Feb. 1, '10	.02		
Cobalt Silver Queen	Ont.	1,500,000	1	315,000	Dec. 1, '08	.03	Paloma, g.	Mex.	3,000	...	99,600	Dec. 1, '12	.60		
Cobalt Townsite, s.	Ont.	199,282	5	1,042,259	Aug. 1, '14	.24	Panuco	Mex.	10,000	...	7,465,000	Nov. 4, '09	6.00		
Coniagas, s.	Ont.	800,000	5	8,040,000	Feb. 5, '16	.25	Penoles, s. g.	Mex.	120,000	20	6,451,687	Sept. 30, '13	1.25		
Con. Mg. & Sm., g. & s. c.	B. C.	95,060	100	290,262	Apr. 1, '16	2.50	Peregrina, pf.	Mex.	10,000	100	328,656	Sept. 1, '10	3.60		
Crown Reserve, s.	Ont.	1,999,957	1	6,102,408	July 15, '15	.03	Peterson Lake	Ont.	2,401,820	1	42,032	294,224	Mar. 1, '16	.01	
Dolores	Mex.	400,000	5	1,374,865	July 24, '11	.22	Pinguico, pf.	Mex.	20,000	100	750,000	Apr. 15, '13	3.00		
Dome Mines, s.	Ont.	400,000	10	800,000	June 1, '16	.50	Porcupine Crown	Ont.	2,000,000	1	120,000	500,000	Apr. 2, '16	.03	
Dos Estrellas, (El Oro)	Mex.	300,000	0.50	15,406,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex.	6,000	15	983,360	Apr. 1, '08	1.00		
El Favor	Mex.	3,600	10	21,000	Apr. 30, '10	.50	Real Caracoles	B. C.	100	58,500	472,500	June 15, '16	.01		
El Galeon, g. s.	Mex.	1,147,500	5	9,136,842	July 11, '13	.24	Rea Mines, Leasing	Ont.	200,000	1	12,700	1,270,000	June 15, '16	.03	
El Rayo, g. s.	Mex.	260,020	2	140,410	Apr. 24, '11	.16	Right of Way	Ont.	1,685,500	1	16,855	560,614	June 15, '16	.00	
El Triunfo, c.	Mex.	2,000,000	1	20,000	Aug. 28, '11	.01	Rio Plata	Mex.	374,518	6	345,744	Feb. 1, '13	.06		
Esperanza, s. g.	Mex.	450,000	1	12,521,250	Dec. 31, '15	.10	San Francisco Mill	Mex.	6,000	25	445,086	Oct. 15, '08	1.00		
Granby Con., c. g. & s.	B. C.	149,985	100	449,956	6,050,341	May 1, '16	1.60	San Rafael	Mex.	2,400	25	6,798,260	Jan. 11, '12	2.00	
Greene-Cananea, c.	Mex.	474,411	100	1,458,627	6,694,432	May 29, '16	2.00	San Toy, s. l.	Mex.	6,000,000	1.00	540,000	July 24, '13	.01	
Greene Con., c.	Mex.	1,000,000	10	11,544,000	Apr. 25, '10	.40	Santa Gertrudis, Hdgo.	Mex.	1,500,000	5	5,485,272	Nov. 16, '15	.24		
Greene Gold-Silver, pf.	Mex.	300,000	10	194,371	Mar. 25, '17	.40	Santa Gertrudis-Guadalupe, g. s.	Mex.	60,000	...	3,960,000	Mar. 27, '09	1.00		
Guanaquato Con.	Mex.	640,000	6	600,000	Oct. 8, '06	.07	Sta. Maria del Paz	Mex.	9,850	12 1/2	6,508,000	Jan. 7, '13	2.50		
Guanaquato Dev. pf.	Mex.	10,000	100	274,356	Jan. 1, '11	3.00	Seneca-Superior	Ont.	478,841	1	335,219	1,316,431	June 15, '16	.30	
Gurgenhelm Explorat.	Mex.	833,732	25	34,032,760	Apr. 3, '16	11.86	Soledad, s. l.	Mex.	960	20	4,439,840	Oct. 17, '11	8.00		
Haileybury, s.	Ont.	50,000	1	60,000	Apr. 5, '11	.50	Sorpresa, g. s.	Mex.	19,200	20	3,979,240	Jan. 6, '11	34.00		
Hedley	B. C.	120,000	10	1,943,520	June 30, '16	.50	Standard, s. l.	B. C.	2,600,000	1	2,100,000	June 10, '16	.02		
Hinds Con., g. s. l.	Mex.	5,000,000	1	88,000	Feb. 27, '03	.02	Temiscamp' & Hud. Bay	Ont.	7,761	1	1,940,250	Nov. 10, '14	3.00		
Hollinger	Ont.	600,000	6	4,890,000	June 16, '16	.20	Temiskaming, s.	Ont.	2,600,000	1	1,423,156	Dec. 31, '16	.03		
Jimulco, c.	Mex.	12,000	100	970,000	Feb. 27, '11	1.00	Tesuitlan, c.	Mex.	8,000	100	1,955,000	Jan. 1, '09	1.60		
Kent, L. Blanche, s.	Ont.	600,000	6	6,420,000	June 1, '16	.25	Tough-Oak	Mex.	52,500	5	132,875	193,192	Apr. 1, '16	.12	
La Blanca, s.	Mex.	144,000	20	2,775,700	Mar. 31, '13	.50	Tretheway, s.	Ont.	1,000,000	1	1,051,988	July 2, '16	.03		
La Republica, s.	Mex.	400,000	6	110,000	Aug. 15, '11	.06	Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	656,386	Oct. 20, '13	.06		
La Rosa Con., s.	Ont.	1,498,627	5	5,536,982	Apr. 20, '16	.05	Yukon, g.	Y. T.	3,600,000	6	625,000	8,108,110	June 30, '16	.07	

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OPEN CUT WORKINGS OF UTAH COPPER PROPERTY—LARGEST COPPER DIVIDEND PAYER IN 1916.

\$137,849,595 in Dividends by Mines and Works in Half Year

By GEO. E. SISLEY.

The resourcefulness of American mines and works was never better demonstrated than by operations during the 6 months of 1916 ending with June. To meet the enormous demands for the various metals production was speeded up to the limit and there resulted a production far ahead of all previous records.

As a result of this great production dividends were paid well beyond the imagination of the most optimistic. From reports received by Mining and Engineering World, and they were never before so complete, American mines and works made disbursements well nigh unbelievable. For no less than \$137,849,595 was paid by 147 companies which look for their profits from mines and works, during the half year period. When in the year 1915, mines and works disbursed \$110,047,145 in dividends it was considered an achievement little short of wonderful. During the first 6 months of 1916, however, disbursements totaled over seven million dollars more than was paid out in dividends during the entire year 1915. In the 1916 disbursements mentioned above 147 mines and works and seven securities-holding corporations participated. As an evidence of the continued profitability of mining we are able to prove by tables published elsewhere in this issue, that companies paying dividends during the 6 months of 1916 have to their credit a total of \$1,290,809,797. Add to this the disbursements of companies not paying dividends in 1916 and we have a grand total that is almost unbelievable.

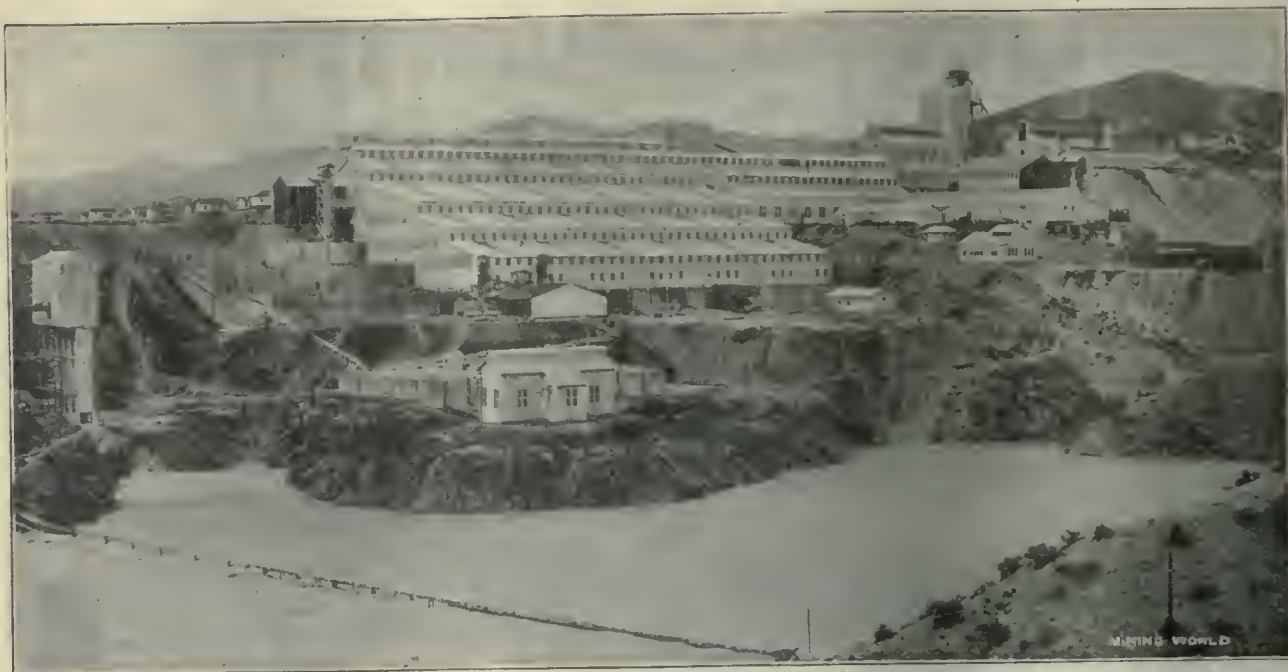
Coppers.

By subdividing the dividends paid by the above 147 companies we find that the copper properties hold the lead in point of dividends, both in the 6 months of 1916 and in total disbursements. According to the reports received there were 30 copper companies participating and these enriched shareholders to the extent of \$57,469,341. Since incorporation these companies have disbursed \$632,997,330, a return equivalent to 182% on their outstanding capitalization. When it is considered that some of these companies have been operating but a few years and have a large capitalization, this return is really remarkable.

Utah Copper ranks as the leader in 1916 copper dividend disbursements with \$8,934,695 to its credit. Since incorporation its dividend payments total \$41,656,592. Anaconda ranks second with \$6,993,750, and to date with the dividends paid by companies it has taken over should be credited with \$171,251,771. Champion of Michigan ranks third with \$3,720,000 and has a total of \$13,720,000. Calumet & Hecla, ranking only fifth for the year, is second to Anaconda in total disbursements with \$132,250,000 to its credit.

Gold-Silver-Lead-Zinc.

That the gold, silver, lead and zinc companies had a profitable half year is shown by the fact that, with 103 companies contributing, no less than \$47,363,484



MIAMI COPPER PROPERTY, ARIZONA.

was passed to stockholders. Since incorporation these companies are credited with paying dividends totaling \$318,656,113, on an outstanding capital of \$277,342,547. The extent to which the zinc producers benefited by the great demand for spelter is shown by the fact that five of these companies contributed over one-half of the \$47,363,484 above mentioned, or \$29,321,963. New Jersey Zinc leads with \$18,200,000 in the 6-months' period, Butte & Superior second with \$5,862,993, American Zinc, Lead & Smelting Co., third with \$2,414,000, Hercules fourth with \$1,450,000 and Interstate Callahan fifth with \$1,394,970.

Of the 103 companies of the above class 80 operate properties in the United States and these contrib-

uted \$41,846,976. To date these companies have paid dividends totaling \$246,576,300. Twenty Canadian companies paid \$4,744,561 and to date \$63,657,026, about six million less than issued capitalization. But three Mexican companies report dividend payments, these disbursing \$771,948.

Metallurgical and Holding Companies.

Six metallurgical companies disbursed \$12,356,066 during the half year, and to date are credited with total disbursements of \$206,014,636.

Seven securities-holding corporations disbursed \$20,690,604 during the 6-months' period, \$10,713,455



OLD DOMINION PROPERTY, ARIZONA.



PROPERTY OF THE COPPER QUEEN CO., ARIZONA.



STEAM SHOVEL OPERATIONS OF THE NEVADA CON. CO., NEVADA.



SMLTER OF THE ARIZONA COPPER CO., ARIZONA.



BUTTE & SUPERIOR CO.'S MILL AND FLOTATION PLANT, MONTANA.

of this coming from the settling up of the affairs of the Guggenheim Exploration Co.

In the following table is given the companies paying dividends in the 6 months of 1916, their issued capitalization, par value, amount paid in 1916, and the total amount to date:

Copper Dividend Payers.

	Issued capital.	6 mos., 1916.	Total dividends.
Ahmeek, Mich.	\$ 1,250,000	\$ 1,200,000	\$ 5,250,000
Allouez, Mich.	2,500,000	450,000	550,000
Anaconda, Mont.	116,562,500	6,993,750	171,251,771
Arlzona Copper, Ariz.	18,832,096	521,164	20,212,162
Butte-Alex. Scott, Mont.	793,110	844,662	1,054,119
Calumet & Arizona, Ariz.	6,419,230	2,565,676	25,714,001
Calumet & Hecla, Mich.	2,500,000	3,000,000	132,250,000
Champion, Mich.	2,500,000	3,720,000	13,720,000
Chino, N. M.	4,349,900	3,044,930	9,742,925
Copper Range, Mich.	39,400,100	1,486,203	16,655,052
Grand Gulch, Ariz.	14,998,500	449,956	6,050,341
Greene Con., Mex.	799,612	8,594	11,992
Inspiration, Ariz.	10,000,000	1,500,000	11,544,000
Magma, Ariz.	18,413,740	1,149,859	1,149,859
Miami, Ariz.	1,200,000	240,000	480,000
Mohawk, Mich.	3,735,565	2,054,563	7,454,442
Nevada Con., Nev.	2,500,000	700,000	4,575,000
North Butte, Mont.	9,993,285	2,500,000	22,475,893
Old Dominion M. & S.	6,150,000	752,500	12,507,000
Osceola Con., Mich.	4,050,000	891,000	5,508,000
Quincy, Mich.	2,403,750	1,067,650	14,006,525
Ray Con., Ariz.	3,750,000	770,000	22,547,500
Shattuck-Arizona, Ariz.	15,712,790	1,571,279	6,144,406
Tennessee Copper, Tenn.	3,500,000	787,500	3,762,000
United Globe, Ariz.	5,000,000	300,000	5,206,250
United Verde, Ariz.	2,300,000	759,000	3,335,000
Utah Con., Utah.	3,000,000	1,395,000	37,822,000
Utah Copper, Utah.	1,500,000	450,000	9,600,000
Wolverine, Mich.	16,244,900	8,934,695	41,656,592
	1,500,000	360,000	8,760,000
Totals	\$321,859,078	\$50,469,341	\$620,997,330

Gold-Silver-Lead-Zinc.

	Issued capital.	6 mos., 1916.	Total dividends.
Alaska-Treadwell, Alaska.	5,000,000	250,000	15,780,000
Alaska United, Alaska.	901,000	54,060	2,045,270
American Z., L. & S.	4,828,000	2,414,000	3,522,820
Amparo, Mex.	2,000,000	200,000	2,132,176
Anchor, Nev.	50,000	5,000	5,000
Argonaut, Cal.	1,000,000	40,000	1,680,000
Barnes-King, Mont.	2,000,000	60,000	60,000
Beaver Con., Ont.	1,996,900	60,000	710,000
Big Four Expl., Utah.	400,000	40,000	50,000
Big Run, Mo.	500,000	6,000	6,000
Bunker Hill Con., Cal.	200,000	30,000	\$51,000
Bunker Hill & Sull., Idaho.	3,270,000	827,500	17,590,500
Butte & Superior, Mont.	2,726,970	5,862,993	11,383,017
Caledonia, Idaho.	2,605,000	468,900	1,351,631
Camp Bird, Colo.	1,799,676	113,584	10,243,964
Cardif, Utah.	500,000	125,000	250,000
Centennial Eureka, Utah.	2,500,000	100,000	4,000,000
Center Creek, Mo.	1,000,000	30,000	580,000
Century, Utah.	1,000,000	44,000	392,087
Chief Con., Utah.	882,960	88,175	439,212
Colorado Gold Dredge, Colo.	2,000,000	100,000	425,000
Commercial, Ore.	1,666,000	8,330	230,490
Conigas, Ont.	4,000,000	200,000	\$,040,000
Daly-Judge, Utah.	480,000	75,000	1,230,000
Dome Mines, Ont.	4,000,000	400,000	\$00,000
Golden Center, Cal.	285,000	11,000	22,000
Gemini, Utah.	500,000	50,000	2,405,000
Golden Cycle, Colo.	1,500,000	180,000	7,488,300
Granite, Alaska.	430,000	17,200	17,200
Hecla, Idaho.	250,000	650,000	4,155,000
Hedley, B. C.	1,200,000	120,000	1,943,520
Hercules, Idaho.	1,000,000	1,450,000	12,200,000
Hollinger, Ont.	3,000,000	720,000	4,890,000
Homestake, S. D.	25,116,000	979,524	36,685,232
Horn Silver, Utah.	400,000	40,000	5,182,200
Interstate Callahan, Idaho.	4,649,000	1,394,970	3,952,415
Iron Blossom, Utah.	1,000,000	150,000	2,650,000
Jim Butler, Nev.	1,718,921	171,802	343,604
Joplin Ore & Sp., Mo.	2,000,000	44,008	44,008
Jumbo Ext., Nev.	1,500,000	194,000	684,998
Kendall, Mont.	500,000	50,000	1,555,000
Kenefick Zinc.	200,000	60,000	60,000
Kerr Lake, Ont.	3,000,000	300,000	6,420,000



PORTLAND PROPERTY, COLORADO, A CONSISTENT DIVIDEND PAYER.



SILVER KING CON. PROPERTY, UTAH.



HOMESTAKE MINING CO.'S PROPERTY, SOUTH DAKOTA, A REMARKABLE DIVIDEND-PAYER.



INSPIRATION PROPERTY, NOW PAYING DIVIDENDS.

	Issued capital.	6 mos., 1916.	Total dividends.
La Rose, Ont.	7,493,135	149,802	5,536,982
Lake View, Utah.	25,000	56,250	102,500
Le Roi No. 2, B. C.	3,000,000	36,450	1,661,650
Little Bell, Utah.	300,000	15,000	75,000
Lucky Tiger, Mex.	7,153,370	207,448	3,470,839
Mammoth, Utah	10,000,000	60,000	2,380,000
Mary Murphy, Colo.	1,850,000	25,067	93,106
May Day, Utah.	200,000	40,000	284,000
McKinley-Dar.-Sav., Ont.	2,247,682	134,861	4,742,030
Mg. Corp'n of Canada.	2,075,000	259,375	1,037,500
Mother Lode, B. C.	1,250,000	137,500	137,500
National Zinc & Lead.	3,000,000	70,000	85,000
Nevada Wonder, Nev.	1,500,000	150,000	783,528
New Idria, Cal.	500,000	200,000	2,030,000
New Jersey Zinc.	35,000,000	18,200,000	.....
Nipissing, Ont.	6,000,000	600,000	14,040,000
North Star, Cal.	2,600,000	100,000	4,887,040
Oroville Dredging, Cal.	3,500,000	166,820	712,350
Oroville Union, Cal.	52,154	14,759	45,994
Osceola L. & Z., Mo.	490,000	9,800	269,609
Peacock, Wis.	50,000	10,000	66,000
Peterson Lake, Ont.	2,401,820	84,064	340,287
Plymouth Con., Cal.	1,200,000	58,250	231,050
Porcupine Crown, Ont.	2,000,000	180,000	600,000
Portland, Colo.	3,000,000	180,000	10,357,080
Prince Con., Utah.	2,000,000	75,000	250,000
Rambler Cariboo, B. C.	1,750,000	52,500	472,500
Reorganized Booth, Nev.	999,854	349,949	349,949
Right-of-Way, Ont.	1,685,500	16,855	560,614
St. Joseph Lead, Mo.	14,647,980	704,700	10,972,598
St. Mary's, Mich.	4,000,000	1,440,000	6,240,000
Santa Gertrudis, Mex.	6,845,000	364,500	2,819,772
Scratch Gravel, Mont.	1,000,000	20,000	20,000
Seven Troughs Coal'n, Nev.	1,443,077	36,076	252,532
Seneca-Superior, Ont.	478,874	335,219	1,316,431
Silver King Coal'n, Utah.	6,250,000	375,000	13,959,885
Silver King Con., Utah.	637,582	127,516	942,373
Socorro, N. M.	1,886,710	37,734	177,205
South Eureka, Cal.	299,981	125,940	1,397,774
Standard, B. C.	2,000,000	300,000	2,100,000
Stratton's Ind., Colo.	600,000	160,000	691,250
Success, Idaho	1,500,000	300,000	1,080,000
Tamarack-Custer Con, Ida.	2,000,000	80,000	80,000
Tomboy, Colo.	1,550,000	74,400	3,861,555
Tonopah Belmont, Nev.	750,016	562,500	8,205,527
Tonopah Ext., Nev.	1,272,801	190,888	1,178,084
Tonopah, Nev.	1,000,000	300,000	13,300,600
Tough Oakes, Ont.	2,657,500	132,875	199,312
Vindicator Con., Colo.	1,500,000	90,000	3,352,600
Wasp No. 2, S. D.	500,000	100,000	649,466
Wellington, Colo.	1,000,000	200,000	850,000
West Hill, Wis.	20,000	8,000	40,000
White Knob, Cal.	2,000,000	40,000	170,000
Wilbert, Idaho	1,000,000	20,000	30,000
Utah Apex, Utah.	2,691,000	264,100	330,125
Utah Missouri, Mo.	100,000	10,000	10,000
Yak, Colo.	1,000,000	120,000	2,127,685
Yellow Aster, Cal.	1,000,000	13,000	1,185,789
Yellow Pine, Nev.	1,000,000	500,000	1,293,008
Yukon Gold, Y. T.	17,500,000	525,000	8,108,110
Totals	\$277,342,547	\$47,363,484	\$318,656,113

Metallurgical Companies.

	Issued capital.	6 mos., 1916.	Total dividends.
American Sm. & Ref. pfd.	\$ 50,000,000	\$ 1,750,000	\$ 56,546,386
American Sm. & Ref. com.	50,000,000	1,500,000	30,833,333
Con. Mg. & Sm. Canada.	5,805,000	420,517	2,740,654
Federal Mg. & Sm. pfd.	12,000,000	240,000	12,095,552
International Nickel, pfd.	8,912,000	267,378	5,614,824
International Nickel, com.	41,834,600	5,428,498	30,941,338
National Lead, pfd.	29,367,600	853,002	32,905,562
National Lead, com.	20,655,590	413,108	9,442,547
U. S. Sm. & Ref., pfd.	24,316,200	859,112	17,654,810
U. S. Sm. & Ref., com.	35,111,500	614,451	7,239,630
Totals	\$278,003,090	\$12,356,066	\$206,014,636

Holding Companies.

	Issued capital.	6 mos., 1916.	Total dividends.
Am. Sm. Sec., pfd. A.	\$ 17,000,000	\$ 610,000	\$ 11,210,000
Am. Sm. Sec. pfd. B.	30,000,000	750,000	16,260,000
General Dev.	3,000,000	300,000	3,324,000
Greene Cananea, Mex.	47,441,100	1,458,627	5,694,432
Guggenheim Expl.	20,843,300	10,713,456	34,032,760
Kennecott	27,809,399	7,000,000	12,000,000
Old Dominion of Maine.	7,333,825	1,320,088	8,640,566
Phelps, Dodge & Co.	45,000,000	5,400,000	58,771,527
Yukon-Alaska Trust	208,433	208,433	208,438
Totals	\$198,636,667	\$27,690,604	\$145,141,718

Standing of the States.

In connection with the great dividends paid by mines and works there is much of interest in what share the various mining states have taken in providing stockholders with such magnificent dividends as those paid during the last 6 months.

New Jersey, with only one company participating, leads all other states in disbursements for the 6-months' period, having divided among its few stockholders no less than \$18,200,000. What its total dis-

bursments amount to cannot be ascertained, as the officials have placed an iron-clad censorship on all matters pertaining to dividends. It was only in May that the company first unbosomed itself to stockholders as to its operations, issuing at that time a brief quarterly report.

Montana is second for the 6 months' period, with seven companies distributing \$14,583,905. Since incorporation these seven companies have divided among shareholders \$197,830,967. This on an issued capitalization of \$129,642,580 is a return of 154%.

Michigan, with 10 companies contributing is third, having paid dividends during the half year totaling \$13,473,853. In total dividends paid by companies paying dividends in 1916, Michigan ranks first with disbursements amounting to \$224,554,077, a return on issued capital of \$62,303,850 or 360%.

Arizona ranks fourth with 11 companies paying \$11,089,736, with total disbursements of \$111,594,322. This on an issued capital of \$88,763,033 is a return of 125%.

Utah with 19 companies participating ranks fifth with \$11,089,736 on the issued capital of \$47,511,442, a return of 181%.

The following table gives the standing of the various states, the amount of dividends paid, and the per cent returned on outstanding capital.

	No. com-panies.	Issued capital.	6 mos. of 1916.	Total.	% return.
New Jersey.....	1	\$35,000,000	\$18,200,000	\$.....	...
Montana	7	129,642,580	14,583,905	197,830,967	154
Michigan	10	62,303,850	13,473,853	224,554,077	360
Arizona	11	88,763,033	11,944,635	111,594,322	125
Utah	19	47,511,442	11,089,736	86,158,774	181
Alaska	4	34,240,999	7,221,200	30,842,470	81
Idaho	8	16,274,090	5,191,370	40,439,546	248
Nevada	11	21,227,054	4,966,215	48,967,123	231
Missouri	9	26,765,980	3,348,508	15,550,035	58
New Mexico.....	2	6,236,610	3,082,604	9,920,130	159
Colorado	16	15,799,676	1,243,051	39,490,434	250
South Dakota....	2	25,616,000	1,079,524	37,334,698	145
California	11	12,537,135	800,949	14,970,647	108
Tennessee	1	5,000,000	300,000	5,205,250	194
Wisconsin	2	70,000	18,000	106,000	151
Oregon	1	100,000	8,330	230,450	230

The Half Year in the Stock Market.

Despite the great profits earned by American copper companies, in fact, the greatest in the history of the industry, stocks of these same companies have not responded accordingly, as compared with the high and low of 1915, prices on June 30 in but few cases showing gain over the high of 1915.

In the table following is shown the price range of the leading copper stocks on the New York and Boston exchanges for 1916 to date and the 1915 year; also the present market with net change since Dec. 31, 1915:

	1916		1915		June	Ch. Change.
	High.	Low.	High.	Low.		
Am. Smelting	113 3/4	88 1/4	103 7/8	56	94	-14 1/4
Am. Zinc	97 3/4	38 3/4	72 1/2	16 3/4	39	+ 5
Anaconda	92 3/4	77	91 5/8	49 1/2	82 1/4	- 9
Butte & Superior	105 1/4	65 1/4	80	35 3/4	67 1/2	- 5 1/4
Calumet & Arizona	75 1/4	66	78 3/4	51 1/2	68	- 4 1/4
Calumet & Hecla	56	520	630	250	530	-38
Chino	60	47 1/2	57 3/4	32 3/4	49 3/4	- 5 1/4
Copper Range	68 3/4	58	65	30	60 1/4	- 4 3/4
Inspiration	50 3/4	42 1/2	47 1/2	16 3/4	50 1/4	- 4 3/4
Mohawk	103 1/2	89	98	46 1/4	98	- 1 1/4
North Butte	32	21	38 3/4	22 1/4	22 1/4	- 3 1/4
Osceola	101 1/2	82	93 1/4	64	91	+ 2 1/4
Tennessee	66 1/4	33	70	25 1/4	35 1/4	-28 1/4
U. S. Smelting.....	80 3/4	54 1/4	54	20	68 3/4	+15 1/4
Utah Copper	86 3/4	75	81 3/4	48 1/4	77 1/4	- 4 1/4
20 coppers average	60.96	53.85	57.45	33.11	54.47	-3.53

*Ex-stock-dividend.

One of the developments of importance to Montana mining interests in recent years has been the great increase in the generation and distribution of electric power, to serve the principal producing interests of the state.



THE DIAMOND MINE OF THE ANACONDA CO., MONTANA.

Six Months of Wonderful Prosperity for United States Mining

The half-year in the mining industry of the United States was productive of a prosperity never before equalled in the history of the industry. In nearly every branch, discussed in the following reviews by representatives of the Survey, there is reported increased production at higher prices for the metal.

Copper Production Continues Heavy.

Under the influence of large demands and resultant high prices the production of copper during the last 6 months has exceeded that of any equal period in the history of the industry.

There has been a steady rate of increase in the output of copper since early in 1915. The production during the last half of 1915 considerably exceeded that of the first half, according to the report by B. S. Butler, and during the year the refineries produced, from both domestic and foreign ores, a total of 1,634,000,000 lbs. of blister copper, of which 1,388,009,527 lbs. was produced from ores mined in the United States.

The price for the period has averaged above the highest price received for copper at any time in recent years, the average for the first 6 months of 1916 being more than 26 cts. a pound. The cost has doubtless increased slightly, as the important copper companies have increased the wages of their employees, but this increase has been largely offset by decrease in cost due to working plants at the maximum capacity. Many small mines are operating that could not be profitably worked under normal conditions and this, of course, tends to increase the average cost per pound.

The profits of the producing companies have been large and as much of the output is sold several months ahead of delivery the prosperity of the industry is well assured for the remainder of the year, so that 1916 will doubtless be the most profitable year in the history of copper production to the present time and possibly for years to come.

Gold and Silver in 1916.

The precious-metal mining industries continued active during the first 6 months of 1916, practically all important mines and mills operating at full capacity. Shortage of cyanide supplies, feared in 1915, was obviated by increased output of domestic sodium cyanide, which has practically replaced potassium cyanide in the leaching of precious metals. Flotation has begun to increase the saving of gold from tailings. There may have been some decrease in gold prospecting during the last 8 or 10 months, as many old gold prospectors have been giving attention to deposits of tungsten, antimony, quicksilver, and other mineral products whose value has enhanced since the outbreak of the war. There was also some labor shortage at mines and mills owing to high wages paid in factories making war supplies.

Final figures of the Geological Survey and the Bureau of the Mint give a total domestic production for 1915 of \$101,035,700 in gold, and 74,961,075 ozs. of silver, valued at \$37,397,300, against \$94,531,800 in gold and 72,455,100 ozs. of silver in 1914. These figures include the gold production of the Philippines, which has been steadily on the increase.

The total output both of gold and silver reported for 1915 was the highest ever recorded under the American flag, but if the Philippine output be eliminated the production of gold in the United States proper was but little above the previous record year of 1909. The output of silver for 1915 was materially above the preceding record yield of 1914. For 1916, from the midyear point of view, the output of gold, which is apparently falling off somewhat as compared with 1915, in Colorado, California, Nevada, and some other states, and increasing possibly in Arizona, Oregon, the Philippines, Idaho, Montana, New Mexico and elsewhere, will probably reach a total somewhat below the high output of 1915. The production of silver, however, will undoubtedly again break all previous records, as the output of silver ores and of the



AMADOR CON. CO.'S PROPERTY, CALIFORNIA.



THE SOUTH HECLA PROPERTY, UTAH, A NEW DIVIDEND PAYER.



SEVEN TROUGHS COALITION PROPERTY, NEVADA.

copper, lead, and zinc ores which produce silver in notable quantities will exceed that of any preceding year, owing to steady demand and high prices for all metals.

Prices of silver were low in the greater part of 1915. The monthly average commercial price at New York, which rose to about 52 cts. an ounce in November, however, reached 55 cts. in December, and climbed steadily to over 74 cts. in May, 1916, but fell to about 65 cts. in June. The sharp increase in prices resulted from strong demand for the Far East at the end of 1915 and abnormally large requirements by the belligerent countries for coinage for the troops in the field. These demands found available stocks low, largely because of the great falling off in the Mexican output due to the long continued disturbance there. With the consequent inevitable rise in prices domestic producers of silver profited greatly, notwithstanding the increased cost of labor and of mining supplies. Silver is in demand not only for coinage, but also for sterling and other silver wares, as well as for drugs and chemicals. The manufacture of silver salts used in photography, particularly in films for hand cameras and cinematographs, has vastly increased in recent years. The midyear outlook indicates continued demand for silver the metal last to benefit by the general domestic prosperity.

Lead and Zinc Mines Promise Largest Output on Record.

The mine production of lead and zinc ores during the first 6 months of 1916 was much larger than that of any preceding 6 months. The lead and zinc mines have been able to produce all the ore needed to supply the increased capacity of the smelters. The ore and concentrates were sold at prices which yielded large profits, notwithstanding increased costs of production and the working of large quantities of low-grade ore which could not be mined at a profit under normal conditions. High-grade zinc concentrates free or nearly free from lead and iron continued to be in demand, and the base price offered for such concentrates was generally much higher than that offered for low-grade concentrates.

The shipments of sphalerite concentrates from the Joplin region during the first 6 months of 1916 amounted to about 180,000 tons, valued at more than \$17,000,000, as against 206,000 tons, valued at \$23,419,000 for the calendar year 1915. The demand was not as active during the last month of the year, when the base price for concentrates decreased nearly \$20 a ton. Unless the base price declines to a point which will prevent the mining of lean "sheet ground" the



DELAWARE MINING CO.'S MILL, NEVADA.



NORTH BUTTE GRANITE MOUNTAIN MINE, MONTANA.

production of zinc concentrates from the Joplin region in 1916 will probably be 60,000 to 70,000 tons more than in 1915.

Development in the Miami, Okla., camp continued to be favorable, and the production should be much larger during the last half of 1916. The increase from Kansas will not be large, for excessive rains have hampered operations. The "soft ground" mines in southwest Missouri have not shown any largely increased yield, but the "sheet ground" has been actively mined and many new mills put in operation. The strike of the hoistmen in the Joplin district reduced the output in June, though few of the mines were

closed down for any great length of time. Some of the mine owners seized the opportunity to make much needed repairs or additions to their plants.

The stock of zinc concentrates unsold in June was larger than usual but probably was not much more than 2 weeks' production. The production of zinc carbonate and silicate showed no great increase, and the galena concentrates sold indicate a production of about 56,000 tons in 1916, or 11,000 tons more than in 1915. The selling price of the lead concentrates was nearly double the average price in 1915.

The large mines in the disseminated lead district of southeastern Missouri were operated steadily, and al-



INTERNATIONAL SMELTER AT TOOELE, UTAH.

though no figures are available for 1916, the output was larger than it was during the first or the last half of 1916.

The number of producing zinc properties in Arkansas increased rapidly and many new mills were operated. The output of sphalerite concentrates was negligible but that of zinc carbonate increased more than 100%. The zinc carbonate is of high grade, and the production of such ore in 1916 in Arkansas will be exceeded only by that of the Joplin region.

The zinc ore mined in New Jersey in 1916 was at least as large as in 1915, and the production from Tennessee and Virginia was larger than in the first 6 months of 1915.

The shipments of raw sphalerite from mines in the Upper Mississippi Valley region steadily increased, and the capacities of the roasting and separating plants were much greater than in 1915. A number of new mines were opened and concentrating plants constructed.

The New Diggings camp was especially active, though development was active in all the other camps.

The shipments of raw sphalerite concentrates

state Callahan, Success, Frisco and other mines were shipping more than 8000 tons of zinc concentrates or ore monthly, which is much more than the shipments in 1915.

In Montana the lead production increased because more lead-zinc ore was mined. The increased yield of zinc probably amounted to above 30%, as the Butte & Superior mine was producing at the rate of 96,000 tons of concentrates yearly and the Elm Orlu at the rate of 60,000 tons.

The reports from all states indicate that the production of zinc ores in the United States in the first 6 months of 1916 was at a rate 25 to 30% larger than that in 1915.

Continued Demand for Quicksilver.

The domestic quicksilver industry has continued active during the first 6 months of 1916, and the average price for the period has been about double the exceptionally high average for the entire year 1915.

Figures just compiled by the Survey show that the



U. S. SMELTER AT MIDVALE, UTAH.

amounted to more than 100,000 tons, compared with shipments of 162,000 tons during the calendar year 1915.

In the western states small increases of both lead and zinc were made in Arizona, Colorado, New Mexico, and Washington. In Nevada an increased quantity of zinc ore was shipped from Clark county and the lead ore shipments from the Pioche, Goodsprings, and Eureka districts indicate a considerably larger output of lead from Nevada for 1916.

In Utah the Bingham district made a record output of lead during the first 6 months of 1916. The zinc production of Utah will probably be only slightly more in 1916 than it was in 1915.

The Cocur d'Alene region in Idaho shipped 30,000 tons of lead ore or concentrates a month. The Inter-

total production of quicksilver in the United States in 1915 was 21,033 flasks of 75 lbs. each, having a marketed value of \$1,826,912, or an average of \$86.86 per flask. Of this output 14,283 flasks, selling for \$1,174,881, came from California, and the remainder almost entirely from Texas and Nevada. The actual average sales value for the whole country exceeded the average market value in San Francisco—which was \$85.80 for the year. In 1914 the domestic output was 16,548 flasks, valued at \$811,680, and therefore the production for 1915 showed an increase of over 27% in quantity and 125% in value.

The increased domestic demand for quicksilver in the last 18 months has been due mainly to war requirements for fulminate and drugs. Early in 1915 domestic stocks began to be drawn upon and production



LEONARD MINE AND SURFACE PLANT, MONTANA.



AJAX PROPERTY, COLORADO.



INDEPENDENCE MILL, COLORADO.

became more active, but as foreign embargoes left the field clear and domestic output was unable to meet the rapidly increasing call for the metal, prices continued to rise throughout the year and into the early months of 1915, the high mark of \$300 a flask being passed in February. Naturally every mine and prospect became of interest. The reaction set in, however, as the high prices drew out quicksilver supplies in Mexico and elsewhere that had been originally purchased for amalgamation of gold and silver ores, and finally as the British Government permitted exports to America under certain limitations. The average monthly domestic price in San Francisco, which had climbed from \$51.90 in January, 1915, to \$295 in February, 1916, dropped to \$219 in March, \$141.60 in April, \$90 in May, and about \$72 in June.

The market remains steady and in general highly profitable, and as domestic prices have dropped below London quotations exports rather than imports of the metal may be expected. There is probably no great quantity of metal stored, and consumption is undoubtedly abnormally large.

Favorable markets have brought out great activity in search for new prospects, and discoveries near Morton, Wash., and Beagle, Ore., in 1916 have led to some development and construction of reduction plants. Also in the Skull Valley deposits, Ariz., and at Black Pine, Idaho, some activity is reported. Many old furnaces have been repaired or enlarged in California, Nevada, and Texas, old workings have been reopened, and new discoveries have been developed.

Very likely the exceptionally high prices of the last few months have led to gouging and robbing many mines of their best ore, and the average tenor of the ore worked by the larger mines during the first half of 1916 may prove considerably below that of previous years. Moreover, some mines have undoubtedly passed their maximum productivity. These conditions are probably offset to some extent by the fact that more furnace capacity is now working on quicksilver ores than at any previous time in the history of the industry. On the whole the midyear outlook is for an output in 1916 fully equal to that of 1915.

Increased Activity in Manganese Mines.

There has been a greatly increased activity among the manganese mines of the United States during the first 6 months of 1916. This activity is shown by the operation of new mines, the reopening of old mines, and more regular production from the mines already active. There is a prospect that the production for the entire year, according to D. F. Hewett, will greatly exceed that for 1915, which was 9651 tons, the largest since 1901. Several discoveries are reported from Arizona, California, Oregon, Utah, and Virginia, and there are new operators in Arkansas, California, New Mexico, Utah, and Virginia.

During the first quarter of 1916 the prices of all grades of manganese ore rose rapidly to the highest figures recorded in 30 years. Prices of 60 to 65 cts. a unit for ore containing 45 to 50% of manganese and more than 1% of iron were freely offered about April 1, and it is reported that 70 cts. a unit, or \$35 a ton, was paid for several lots. During the second quarter prices remained constant at these figures. Large quantities of Brazilian ore continue to be received, and there is a prospect that the imports will exceed those for 1915, which were the largest on record with the exception of one previous year.

Several new producers have entered the ferromanganese field, and although imports from England appear to be greater than last year, it appears that the domestic production for 1916 will be the largest in the history of the country. Prices for ferromanganese for immediate delivery in March reached the highest figure ever recorded—\$425 a ton for small lots—and large quantities were sold for \$350 to \$400 a ton. For delivery within 6 months the price has remained constant at \$175 a ton. During the second quarter prices receded to \$350 a ton for immediate delivery.

As long as the present demand for steel continues there is little prospect for greatly reduced prices of either manganese ore or ferromanganese, and even if peace is declared during the winter prices can scarcely decline to normal for at least 6 months or a year.

Producers of manganese ore particularly should realize that never before for so long a period has there been a better opportunity for the profitable mining of manganese ore. They should realize also that this condition can not continue indefinitely.

The Portland Cement Industry.

The first half of 1916 has been a busy period for the Portland cement industry in most parts of the United States. Labor troubles have caused the temporary shutting down of a few plants in Illinois, and the business ordinarily taken care of by these plants has gone to others in the central states, but none have been reported as having voluntarily closed in 1916.

The opening of a new cement plant nowadays, when the country is so well dotted with plants, is an event of importance, and the fact that two new ones have begun operations is of considerable interest. Both of them are in the middle west, one at its extreme north, at New Duluth, Minn., the other at its extreme south, at Houston, Tex. The location of both was influenced more largely by commercial considerations than by the proximity of raw materials. The plant at New Duluth, a mill of the Universal Portland Cement Co., utilizes limestone brought by boat from the shore of Lake Huron near Alpena, Mich., and slag from the blast furnaces of the Minnesota Steel Co. at New Duluth. The plant at Houston is mill No. 2 of the Texas Portland Cement Co. It manufactures cement from oyster shells dredged from a reef in Galveston Bay and clay from Harrisburg, Tex. This plant is on tide-water, and efforts will be made to establish for it an export trade with South America.

In 1914 and 1915 there was a decrease in the production of cement, consumers exercising strict economy in its use, but the year 1916 shows a reaction, having opened with a demand unprecedented for a midwinter season. Prices, which had averaged only 86 cts. a barrel for the entire year 1915, began to rise toward the end of that year and in the eastern and middle states, where cement sold at 70 to 90 cts. a barrel, they continued to rise in 1916 until, in June, they ranged from \$1.10 to \$1.25 a barrel. The increased prices, of course, do not mean an equivalent net increase in returns to the manufacturers, for the costs of explosives for blasting and of coal have both risen, and laborers are in many places demanding an increase in wages. These comparatively high prices have not, however, checked the demand for cement. Many manufacturers are selling all they can produce, and others are even drawing on stocks so as to fill orders promptly.

Although no statistics have been reported to the

Survey at this date, it is believed that the total output of Portland cement for the first half of 1916 has considerably exceeded that for the corresponding period of 1915. In general an optimistic feeling prevails among manufacturers, and it is confidently predicted that the year will show a gain over 1915, both in production and shipments of Portland cement. Moreover, there is a fair possibility that they will exceed those of 1913 and thus establish a new record.

New Record Established in the Coal and Coke Industry.

The output of bituminous coal in the United States during the first 6 months of 1916 was the greatest ever recorded in any half-year period. Estimates by C. E. Leshner, based on returns from over 100 railroads originating coal and coke shipments, indicate that the production during this period was 261,000,000 tons, an increase of 35% over the first 6 months of 1915, and of 5% over the last 6 months of the same year, and greater by several million tons than the record established in the last half of 1913. Compared with the first half of 1913 the exports from the Atlantic seaboard during the last 6 months have increased about 10%, and the exports to Canada have nearly doubled. The movement of bituminous coal through the Soo Canal on the Great Lakes shows an increase of 80%, and the coal used in coking has increased nearly half. Increased consumption by railroads and by the iron and steel and nearly all other industries has been a large factor in establishing this record. From April, 1915, to January of the present year the production of bituminous coal increased at a rapid rate, with but temporary slackening in November and December, due to car shortage. The output in January, 1916, was more than 60% greater than in April, 1915, and the production in February and March, 1916, was nearly as great. Many large users of coal laid in stocks of fuel in anticipation of a possible shut-down at the mines in April because of labor troubles, and though there was no general strike, the production in April declined greatly as a result of decreased buying on the part of those having stored coal to use. May and June, however, showed successive increases, and there is every indication that the production during the coming 6 months will equal if not exceed the 6 months just past, and that the output in the calendar year 1916 will exceed 500,000,000 tons, establishing a new record for bituminous coal.

Every coal-producing state from Washington to the Atlantic coast has shared in this general increase.

The output of beehive coke has increased from about 11,250,000 tons in the first half of 1915 and 16,250,000 tons in the second half of 1915 to more than 18,000,000 tons during the last 6 months. The manufacture of coke in by-product ovens has also increased as new ovens have been completed and put in commission.

The production of Pennsylvania anthracite increased about 3% over the corresponding period in 1915.

Prosperity in the Iron Industry.

The first 6 months of 1916 in the iron industry showed a continuation of the highly prosperous conditions that prevailed during the last 4 or 5 months of 1915, according to E. F. Burchard. In fact, activity

was even greater in 1916 than in the first half of 1915. Large increases are shown in the output of both iron ore and pig iron. The shipments of ore from the Lake Superior region during the first 5 months of 1916 were more than 10,000,000 gross tons, or 83% greater than those of the corresponding period of 1915.

Ore prices at lower lake ports for 1916 were increased 75 cts. a ton over those for the season of 1915, but lack of boats is reported to have forced concessions in the price of ore from some mines that do not control their lake transportation facilities.

The production of coke and anthracite pig iron in the first 5 months of 1916 showed an increase of 66% over that of the corresponding period in 1915, and prices are from \$5 to \$7.25 per ton higher, or 33 to 40% above those in June, 1915.

Prices for steel bars and beams have increased 100 to 130% over those of a year ago, and if conditions are not adversely affected by miners' strikes now threatening and if the present strong demand for iron and steel continues, the total ore output from the Lake Superior region may possibly reach 60,000,000 gross tons.

Birmingham and other iron districts are not capable of such rapid increases in output as the lake districts, and if 10,000,000 tons be estimated for the production of all other districts it indicates a possible total domestic production of iron ore of 70,000,000 gross tons for 1916. At any rate, there are good indications that a new high record of iron-ore production will be made this year.

Large Oil Production Expected.

The quantity of petroleum marketed in the United States during the first half of 1916 is estimated by John D. Northrop at 140,000,000 bbls. His estimate is moderate and his apportionment of the output among the major fields is as follows:

Field.	Barrels.
Appalachian	11,400,000
Lima-Indiana	1,800,000
Illinois	7,900,000
Kansas and Oklahoma	50,500,000
Northern and Central Texas	4,200,000
Northwest Louisiana	6,800,000
Gulf Coast	11,400,000
Wyoming and Montana	2,400,000
California	43,500,000
Miscellaneous (Colorado, Michigan and Missouri)	100,000
	140,000,000

This quantity, which includes a little oil actually produced in 1915 but marketed during 1916, is appreciably less than the output during the first half of 1915, though it is greater by about 5,000,000 bbls. than one-half the entire quantity marketed last year. When it is considered that the first half of 1915 includes the period of maximum production of the Cushing pool in Oklahoma and the Crichton pool in northwestern Louisiana the disparity in output between the corresponding periods is not especially significant. The magnitude of this quantity, the fact that it is greater than one-half the total petroleum marketed in the United States in 1915, and the further fact that it reflects the results of general activity throughout all oil-producing areas rather than flush production in restricted areas is, however, significant and leads to no other conclusion than that the final statistics of oil marketed in 1916 are destined to establish a new record.

The outstanding feature of the petroleum industry during the half-year just closed was the high level reached in the prices of crude oil in March and main-

tained firmly to the end of the period. This level involves prices ranging from 90 to 350% higher than those of a year ago for high-grade Eastern and Mid-Continent grades and reflects less strongly the decreased capacity of Cushing than it does the increased demand for crude oil resulting from the activity of a large number of new refineries installed during the recent period of low prices.

As a consequence of the incentive afforded by the high prices in the early part of 1916, activity in drilling increased enormously in all fields with the opening of spring, and though within the half-year period no strictly new pools were discovered there was a development of old pools and new extensions that was attended with gratifying success. So marked was this success in the Augusta and El Dorado pools in southern Kansas, the Blackwell pool in Kay county, Okla., and the Shamrock extension of the Cushing pool in Creek county, Okla., that at the end of the half-year period the production and consumption of crude oil east of the Rocky mountains are essentially in balance and a tendency toward weaker prices for Mid-Continent grades is apparent. Thus far this tendency has affected high-grade crude oil only to the extent of lowering the premium on certain types that are in greatest demand, but its influence on market quotations is inevitable if production continues its steady increase or if the remarkable wildcat campaign now under way in the southwest results in the discovery of even one considerable pool of high-grade oil.

Silver of Today and 25 Years Ago.

The average cost of producing silver from silver mines today, according to a Survey report, is nearly 50 cts. per ounce less than 25 years ago. Seven of our biggest silver mines, enumerated below, which are producing in 1916 nearly 14% of the world's entire silver output from all sources, produce over 25,000,000 ozs. yearly at an average cost of 22½ cts. per ounce. The average cost of all silver shipped by shipping silver mines and silver-lead mines (exclusive of silver recovered in copper refining) is between 30 cts. and 40 cts. per ounce, with the probabilities nearer the lower figure. In 1893, the late R. P. Rothwell,

estimated 77½ cts. per ounce as the average cost of producing silver in the United States that year. In the 90s, only a few of the richest mines could show costs as low as 50 cts. per ounce. The bonanza Ontario silver mine spent 54 cts. per ounce on the 19,766,772 ozs. produced in 15 years from 1877 to 1891. It cost the Alice, at Butte, Mont., 74 cts. per ounce on the 8,721,597 ozs. produced in 11½ years from 1880 to 1891. Both were big dividend payers.

Silver at 60 cts. per ounce today is really equivalent to a price of over \$1 per ounce in the 90s, considering the lower cost of production now, thanks to lower cost of mining, treatment, and freight, and better recoveries from the ores.

The following summary shows the yearly production of seven of our biggest silver mines, the costs per ounce, together with the number of ounces of silver output yearly per share of issued stock of the respective companies.

	Yearly production ozs.	Ounces per share of stock.	Costs per oz.
N. Y. & Honduras	1,800,000	9.00	29½c
Kerr Lake	2,740,000	4.57	21
Nipissing	3,650,000	3.04	20½
Tonopah Belmont	2,960,000	1.97	18½
Tonopah Ex.	2,040,000	1.60	22½
Tonopah Mining	1,500,000	1.50	27½
Real del Monte	9,000,000	....	22½
	25,690,000		22½c

Aluminum from Clay.—A process of obtaining aluminum from clay has been patented (U. S. 1,160,431) by Grenville Mellen, of East Orange, N. J. The clay or kaolin is fused with sodium sulphate and sulphuric acid, or with its equivalent of sodium bisulphate in proportion to form aluminum sulphate and free silica. After the reaction is completed the mass is cooled and dissolved in hot water or in a hot dilute solution of sodium sulphate containing a small quantity of aluminum salts from a prior reaction. The hot necessary. A concentrated solution of sodium fluoride solution thus obtained is filtered and concentrated if is added, precipitating aluminum fluoride, which is separated by filtration. This is fused with sodium chloride and electrolyzed, producing aluminum. The sodium sulphate filtrate is concentrated to crystallize the contained salt, which is used again. By-products are pure silica, chlorine and sodium sulphate and the process is cyclic.

Further Heavy Increases in the Zinc Smelter Capacity of the United States

The large and general increase in zinc smelter capacity during the first half of the year is apparent from comparing the table published in our Jan. 1 issue, which was checked in every detail by the companies interested, with that shown on the following page for Aug. 1.

In Illinois 512 retorts were added by the Collinsville Zinc Smelter Co., Collinsville; 2400 are under construction at East St. Louis by the Granby Mining & Smelter Co.; an increase of 134 has been made by the Missouri Zinc Co., Beckemeyer; the National Zinc Co. has added 640 at Springfield, and a gain of 1360 is shown by the Robert Lanyon Zinc & Acid Co., Hillsboro.

Kansas smelters registered an increase of 640 re-

torts by the Owen Zinc Co., Caney, whose plant is under lease; 400 by the Chanute Smelter Co., Chanute; 348 by the Joplin Ore & Smelter Co. at Pittsburg, and 448 by the Weir City Smelting Co., Weir City.

In Oklahoma there was an increase of 1520 retorts for the Tulsa Smelter Co., Tulsa, now owned by the United States Zinc Co., and 1200 for the Henryetta Smelter Co., Henryetta.

The New Jersey Zinc Co. of Pennsylvania now has in operation 6960 retorts at Palmerton, an increase of 234 over previous figures; while West Virginia shows a gain of 1824 for the Clarksburg Zinc Co., Clarksburg, which is doubling former capacity, and 592 for the Grasselli Chemical Co. at Meadowbrook.

ZINC SMELTING CAPACITY IN THE UNITED STATES, AUG. 1, 1916.

Operating Company		Number of Retorts building or in operation
ILLINOIS:		
American Zinc Co. of Illinois.....	Hillsboro	4800
Collinsville Zinc Smelter Co.....	Collinsville	2304
Granby Mining & Smelting Co.....	East St. Louis.....	5620
Hegeler Zinc Co.....	Danville	5400
Illinois Zinc Co.....	Peru	5440
Mathiessen & Hegeler Zinc Co.....	La Salle	6168
Mineral Point Zinc Co.....	Depue	9068
Missouri Zinc Co.....	Beckemeyer	384
National Zinc Co.....	Springfield.....	4480
Robert Lanyon Zinc & Acid Co.....	Hillsboro	3200
Sandoval Zinc Co.....	Sandoval	672
KANSAS:		
U. S. Smelting Co.....	Altoon	4620
American Zinc, Lead & Smelting Co.....	Caney	6080
Owen Zinc Co.*.....	Caney	1920
American Zinc, Lead & Smelting Co.....	Dearing	4480
Chanute Spelter Co.....	Chanute	1280
Edgar Zinc Co.....	Cherryvale	4800
Granby Mining & Smelting Co.....	Neodesha	3760
Pittsburg Zinc Co.....	Pittsburg	910
Prime Western Spelter Co.....	Gas (Iola).....	5040
U. S. Smelting Co.....	Iola	3440
U. S. Smelting Co.....	La Harpe	1924
Weir City Smelting Co.....	Weir City.....	448
Lanyon Smelting Co.....	Pittsburg	448
Cherokee Smelting Co.....	Cherokee (Bruce).....	896
Joplin Ore & Spelter Co.....	Pittsburg	1780
American Spelter Co.....	Pittsburg	896
MISSOURI:		
Edgar Zinc Co., Carondelet Works.....	St. Louis	2000
Nevada Smelting Co.....	Nevada	672
OKLAHOMA:		
Bartlesville Zinc Co.....	Bartlesville	6336
Bartlesville Zinc Co.....	Collinsville	13,440
Lanyon-Starr Smelting Co.....	Bartlesville	3456
National Zinc Co.....	Bartlesville	4256
Tulsa Fuel & Mfg. Co.....	Collinsville	6232
Tulsa Spelter Co.†.....	Sand Springs.....	8000
Kusa Spelter Co.....	Kusa	4000
American Spelter Corporation.....	Kusa	200
Henryetta Spelter Co.....	Henryetta	3000
COLORADO:		
United States Zinc Co.....	Pueblo (Blende).....	2208
PENNSYLVANIA:		
American Zinc & Chemical Co.....	Burgettstown	1912
American Steel & Wire Co.....	Donora	9120
New Jersey Zinc Co. of Pennsylvania.....	Palmerton	6960
WEST VIRGINIA:		
Clarksburg Zinc Co.....	Clarksburg	3648
Grasselli Chemical Co.....	Clarksburg	5760
Grasselli Chemical Co.....	Meadowbrook	8592

 Total180,050

*Under lease to Am. Zinc L. & S. Co.

†Owned by United States Zinc Co.



THE GRANBY CONCENTRATOR, MISSOURI.

Half-Year in the Joplin Lead-Zinc District

By BURT W. LYON.*

The production of ore in the Joplin district during the first 6 months of the current year amounted to 381,117,464 lbs. of zinc (including calamine) which sold for \$17,981,313, and 55,994,072 lbs. of lead which sold for \$2,493,728. During the corresponding period of 1915 production of zinc (including calamine) was 298,390,830 lbs. which sold for \$10,202,810, while the lead output amounted to 42,763,900 lbs., which sold for \$1,010,144; thus showing the total value of both ores produced during the past 6 months to be \$20,475,041 as compared with a total value of \$11,203,954 during the corresponding period of last year.

The year opened with top-grade zinc ore selling at \$110 per ton, from which it gradually advanced to \$120, then receded to \$118 during January. February saw the price advance to as high as \$130 and then ease off to \$120, while March showed a wider range of fluctuation from \$120 down to \$95. During April the market stiffened and top grades sold from \$100 up to \$125, then back to \$115. In May the price went off from \$115 at the beginning of the month to \$95 at the close of the month, while June showed the smallest change of any month, with the market declining from \$95 to \$85.

It is believed that the price has about reached bottom as indicated by a strengthening spelter market in London and the fact that some large contracts now being placed in this country will have to be covered by ore supplies in the immediate future.

Owing to the large increase in the number of munition plants in England, France, Russia and Italy during the past few months it is hardly probable that American manufacturers of war supplies will be as heavy buyers of spelter in the future as they have been in the past, although we see no reason why there should be any appreciable decline from the other side in the demand for raw materials, such as steel, copper and spelter, for while a prolongation of the war may cause the erection of additional smelting capacity in Europe, time is required to build smelters and the availability of Australian ores to supply them cannot be regarded as affecting the demand for American spelter for many months to come. Even though the warring nations are now able to make more of their munitions much of the metal-used must still come from America.

Furthermore, it is a well-known fact that there is an enormous arrested demand for spelter both in this country and abroad for use in the various commercial industries, which the abnormally high prices of the past year have practically eliminated from the market, and with spelter even as low as 10 cts. many of these industries are able to come into the market for their supplies. It is hardly to be expected that spelter will again attain the dizzy heights to which it soared during the recent periods of extreme scarcity, but if a price level of from 10 to 12 cts. can be maintained, it insures a price of from \$80 to \$100 per ton for the high-grade ores of this district, and mines that cannot be profitably operated on such a market should not be operated at all.

During the recent era of high-ore prices a number of thin sheet ground mines have been opened up in this district whose operation could not be undertaken under normal conditions, and such properties are not only a poor investment for their owners, but are a constant menace to the stability of prices, for the reason that while they can not produce ore at a profit under normal conditions what they do produce tends to swell the total output to a point where the stability of prices is continually menaced.

A number of such properties are under the ownership and management of men having no previous practical experience in zinc mining, who have been induced to enter the industry in anticipation of fabulous profits held out by professional promoters having still less knowledge of the essentials to successful mining. Experienced operators are not alarmed at the recent decline in the price of ore, which has its compensation in reduced pay rolls and other operating charges, and with a decline in the price of explosives and other mining supplies which it is believed must soon occur, many operators in this district are of the opinion that net mining profits with ore selling at from \$75 to \$90 per ton will be practically as large as when it was selling at from \$100 to \$125 per ton.

There has been considerable talk of a strike among the miners because of the recent cut in wages from the scale paid when ore was selling above \$100 per ton, but thus far the hoisting engineers are the only ones who have put their threat into execution, and while their strike has reduced the output at some mines it is now felt that their attempt to maintain a

*Of Lyon Investment Co., Joplin, Mo.



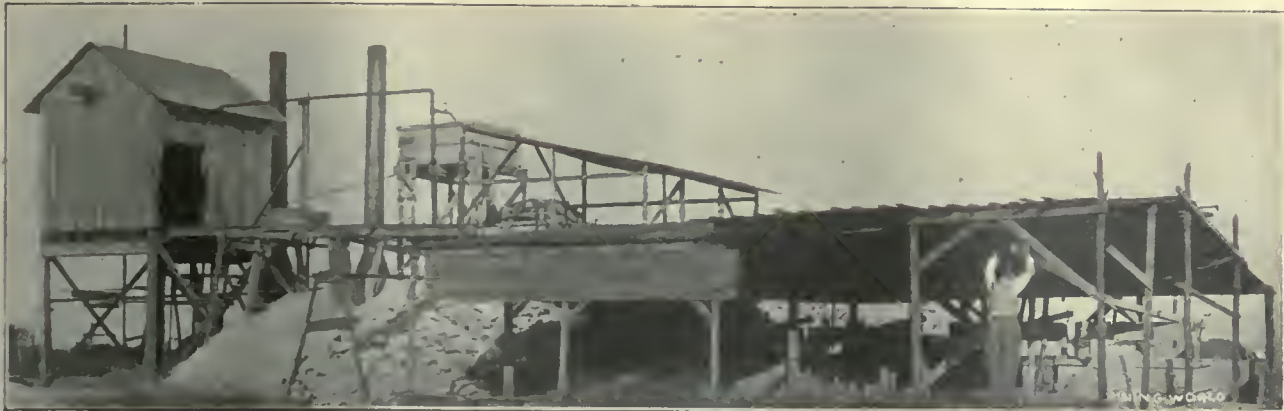
LA HARPE, KAS., PLANT OF U. S. SMELTING CO.



THE S. Y. RAMAGE MILL, MISSOURI.



GROUP OF MINES AND MILLS IN THE PROSPERITY CAMP, MISSOURI.



A LEASE ON THE MEXICAN-JOPLIN LAND, MISSOURI.

high wage scale in the face of lower prices will prove abortive.

For the first time in the history of this district, which to date has produced over \$350,000,000 worth of ore, it now looks as if the mine operators and land owners would get together in a sound and efficient working organization having for its principal object the permanent establishment of a proper relation between the price of ore and spelter; which will result in the stabilizing of both the mining and smelting industries. To achieve this purpose it has been proposed that the sore heads with a chronic grievance be eliminated from such organization and its affairs be placed in the hands of the more substantial and conservative element among the mine operators of this district, to the end that friendly conferences with the smelting people for the discussion of mutual interests shall take the place of threats or cajolery.

Probably no mining district in the world has been so grossly misrepresented, both favorably and unfavorably, as the Joplin district. The comparatively small amount of capital necessary to prospect, develop and operate mines in this field has resulted in its periodical invasion by a class of cheap or unscrupulous promoters every time the price of ore has reached unusually high levels. With a nauseating mass of trashy tommy-rot these people have depicted the Joplin district as a veritable Golconda, where it was only necessary to put in dollars to take down hundreds; and after the unfortunate suckers have realized their inevitable loss they in turn damn the district as the most unreliable and unprofitable mining camp in the world. Both statements are equally untrue.

Enormous profits have been made here during the

past year or two and very large profits have been made consistently during the past 30 or 40 years, but only by people who have been careful in the selection of their investments, and who have managed their properties in a practical business-like manner after acquiring them. Very naturally there have been some losses by inexperienced operators who knew nothing of the mining business and who were too egotistical to learn, while those who have bought stocks in mining companies that were capitalized at eight or ten times the value of the property owned experienced a like result. But some people never seem to learn that even a gold dollar is not worth a pound sterling.

At this writing it appears quite certain that the present year's output of this district will easily exceed \$30,000,000 in value, but the one thing that is assured beyond question is the fact that its activities will continue and its profits roll up year after year regardless of either the ultra optimist or the disappointed sucker who likes to think of himself as an investor.

Gasoline from Shale.—According to the U. S. Geological Survey estimates there is sufficient shale in Colorado in beds 3 ft. or more thick, to yield 20,000,000,000 bbls. of crude oil from which at least 2,000,000,000 bbls. of gasoline may be extracted by ordinary refining processes. The area that has been studied by the Survey comprises northwestern Colorado, northeastern Utah and southwestern Wyoming. The shale found there contains materials which, when heated, may be converted into crude oil, gas and ammonia. Sooner or later this great source of supply will be utilized to supplement the decreasing production from the regular oil fields.



WALLOWER ZINC-LEAD MILL, MISSOURI.



THE GOOGIE MILL, MISSOURI.



COYOTE CO.'S PLANT, MISSOURI.



MATTES BROS. MILL, MISSOURI.



THE EMPIRE ROASTING PLANT, WISCONSIN.

Zinc and Lead Districts of Wisconsin

By J. H. LEWIS.

As a result of abnormal conditions prevailing the entire year 1915 in the zinc-lead markets of the world which carried over at the beginning of 1916 much was expected in the way of production, mine development and equipment and additional prospect work on lands acquired under lease and as yet unexplored.

A careful tabulation of ore recoveries from all active mines in the field the first half of 1916 shows substantial gains until well along toward June when rapidly slumping prices influenced output and a consequent curtailment in ore production. The total recovery of zinc concentrates from mines for this period aggregated 201,862,000 lbs. The U. S. Geological Survey Press Bulletin, No. 273, published May, 1916, and showing in detail the yield for the zinc and lead districts of Wisconsin for 1915 gives this region credit for a total output for last year of 141,575 tons. Comparison on the rate of production shown for the first six months of this year if maintained would give the field a gain approximately for the current year of 60,000 tons. This gain will not be fully realized as low-grade ores, for which this field is particularly noted, were in poor demand as June drew to a close, and a conservative summarizing of ore held in reserve as practically unsaleable showed nearly 8000 tons being carried over. The base price of zinc ore had receded from \$110 per ton at the beginning of the year, to an average of about \$70 for 60% zinc content, for standard and top grade zinc ore, down to \$60 for base for ores running as low as 50% zinc content. Below this value sharp discrimination was evident so that low-grade producers were left floundering in a rather turbulent sea without a near hope of rescue. The situation revived the condition of zinc ore producers about a year before when high-grade ore was in demand, and refining of ore at local magnetic separating plants became imperative. This situation was being met heroically as the first half of the year was being concluded.

Net deliveries of zinc ore from separating plants to smelter and from mines to smelter direct for the first 6 months of 1916 ran higher than for the same period of 1915, aggregating 120,000,000 lbs. This improved showing was made possible by the introduction of several new separating plants early in the year, and the enlargement and improvement of plants which have been operating in this field regularly for several years. The New Jersey Zinc Co. put in a new plant of

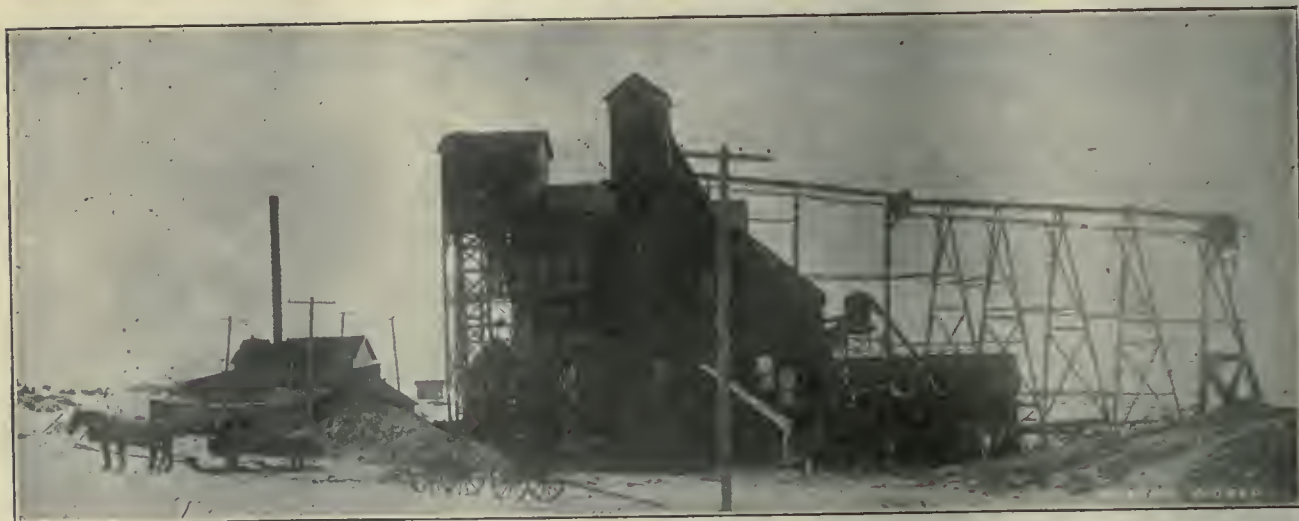
the McDougal type at Mineral Point. Another new plant constructed for the Wisconsin Zinc Co. at New Diggings the latter part of 1915, at a cost of \$100,000, was placed in commission during March on regular three shifts. The Galena Refining Co. completed a new ore refinery at Galena, set in operation early in the year. At Cuba the National Zinc Ore Separating Co. enlarged its plant to 150 tons of ore daily, and was one of the heaviest shippers of high-grade ore in the field. The Linden Zinc Co., Benton Roaster Co., Enterprise Roasters and Joplin Works at Galena, handled much low-grade ore, and figured weekly in the reports showing shipments of high-grade ore out of the field to smelters.

Mine development prosecuted vigorously during 1915 was brought to a successful conclusion early this year and equipment provided, many fairly substantial producers being annexed to the list of regular producers and shippers. Plants were finished and put into operation as follows: Linden district—Stoner Bros.' Gilman mine for Linden-Milwaukee Development Co., Optimo No. 3 for Frontier Mining Co. Platteville district—Block-House mine, Kistler-Stephens Co., Mann & Harding Mining Co. Cuba district—Anthony mine for Standard Metals Co., Chicago. Benton district—Hird mine for Frontier Mining Co., Longhenry Mining Co., Blackstone mine for Vinegar Hill Co. Hazel Green district—McMillan Zinc Co., Monmouth Zinc Mining Co. Shullsburg district—Little Giant Mining Co. Galena district—Graham mine for Vinegar Hill Co., Birkbeck mine for the Wisconsin Zinc Co.

At the end of June a considerable building program was being followed at all points in the field. In the Highland district one new plant for the Saxelampe Mining Co., another for the New Jersey Zinc Co. on new discoveries known as the Kennedy-Eberle mine; in the Linden district for the Mineral Point Development Co. on the Wickes lease; Mifflin district for the M. & A. Mining Co. on the Big Tom lease; for the Vinegar Hill Co. on the Yewdall lease, tapping extensions of the Rundell range; Platteville district for the Bell Mining Co. on the Graham-Stephens mine; Cuba district for the Standard Metals Co., on the Gritty-Six property; Benton district on the Acker mine, for the Acker Mining Co. of Pittsburgh; Hoffman Mining Co. and Sally Mining Co. at New Diggings, had mills completed and in running order, but



PLANT AT THE BLACK JACK MINE, WISCONSIN.



CHAMPION MINE AND MILL, WISCONSIN.



VINEGAR HILL PROPERTY, WISCONSIN.



FIELD MINING CO.'S PROPERTY, WISCONSIN.

no shipments of ore had been reported; in the New Diggings district mills were building for the Wisconsin Zinc Co. on the Longhorn lease, and on the Chas. A. Thompson lease; in the Shullsburg district, the Oliver Mining Co. had zinc mill well along toward completion with roasting and separating plant, and a big new boarding house. In the Galena district a new company had a plant completed and in operation on the Little Corporal mine; the Cleveland Mining Co. had rebuilt a mill on the old Dinsdale mine which was producing, and had already made one or two shipments, and several old plants had been remodeled and were in shape to resume operations.

The drilling program on lands newly acquired for zinc mining purposes reached high tide in the field during the month of June, and rich discoveries in virgin soil were of almost daily occurrence. A fair criterion of the volume of work that was being followed in this branch alone may be gained from the statement that the Wisconsin Zinc Co. and the Vinegar

Hill Zinc Co. had between them alone going night and day 35 drillings machines in the Benton, Hazel Green, Shullsburg and New Diggings districts. Scores of independent operators were engaged with one or two machines, many with excellent results. All large operating companies were similarly engaged, though not quite so extensively as shown for the two companies herewith specifically mentioned. Leasing, which it seemed had been brought to the last stage of intensity at the close of 1915, continued wherever lands were found available for mining purposes, and where drill rigs could be obtained to perform this class of mine development. By the end of June this year there was scarcely a foot of land to be found south of the Platteville district that had been overlooked.

In the New Diggings district progress was recorded in the completion of a macadam road from mines operating in this camp to the main line of the Northwestern railway. The success of this enterprise immediately led to the installation of auto trucks for



SURFACE PLANT OF PITTSBURGH MINE, WISCONSIN.



THE WINSKILL MINE AND PLANT, WISCONSIN.

transportation purposes with a degree of success that will spread to all outlying producers.

In the matter of lead ore production, a substantial gain was shown over the corresponding period of 1915. The high prices paid at the beginning of the year stimulated production, many miners breaking away from pay rolls to clean up on shallow diggings long abandoned.

Shipments aggregated 2115 tons, as against 3200 tons for the entire year 1915. Lowering prices in sympathy with the declines recorded in the zinc markets encouraged many operators to hold over, and 1000 tons were held in bin the last day of June.

Shipments of pyrites for the first 6 months of 1916 amounted to 30,000,000 lbs. Millions of pounds of pyrites were held by all the zinc ore refiners of the field at the end of June for which a market had been denied for 2 months. Pyrites secured as fines at magnetic separating zinc ore plants are held as by-product and usually sold off at \$3.75 to \$4 per ton. No market was available at all after May 1, and one of the leading zinc ore refiners of the field protected by a contract, and the only shipper in the field, explained the situation as due to the increased acid making capacity in the United States, but more to a demand for high-priced spot acid making it profitable to draw on the

sulphur beds of the state of Louisiana and pyrites conveying high-acid values. It is more than probable that this situation will carry through the latter half of the current year.

Carbonate zinc ore producers chiefly in the northern camps of the Wisconsin field found their product a drug on their hands, with now and then sporadic offers from outside buying interests. The New Jersey Zinc Co., the acknowledged outlet for these ores in this field, offered no market and contented itself with importations from Canada and Mexico to supply its needs. This resulted in a much lowered output the yield for 1915 totaling 2579 tons. This year the total will be under this figure.

Process of Briquetting Zinc Ores and Waste Products.—The preparation of finely divided zinc ores, zinc dust, ash, trimmings and other forms of waste material containing zinc, for treatment in electric or retort furnaces, is patented by Otto Kippe, of Osnabrück, Germany. (U. S. patent 1,168,401.) The materials mentioned are briquetted with from $\frac{1}{4}$ to 2% of a soluble salt, such as the chloride or sulphate of magnesium, calcium, iron or zinc. The briquets thus formed are coherent and hard, and are ready for smelting in a short time.



PLANT AT THE BULL MOOSE MINE, WISCONSIN.

Six Months' Tungsten Production

The tungsten production of the United States during the first 6 months of 1916 exceeded the production of this or any other country in any previous 12 months. Prices were even more phenomenal than production and reached more than 10 times their ordinary level. The output was equivalent to about 3290 short tons of concentrates carrying 60% WO_3 , valued at \$9,113,000, according to an estimate made by Frank L. Hess. Statistics are valuable only so far as their accuracy is known, and this estimate is believed to be correct within 10% and to be under rather than over the true figures.

These figures are no less noteworthy when it is known that in 1915 much the larger part of the production was in the second half of the year, so that the

production. The quantities and values were approximately as follows: Ferberite, 1495 tons, \$3,590,000; scheelite, 1404 tons, \$4,322,000; wolframite, 201 tons, \$613,000; and hubnerite, 185 tons, \$587,000.

In most countries the prevailing mineral is wolframite, and no other country approaches the United States in the quantity of ferberite or scheelite produced. The scheelite comes mostly from Atolia, Cal., but significant quantities are mined in Nevada, Arizona, Idaho and Connecticut.

The tremendous increase of prices caused by the need for "high speed" tools to cut war steel ordered by the governments of Europe of course caused the great increase in production. Prices at the beginning of the year were irregular and depended on the buy-



PRIMOS MILL, COLORADO.

total domestic output for the 12 months ending June 30, 1916, probably amounted to about 5000 tons.

Colorado has regained its lead in the production of tungsten ores and, between Jan. 1 and June 30, marketed 1505 tons, valued at \$3,638,000, of which the Boulder field furnished 1494 tons. California sold 984 tons, valued at \$3,005,000. The reason for the higher value of the California ore was that it was nearly all sold as high-grade concentrates, but a large part of the Colorado ore sold was of low percentage and had to be milled and concentrated, with consequent expense and loss.

From Nevada, 461 tons, valued at \$1,432,000, and from Arizona 175 tons, worth \$565,000, are estimated to have been shipped. Smaller quantities were mined in Alaska, Connecticut, Idaho, Missouri, New Mexico, South Dakota, Utah and Washington.

Not only were the output and prices unique, but the ratio of the several tungsten minerals produced was different from that of other countries of large

er's need of the ore and probably on his fear of the possibility of not being able to get it when he might need it even more. Ores carrying 60% tungsten trioxide brought at that time as much as \$66 a unit, but by the last of March some ferberite sold for \$93.50 a unit at the mills, and even higher prices were quoted in the newspapers, though they could not be confirmed. The prices of the same ore in the New York market would naturally be somewhat higher. Under the stimulus of these high prices production, not only in this country but in the world at large, has been at the highest point ever known. At first the sudden demand created by the orders for war steel were far ahead of the instant productive power of the country. The rapid increase in prices, starting last fall at a time when tungsten mining was at a low ebb and culminating in the undreamed maximum mentioned, caused prospecting and consequent discoveries of new deposits, increase of development of known deposits, the operating at high tension of old mills, and the hasty build-

ing of new mills. As a result, the production increased faster than the consumption and soon overran the demand that would absorb the output at the extremely high prices prevailing, so that a drop in prices was inevitable. June closed with the price around \$25 a unit, which was still much higher than any price known before this year. The highest price previously reported was \$15 a unit, paid in 1907. The normal price has been \$6 to \$7.

During the 6 months under consideration 40 mills of various types and sizes were in operation part or all of the time on tungsten ores, and at the end of June, 14 were under construction.

In the tungsten mining camps the excitement that followed the increase of prices was similar to that caused by important gold discoveries. Nederland, Colo., a little village of two or three dozen homes, suddenly became a town of 3000 or more inhabitants. East of Nederland two settlements, each containing several hundred people, sprang into existence. Atolia, Cal., a camp of 60 or 80 people, grew to more than a thousand.

In the Boulder region, Colo., 10 mills, 6 of which



CONSOLIDATED TUNGSTEN CO.'S MILL, NEVADA.

were new, were in operation. Besides these, at the end of June five old mills were being overhauled to work on tungsten ores and three new ones were under construction. One was in course of erection on the Copeland property, on South Boulder creek, to work ores that have heretofore given much trouble owing to the fineness of the particles of ferberite, which are spread through "horn rock." Fifteen jigs are reported to have been operating on old tailings piles and on placers. From those workings on tailings, the concentrates were sent to Wilfley tables. All mills and jigs were operated by electric power, and so great was the demand for motors that the stocks in Denver were exhausted.

In Arizona four mills were erected at Dragoon, three at Arivaca and one at Yucca. In California two mills were reported under construction near Goffs and one near Nipton. At Atolia the mill of the Atolia Mining Co. was burned but was rebuilt and enlarged. A smaller mill was operated at Johannesburg, and many kinds of machines were used to extract scheelite from the desert debris between Randsbury and Atolia.

In Nevada a mill was constructed and operated near Toy, Humboldt county, and four or more mills

were constructed in the Snake range, in which tungsten deposits were found through a length of 50 or more miles. The United States Tungsten Corporation operated the mill built a number of years ago by former owners of the property at Tungsten, 12 miles south of Osceola, and a small mill was operated on the east side of the range. Most of the deposits of the Snake range are said to be of low grade. A mill was also operated at Round Mountain.

Tungsten mining was started as a new industry at Silvermine, Madison county, Mo., and a small quantity of scheelite was mined at Long Hill, 8 miles north of Trumbull, Conn. The mill on the Long Hill property was burned and operations ceased for a time. In Washington a mill was under construction on Tungsten mountain, 35 miles northwest of Oroville.

One of the most interesting developments of the year was the beginning of production of scheelite from contact-metamorphic deposits. Two deposits of this sort near Toy (Browns), Nev., were exploited, and near Bishop, Cal., mills of 80 and 100 tons were erected on similar deposits. Other contact deposits were located a few miles south of Bishop. It is thought by the Bishop mill owners that their claims can be worked profitably under such prices as were paid before the war. Tungsten minerals added largely to the receipts of gold mines at Lead, S. Dak., and White Oaks, New Mexico.

The consumption of tungsten in the United States was even greater than was indicated by the ores produced, for all parts of the world free from the control of the warring European nations were drawn on for supplies, and during the first 5 months of the year 1520 tons of tungsten ore, valued at \$3,449,311, were imported. The June imports were probably equal to the average of the five preceding months, making the total for the half year 1824 tons, valued at \$4,139,000. Some of the ore imported is known to have been of low grade, but a considerable quantity carried more than 60% tungsten trioxide, and probably the average was not far from 60% WO_3 . Most of the ore came from South America—Peru, Bolivia, Argentina and a little from Brazil—but some ore came from Japan and Mexico. Some of that imported, like a little of the American ore, contained phosphorus, arsenic, copper and other harmful impurities, but during the height of the demand even this ore was readily bought. By June buyers became more careful and it was not so easy to sell bad ore.

Ten tons of tungsten metal and ferrotungsten, valued at \$36,885, were recorded as imported. The exports for the first 5 months of the year amounted to 4906 lbs., valued at \$10,571.

If the American production and imports are added the consumption seems to have amounted, roughly, to 5100 tons of 60% concentrates, valued at \$13,278,000. On the supposition that 20% of the metal was lost in various operations, it seems probable that between 11,000 and 12,000 tons of new high-speed steels were made during the period, in addition to the steel made from tungsten saved from scrap and scale.

Larger Imports of Manganese Ore.—Imports of manganese ore into the United States in April were 48,413 gross tons, the largest this year. This brings the average to May 1, 1916, up to 24,989 tons per month, which compares with 26,731 tons per month in 1915 and 28,757 tons per month in 1913. For the 10 months to May 1, 1916, the total imports have been 355,795 tons, against 159,203 tons and 242,748 tons for the same periods in 1915 and 1914, respectively.

A Half Year With Makers of Mining Machinery

The past 6 months has witnessed great activity among the manufacturers of mining and metallurgical machinery as a result of the unusual prosperity of the mines and works. It is the general opinion of these manufacturers that the outlook for the immediate future is excellent and that continued high prices for the metals will result in record production, and a resultant demand for additional equipment.

Conditions governing the machinery manufacturing end of the mining industry during the past 6 months are voiced by some of the leading firms of the United States as follows:

Worthington Pump & Machinery Corporation.

Although the Power & Machinery plant of the Worthington Pump & Machinery Corporation has experienced the same difficulty in obtaining raw material as other manufacturers, we have been able to keep our works operating at a capacity on our regular line of material, owing to the fact that we have not undertaken any munition work. A great many inquiries, resulting in orders for ore reduction materials, are coming in during this time, particularly copper converters. We have made several of these machines for Spain, South America and the United States, and of particular note, two converters of the Pierce-Smith type, 30x13-ft. size, from which even better results are expected than from the use of the 20-ft. Great Falls type. In connection with crushing machinery, there has been the usual demand for gyratory, and an exceptional demand for the large sizes of jaws, up to 84x6-ins. We have sold more than a dozen of the latter size, for use both in this and foreign countries. Both rolls and tube mills remain popular, and there seems to be a tendency on the part of the buyers to desire the larger and heavier types of machines, of which there is no doubt of the efficiency, although there has been some hesitancy in the past in undertaking the installation of the same when the metal markets were less favorable. Tube mills seem to tend to larger diameter and shorter length, and the large diameter, short length ball mill is also popular at the present time. We are making a number of these machines both for fine grinding in connection with flotation, and also as preliminary grinders to pebble mills in connection with cyaniding.

B. L. KNOWLES,
Publicity Manager.

Wedge Mechanical Furnace Co.

As you know, it has been our policy not to publish any articles on the work we have done or may be doing, preferring that any economies or improvements in the recovery of metal values which may have been secured through our efforts in any manner, be given publicity by users of the equipment or by articles written by engineers or metallurgists. However, we are pleased to advise you that we have enjoyed prosperity with the metal industry, due to the large quantity of new equipment which has been required by the smelters, to enable them to increase their output, and at the same time place them in a position to operate economically for future production.

LESLIE H. WEBB,
Secretary.

Hardinge Conical Mill Co.

Although we have hundreds of mills in commission in plants having capacities varying from 10 to 15,000 tons per day, none bear the unique importance of absolute advancement as does the recent installation of 8-ft. Hardinge ball mills in the great Dome gold mines of Canada, where eighty

1250-lb. stamps have been dropping for 3 years, some of which have already been scrapped and the balance will soon follow. The Dome Co. is controlled by its president, Capt. J. R. DeLamar, of international mining fame. Its manager, C. D. Kaeding, was formerly connected with large Goldfield, Nev., mining interests where stamps were the fashion. The management, influenced by the claims made for ball mills of different designs, started investigations of the work performed by ball mills at the Inspiration plant and other points in the United States. The result of the investigation was an order for two 8-ft. by 30-in. Hardinge ball mills to perform the work previously done by the stamps under the following guarantee by us: (a) That each mill should have a capacity of not less than 350 tons per day (in closed circuit) to a finer product than was being obtained from the stamps, which were equipped with $\frac{3}{8}$ -in. screens, and total metal consumption would not exceed $\frac{3}{4}$ lb. per ton of ore. (b) That the power should not exceed 125 hp. per mill when operating with a full charge of ore and balls, the latter being approximately 30,000 lbs. The result of the operation of the first of these mills, under the conditions above mentioned, on a test run of 50,000 tons, is: (a) The capacity of the mill under normal operation (without the aid of the closed circuit) is 600 net tons per day to a much finer product than is being obtained by the stamps, and metal consumption is less than $\frac{1}{2}$ lb. per ton of ore. (b) The actual net horse power required is 113, and 10 stamps have been removed for the placement of the second Hardinge mill now being installed. This 100-ton space is now converted into 600 tons. Taking into account the capacity, fineness of product, together with the lesser horsepower required, we are of the opinion that the mills are doing nearly 100% better than our guarantee.

H. W. HARDINGE,
President.

Traylor Engineering & Mfg. Co.

The past year has been the most prosperous in the history of the Traylor Engineering & Mfg. Co., of Allentown, Pa. Having a location second to none for the manufacture of mining and smelting equipment, and in fact all kinds of heavy machinery, they have ever been ready to introduce new machines that would tend to make the life of the mill and smelter superintendents less burdensome, as well as to increase the recovery of values from the ore and reduce the cost of treatment. During the half year just ended there have been more Traylor water jackets installed than ever before; more than 2,000,000 lbs. of plate steel has gone into their jackets, and when you consider that the first of these jackets with welded tuyeres and corners were not made until the fall of 1907, it speaks volumes for their design and construction. There is not a big smelting company in the world that does not use these jackets. The Traylor crushing rolls, with the automatic lateral and adjustment, is another evidence of the progressiveness of this company. At the present time they have on order 24 sets of these rolls, ranging in size from 30 by 14-in. to 54 by 24-in. All of these rolls are equipped with this automatic lateral shifting device. Among the other specialties made by the company are the Bryant-Wethy safety crossheads and skips. This device complies with all of the safety-first laws of the mining states and the proposed National Safety-First Law as applied to mines. This device was originally developed in the Montana copper district, but has since become a very general part of the first-class mine's equipment. The general prosperity of the company is evidenced by the fact that at the present time it is adding to the already well-equipped plant a new machine shop, 100 ft. wide by 600 ft. long, which will contain equipment consisting of the very latest design, all electrically driven. In addition to this new machine shop it has already added 150 ft. to the plate shop, and will erect this fall a new 4-story warehouse and administration building. The plan adopted of carrying a stock will undoubtedly be greatly appreciated by the mining and metallurgical people,

as it often means a great many thousand dollars to them to be able to get equipment without waiting for the same to be manufactured. The company extends a cordial invitation to all of their customers and friends to visit their plant at Allentown, Pa., when in the east. Allentown is easily accessible from New York by the Lehigh Valley or Central Railroad of New Jersey or from Philadelphia by the Philadelphia & Reading or the electric trolley lines.

LEWIS A. RICE,
Sales Engineer.

R. & J. Dick, Limited.

We can safely say that our business during the first half of the current year has been the largest for a similar period since the establishment of our plant in Passaic for the manufacture of "Dickbelt," previously marketed through our home factory at Glasgow, where Balata belting was originated and sold to the world for over 30 years. In addition to branches already established we opened a new office in Seattle in January to care for the increasing demands of the Pacific coast and the great northwest. Despite the greatly increased cost of all raw materials we have endeavored to protect our patrons by maintaining old selling prices depending upon the increased volume of business to see us through. Our policy has borne fruit in this respect as evidenced by the fact that we have been compelled to operate our plant by night as well as by day to keep up to our reputation for quick service. We were fortunate in being able to overcome all labor difficulties which threatened us as well as all other manufacturers. Through a well-organized system of distributors we are in a position to serve every section of the United States in addition to which we maintain a force of direct factory representatives so well located that we are in quick touch with all points of the country. We are hopeful of a continuance of this prosperous condition, not only for ourselves, but for the other manufacturers of the country as well.

J. F. LINN,
Manager.

General Naval Stores Co.

Progress in the oil flotation field has been of a kind most welcome to producers of flotation oils. A year ago inquiries ranged from green soap to fusel oil, and included many materials entirely impractical from the standpoint of price or available supply. Today inquiries, though vastly increased in number, have sifted down to a few standard products which have proved suitable under actual mill conditions and of which the supply is sufficiently ample to permit expanded operations without undue price fluctuation. This progress is largely due to a better understanding of oils and their functions as applied to flotation. "Frothing Agents" and "Oiling Agents" were vague terms at this time last year, but today, thanks to the excellent data published by our mining papers, they are both recognized and applied. Pine tar oils and pine oils have become firmly entrenched as the cheapest and best "frothing oils" for American operations. They will doubtless continue to make up 25 to 30% of the total flotation oil consumption. Certain grades of hardwood distillates have also attracted attention as "frothers." The question of what "oiling agent" shall be used seems to hinge largely on what oil can be obtained cheapest under local conditions. Coal tar and coal tar creosotes, hardwood creosotes, petroleum oils and pine tar have each found extended use in various parts of the country. Bigger and better business sums up our activities for the first 6 months of 1916.

CHAS. A. LUNN,
Director.

The Denver Quartz Mill & Crusher Co.

Denver is always first to perceive a revival of activity in mining, because she stands in the front rank as a manufacturer of mining machinery and mining supplies. The prosperity of the mining industry is distinctly shown by a visit to the Denver plants engaged in the manufacture of all

types of mining and ore milling machinery. The business of the Denver Quartz Mill & Crusher Co., which is related directly to the ore milling industry, is splendid evidence of the activity in the production of ores, concentrates and bullion. The amount of business done by it during the last 6 months is over 400% better than that of any other similar period within 3 years. This showing reflects the prosperity of all the mining states and territories from Alaska to the southern border of the United States and South America. It tells the story of new construction in the mining districts and of the increasing capacity of plants already in existence. Our experience is matched by the other manufacturers of Denver, a city which supplies mining equipment to the entire world. I trust that the rest of the United States is as prosperous as Denver.

J. G. BARTLEY,
President.

E. H. Moyle Engineering & Equipment Co.

We have expended considerable in laying out our new lines and putting in our developing plant, so as to work on a larger scale. Since writing you last we have done considerable development on our new crusher and pulverizer, and have held several demonstrations of the machine in our new plant. All the mining men pronounce it the best crusher on the market, and predict a large future for it. I am sending you a couple of samples of the product from this crusher, one of them being a hematite quartz ore (red), which went through the machine twice. And the other sample is hard quartz ore, once through. From this you will note that we have something very good. I might state that the advent of this new crusher will mean a great change in the reduction of ores, particularly free milling. For the reason that the mill will now take the appearance of a streak up the hillside, or a steel chute leading from the mine to the tailings pile, with the machines set between, and a large amalgamating pan at the bottom or something of that kind characteristic to the ore. I am now figuring on some large orders for big machines, and anticipate closing many of them.

E. H. MOYLE,
President.

The Carbo Corporation.

As with most other concerns engaged in the steel manufacturing business, our problem during the past 6 months was not that of obtaining orders, but rather of providing sufficient raw material and securing labor. We are fortunate in that while we are specialists, manufacturing exclusively steel poles for power, telephone and telegraph lines, and steel fence supporting units, our products are required by such a large variety of industries and people that the demand is well distributed. Inquiries from mining companies were light during the early part of the year, but have increased lately. New power and telephone projects have contributed the largest share for steel poles; and the farmers for steel fence supports. New foreign business is coming without any solicitation. Our main plant has been enlarged, and we are about to erect a Canadian branch in Ontario for the handling of Canadian requirements, and also for exports to British possessions. The outlook for the future could not be any brighter.

E. J. MASEGER,
Asst. to President.

The Prest-O-Lite Co., Inc.

A very marked activity in the mining industry is being reflected in our increased business on dissolved acetylene as well as oxy-acetylene welding and cutting equipment for all kinds of construction and repair work. This process, as you know, is being used on a wide range of mining work—down in the mines for such work as making butt-welded joints in compressed air and steam pipe lines, making the joints absolutely leak-proof; welding copper bonds on mine tracks; in the machine shops for welding various broken or worn mine equipment, also for boiler repairs. Another interesting development is the employment of this process on sheet-

metal construction work, also for lead burning on acid tanks. Our business with the mines has been more than satisfactory, probably due to the fact that our equipment is especially suited for mine work. The Prest-O-Lite outfit being portable, construction or repair work can be handled right on the spot, no matter where located. Our engineering department reports that the mines are showing an increased interest in the oxy-acetylene process, hardly a day passing without we are requested to offer expert advice on some welding problem which has confronted the use of the oxy-acetylene process.

BRUCE DANIELS,
Asst. Promoter of Sales.

Standard Spiral Pipe Works.

We find conditions very greatly improved, inquiries and orders coming in from all over the United States. We have as yet no past information whereby we might gauge our inquiries, because of the fact that our pipe is a new article on the market, and the engineering and mining fraternity are just appearing to realize the fact that we have an article of merit. One noticeable feature of business which is being received lately is the fact that it comes from a wider field than we had anticipated, and our product is being found satisfactory for many uses which had not been looked for at first.

A. J. BERGER,
Vice-President.

Hyatt Roller Bearing Co.

Anti-friction bearings on mine cars were thought to be a luxury some years ago. Today everybody acknowledges the anti-friction bearing to be a necessary part of a mine car in order to obtain maximum haulage results at minimum cost. The Hyatt Roller Bearing Co. has always realized the importance of their product in connection with the mine car. Still, were we satisfied as to the importance alone, advancement would not be great. A large amount of research work must be done. We have always realized the importance of this work and during the past 6 months we have prepared to do more than ever before. Our dynamometer car, which is the only one in the mining field, is doing a marked amount of good work. The first series of results obtained with this car was published in the June, 1916, Bulletin of the American Institute of Mining Engineers. An abstract of this article appeared in the June 24th issue of the Mining & Engineering World. A new sales department to more effectively handle the increased mine car bearing business was formed in February. This department is planning well ahead for the future business that is bound to come. Sales engineers have been added to the sales force for the purpose of cultivating a more extensive acquaintance with the conditions existing in the mining districts. The sales engineers are demonstrating to mine car users the advantages that can be gained by adopting anti-friction bearings as a mine car accessory. Their work is being followed up by an extensive advertising campaign. During the past 6 months two large 9-story concrete buildings have been completed and another, which is to be 9 stories, has been started. When this new building is finished in the course of a few months, we shall have 650,000 sq. ft. of floor area devoted to the manufacture of Hyatt roller bearings.

WALTER R. BYLUND,
Publicity Bureau.

McLanahan-Stone Machine Co.

We were exceptionally busy at the beginning of the year on our single roll crushers, which have proven a remarkable success when used for crushing limestone for fluxing purposes, and for brick plants for crushing their hard shale preparatory to feeding to pans. The price of manganese having advanced at such a rapid rate has been the cause of a number of mines opening up that heretofore were not able to operate, due to the fact that their ore was not rich enough, or required too much labor to concentrate same in order to find a ready market; but they are now able to sell this material at fancy prices. For this reason we have been

busy furnishing washers, jigs and other machinery for the cleansing and concentration of this material. We have also had a number of orders for repairs from iron mines throughout the south, as most all of them are equipped with our machinery. We have been hampered considerably, due to the fact that we were not able to obtain mechanics. The prospects for business look good at the present time for at least 3 or 4 months.

WM. F. KIRK,
Manager.

Atlantic Metal Hose Co., Inc.

The metal hose industry in this country, which is yet in its infancy, has made quite a record for itself among mining, railroad, stationary engineers, etc., who are rapidly adopting it. Flexible metal hose was originated in Germany and was hardly known in this country a few years ago, and therefore quite some missionary work had to be done among the various engineers in this country, in order to convince them that a flexible medium can be had by adopting metal tubing, steel or bronze, which combines the three essentials of flexibility, durability and efficiency. This metal hose industry has since made very rapid gains, especially since Europe is at war, as many foreign countries which formerly obtained their supply from abroad are obliged to turn to this country for their supply. The factories turning out this product are taxed to their full capacity with orders for months to come. During the last few years the U. S. Navy Department has found it advisable and economical to adopt flexible metal hose for conveying steam and loading and unloading oil. The government has placed orders for thousands of feet of flexible steel and bronze hose within the last few months. Many of the leading mining and railroad companies in the country have also turned their attention to flexible metal hose, where it is now used for all purposes. The prospects for this line are very promising, as figures show that the business of this product for this year has gained by leaps and bounds, and has an increase of about 400% over last year, and it looks as though the year of 1916-17 will be a record-breaking year for this industry.

Metals Production Equipment Co.

On account of activity in the iron and steel industry and the alike metal trades, we have had a good business in metallurgical furnaces. Most of this business has been for standard furnaces with a small proportion of war order work. We have had many inquiries from the iron and steel trade for powdered coal equipment. The demand for iron castings has been large and has kept our iron foundry very busy. We have recently completed a brass rolling mill and have a number of large contracts which will keep us busy into 1917. On a whole, the past 6 months has been a period of unusual activity. Our chief difficulty has been to secure a supply of competent labor.

JAMES A. VALENTINE,
Treasurer.

Western Wheeled Scraper Co.

One of the main products of this company is dump cars. Our business during the past 6 months has been quite good, particularly in the industrial field, as many mining and industrial concerns have become alive to the advantage of the use of dump cars in handling earth, stone, ore, slag and light material with this class of equipment, so that the business in this particular field has improved considerably.

WM. D. FOULKE,
Treasurer.

The Connersville Blower Co.

The first half of this year has gone into history, and as concerns our business it has been the most remarkably active like period we have experienced. Our unfilled orders have been greater, and sales, both as to the total and individual size, larger. The European war stimulated greatly

the building of by-product coke ovens and plants for developing the by-products of the process. It has been in this field that our largest volume of business during the past 6 months was secured, we having furnished nearly all of the gas pumps, exhausters, boosters, tar, liquor, and oil pumps installed, and they have been large in number. The demand for high-pressure blowers in flotation service, and vacuum pumps for cyaniding, continues to develop rapidly and is proving an important part of our business. To handle the situation we have added considerable to our plant and equipment. The future prospects are indeed bright.

J. T. SUTLIFF,
Advertising Manager.

Spray Engineering Co.

The nature of our business is such that it is, we believe, a very fair barometer of general business conditions, as we secure our orders when the large electric lighting, street railway, and industrial plants are adding to or improving their power house equipment—in other words, when general business is increasing its production and it has the money available for additions and improvements. The new business secured by this company during the past 6 months is in excess of any previous 12-month period, and we see no indication of any slowing up in the near future. The only difficulties which we are experiencing are in obtaining reasonably quick deliveries of material which we, ourselves, purchase to fulfil our contracts—another indication of general prosperity in general business.

JOHN T. CLARK,
Treasurer.

Redwood Manufacturers Co.

Our business for the first 6 months of 1916 has been more than satisfactory. It has shown a very large increase over the first 6 months of 1915, which we thought was a very good year. The main reason for this is the very decided increase in the production of copper, which necessitated the use of a large amount of additional tankage and piping. As a great part of our trade for many years has been with the mining companies, we shared in the general prosperity. Another decided feature was the inability to get steel, which led many concerns who had not heretofore used redwood pipe to install it because we could deliver immediately. If the last 6 months of 1916 are equal to the first, we would be willing to certify that this year has been a banner year.

H. B. WORDEN,
Manager Pipe, Tank & Silo Dept.

Huff Electrostatic Separator Co.

Our business has increased over 200% during the past 2 years and the only difficulty that we encounter is in not being able to get out our equipment fast enough to meet the demand. The electrostatic method has been used largely for the treatment of table middlings, etc., or as a secondary process to the general milling scheme; but during the last 2 years, we have installed plants treating crude ore, which have met with good success and we are now designing and installing a 200-ton mill for the treatment of copper ore. The results of this plant we expect will be very interesting to mill men in general, and we believe will show some very advantageous points in favor of electrostatic concentration, which heretofore have not been developed.

H. B. JOHNSON,
Manager.

Ridgeway Dynamo & Engine Co.

We are pleased to say that the last 6 months have been quite satisfactory from our standpoint, so far as the volume of new business booked is concerned, this volume having far outrun that of any previous similar period in our history. We, like all manufacturers, however, have been more or less hampered by the difficulty of securing skilled labor and the very unsettled state of the raw metal markets, which has made prices of all such material unusually high and deliveries very unsatisfactory. Our belief is that the high tide of

demand has just about reached the maximum and that we will see a more or less gradual recession during the balance of the summer and fall. We have nothing, however, to indicate that a sound, healthful condition of business may not be expected for a considerable time to come, regardless of whether the European war continues or peace is declared before the end of the year. We base this belief on the fact that domestic consumption has for years past been much lower than normal and that, as a consequence, the demand which we have been having, and probably will have for some time to come, is an accumulative one and added to it will be the increased foreign demand which has been a result of the European war. We feel that some shaking down of the abnormal conditions which have existed for the first half of the year, will probably be beneficial, rather than otherwise, and that, if manufacturers and financial interests are reasonably conservative, there is nothing in the immediate future that need be feared by business interests at this time.

H. A. OTTERSON,
Sales Manager.

The White Co.

The mining and metallurgical world has contributed much to the present strong position of the motor truck industry, being one of the heavy buyers of motor transportation equipment. The high prices that are now being paid for practically all metals has stimulated the introduction of motor trucks for speeding up the hauling of ore in sections where trucks have been used only in a limited way heretofore. In fact, many mining companies have so thoroughly established the success of motor trucks for hauling ore between the mines and the smelters or the shipping points, that they are now buying trucks in much the same manner as they buy other equipment and supplies. The economies effected by a few companies that started to use motor trucks in a small way, have resulted in orders being placed by telephone and shipments being made by express. When several mining companies near Tucson find trucks sufficiently economical to warrant them in paying \$355 in express charges from Los Angeles, merely to expedite the delivery of the trucks, the incident offers ample proof of the loss sustained by neglecting to install motor trucks. Among the companies that have recently installed motor trucks, built by the White Co., are the Boston & Montana Development Co. at their French Gulch and Elkhorn properties, Montana; the Cananea Con. Copper Co., Cananea, Mexico; the Eastern Tulare County Magnesite Mines, California; the Bunker Hill Mines Co. Tombstone, Ariz.; the McCausland Mines, Zabriski, Ariz.; W. R. Ramsdell, Tucson, Ariz.; Vulcan Mining Co., Salido, Colo., and the O'Kelly Lease, Jean, Nev.

H. M. NEWTON,
Asst. Adv. Mgr.

Raymond Bros. Impact Pulverizer Co.

We are extremely busy at the present time, as we have just recently received an order from the Carnegie Steel Co. for 17 of our largest sized mills to pulverize coal for use in their open-hearth furnaces. Pulverized coal is fast becoming recognized as the best fuel to be used in open-hearth furnaces and many other metallurgical operations. In evidence of this, we have received many orders recently for both experimental installations and complete installations for mills for this purpose. Besides this we are keeping our shops working night and day on mills to be used in all other industries requiring finely ground materials.

W. A. KOREN,
Publicity Manager.

Colorado Iron Works Co.

The decided improvement in our business, which developed early in the present year, was due in the main to expansion by existing ore treatment plants consequent upon the high level of metal prices. Flotation has called for much new equipment and re-arrangement of old equipment in the extensive utilization of that process for the attainment of

improved recoveries. The impetus given to tungsten mining by the unexampled demand for that metal accounted for a quite measurable portion of our business, including four complete plants designed and erected, in addition to a considerable amount of equipment supplied to mills already in operation. Aside from the tungsten industry we have not felt the influence of new enterprises to anything like the extent we experienced in former years when manufacturers of mining machinery were enjoying widespread prosperity. The last 6 months, as we rate the progress made during that period, have been notable rather for the firmer position secured by pre-existing producers than for any considerable addition to the number of mills and smelters.

H. B. LOWDEN,
Secretary.

The Pennsylvania Drilling Co.

We are pleased to furnish you statement showing condition of our business for the last 6 months. During the past 6 months our business has increased rapidly; 22,500 ft. drilled, which is nearly double the corresponding 6 months of last year. Believe business is going to keep on improving, as 90% of the work we have been figuring on has been held up from week to week. These people are bound to go ahead when they find that conditions actually demand it. Activity seems to be general, as we are getting inquiries from all parts of the United States, as well as Canada and Central America.

T. B. STURGES,
General Manager.

Abbe Engineering Company.

With reference to the additional business for the past 6 months, wish to say that there has been a steady increase month after month, in the volume of business which we have been doing up to the present time, so that at the end of June, we had done business which amounted to practically 20% more than the total volume of 1915, which was a very good year for us. From the present indications there does not seem to be any signs of this condition changing.

Allis-Chalmers Mfg. Co.

The demand for mining and metallurgical machinery has been exceptionally good during the past 6 months. Owing to the high prices of all metals, especially copper and zinc, the mines producing these commodities have been pushed to the limit of their production.

Our business in mining and metallurgical machinery has been better this year than at any time in the history of this company and if it had not been for the scarcity of labor and the difficulties in obtaining raw material, especially steel plate and steel castings, our output would have been considerably larger. In many cases where improvements or additions to metallurgical plants were under consideration, they were not carried out because of the length of time manufacturers required to execute an order.

The outlook for the immediate future is equally good. As long as the war in Europe continues, the demand for all metals will be abnormal and prices will be high, and producers will continue to work under pressure to maintain a maximum rate of production.

Accepting the views of those who are in close touch with the conditions in Europe, that the war is likely to continue for at least another year, we feel that the mining industry in this country generally will continue to be prosperous and that the manufacturers of mining and metallurgical machinery incidentally will share in this prosperity to a limited extent.

H. C. HOLTHOFF,
Manager Mining Machinery Department.

American Blower Co.

A recent canvass among our own offices disclosed a very gratifying condition of business, it being almost the unanimous consensus of opinion that we may look for an indefinite period of prosperity. Despite the excessive cost of building

material and the consequent abandonment of many building projects, there is still available to us a larger volume of business than we have ever had to deal with in the past. The section of our work dealing with the particular field served by your valued paper, such as the application of fans and blowers to the ventilation of coal and metal mines, smelter fans, mechanical draft apparatus for boilers, etc., is fully as active as any other department of our business. As regards improvements relating to metallurgy and mining, will state that we have recently developed the Sirocco system of inductive extraction for exhausting corrosive fumes by induced flow, the fan in each case handling atmospheric air only.

T. CHESTER,
Chief Engineer.

El Paso Foundry & Machine Co.

As you know, our principal business was in Old Mexico, manufacturing mining machinery and furnishing supplies to a great many of the companies there; but it grew steadily worse and at last stopped, as it was impossible for people to do anything in that country, not only on account of the railroads being out of commission and partly destroyed, but the uncertainty of the government and who the ruling power would be in the district in which they were located. I have been surprised very often at the faith and persistency of many of these mining men in Mexico. This affected our business, but fortunately for us here, the copper market took on a tremendous advance a little over 6 months ago, and consequently we have been very busy so far this year and I feel that conditions warrant me in saying business will be good for the next 6 months. We have been obliged to run night and day on machinery for the mines. In regard to Mexico, we all feel that it must come to a head very soon, as it has been growing steadily worse for over 5 years. People in the southwest are very tired of the "watchful waiting" policy of our government. Also, we do not like to have these Mexicans come into the United States and kill people who had no interests in Mexico whatever. This has happened many times. As soon as Mexico does get straightened out, there must be a tremendous amount of business in this country.

W. N. SMALL,
President.

The Marion Steam Shovel Co.

Unusual activity in the mining field and in many of the other lines of business which we serve, has made 1916 an exceptional year for us. Our only complaint is that we could have done an even greater business, had we been able to secure the necessary material and labor.

F. H. KING
Sales Manager.

The Webster Mfg. Co.

We have no munition contracts, but nevertheless, have been very busy on work for domestic concerns, and have reasonable expectations that the balance of the year will find us equally busy. Of course, we have experienced considerable difficulty in securing certain raw materials, but this trouble is shared by all other manufacturers of similar equipment. It is interesting to note that the present activity in the buying of mechanical equipment follows out the rule that there is more buying when prices are higher and manufacturers busier than when a slack market renders the same equipment available at a much lower figure.

MINER RAYMOND,
Advertising Manager.

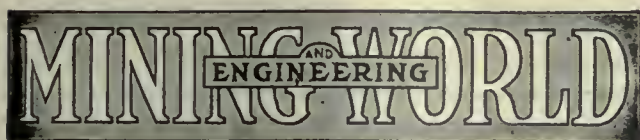
The Pelton Water Wheel Co.

Replying to your letter relative to the conditions of the industry, installations, improvements in metallurgy, mining, etc., the Pelton Water Wheel Co. has had a very satisfactory business during the past 6 months.

J. W. SWAREN,
Publicity Manager.



H. Jackson



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Who's Who in Mining.

With this issue we inaugurate the publication of a "Who's Who in Mining," presenting from time to time men foremost in building up the great American mining industry. The series could begin with a no more notable representative than Daniel Cowan Jackling, whose likeness graces the opposite page.

Probably no man connected with affairs of mining the world over has recorded greater signal triumphs in mining and metallurgy than has Mr. Jackling, particularly in the handling of low-grade properties—both gold and copper. As monuments to his wonderful executive and professional ability stand the Utah, Ray Con., Chino and Nevada Con. Copper companies and the Alaska Gold Mines, with all of which he holds managerial positions. In addition he holds important offices in banks, power companies, hotels, etc.

He was born in 1869 and graduated from the Missouri School of Mines in 1892 and his life since that time has been one of constant advancement.

Geological Survey's Mid-Year Review Shows General Prosperity.

"The accomplishment of the mining industry in the 6-month period just completed warrants the forecast that 1916 is to be a record-breaking year." With this statement the Director of the United States Geological Survey sums up his official mid-year review of the mineral industry as reported to him by the Government geologists and statisticians covering the different subjects. "Active demands and good prices have furnished the mine operators with full opportunity for success in working developed properties, and this in turn has given added incentive and available funds for exploration, prospecting, and experimentation with new processes. The mining man is having his innings."

Summarizing the special reports which are now being made public, Director Smith continues his review:

The returns for 6 months furnish a basis for the belief that 1916 will set up a new record for the soft-coal mines. Every coal-mining state is sharing in this prosperity and, of course, this demand for coal is to be traced back to the increased business of the railroads and of the steel and other large industries.

Drilling activity throughout the oil-producing

states has brought about a gratifying increase in production of crude oil that promises to make 1916 a record year for marketed petroleum. Already production and consumption are reported by the Survey's specialist as essentially in balance east of the Rocky mountains, with a tendency to lower prices.

The Portland cement industry has had a busy 6 months and the manufacturers are optimistic. It is predicted that in both production and shipments of cement this year will show a gain over last year, if indeed it does not establish a new record for cement.

Among the metals copper is continuing the steady increase in production which began early last year, and the forecast for 1916 indicates not only the largest output ever known but also the largest profits.

Shipments of iron ore from Lake Superior points for 5 months of 1916 exceeded by more than 80% those for the same months in 1915, and the indications for the year are favorable for a new high record on iron-ore production, and of pig iron as well. Higher prices with a steady demand are stimulating the mining of manganese, with the result that this year's output of ore is expected to surpass the large production of last year.

The lead and zinc mines are producing ore at a rate even exceeding that of last year and the prevailing prices have made possible the working of large quantities of low-grade ore.

Most precious-metal mines are operating at full capacity. The gold production will probably fall below the high yield of last year, but silver, the one metal last to benefit by the general domestic prosperity, is expected this year to break all previous records.

In quicksilver the outlook is for a continuance of the output of 1915, which was the largest for several years. Thus far in 1916 the average price has greatly exceeded the 1915 prices; and although the reaction in prices has come, conditions are favorable for steady and profitable operation of the quicksilver mines, some of which are newly opened.

The reports from the Survey's western offices are all optimistic. In Arizona mines and smelters are working at high pressure, and the production of metals already shows an increase that promises to make the value of the output nearly double that of last year. Arizona will maintain first place as a copper producer. New Mexico is continuing its rapid progress as a metal mining state, with increases in its output of lead, copper, zinc, gold and silver. The mines of Colorado in the 6 months just past have shown some changes in output as compared with last year; an increase of 30% in copper is indicated, together with small gains in lead and zinc, a 15% decrease in gold, and little change in silver. This output, however, represents a large gain in value of mine production. Mining has also been stimulated in Montana, and the forecast indicates an increase of 60% in the value of the mine product over that of last year. Here also record outputs may be

expected for 1916. Idaho mines are increasing their shipments in all the metals, with higher wages and larger dividends as the result of better prices.

Utah is experiencing an ore production in excess of smelter capacity. The value of the 1916 output of copper is expected to be double that of last year. Throughout Nevada the old term "boom" best expresses the present mining revival. Old mines are being reopened and regular producers are working at full capacity. The chief gains in production will be in copper, lead, and zinc. The increased activity in the mining industry of California is finding expression largely in the reopening of mines that have been long idle and the opening of new mines for chrome; tungsten, manganese, antimony, and magnesite, rail shipments of these ores to the East being made possible by prevailing high prices. Washington is another state which shows increased production, the mining industry there being in better condition than for several years past. Alaska also is benefiting by the increased activity of its mines. Copper mining is showing great advances, and the output of both copper and gold promises to exceed that of last year.

The Copper Metal Situation—End of War Will Continue Demand.

Copper has always been a subject of conflicting views owing to the active speculation that exists in the metal. The situation at present is undergoing more analyzing than when the price was around 11 cts. Here you hear of an inflated market; there it is decided that it is fundamentally strong. The absence of business is declared by some to be caused by certain copper producers maintaining prices above 25 cts. Some conservative copper factors declare that the large producers are using their abnormal profits to tide the market over the dull period, and that unless business again develops on an extensive scale, these producers will not only have lost a good part of their profits but also sacrificed an opportunity to maintain a strong market for the metal for a lengthy period. In other words, they contend that it would be far better to bring copper down to a stable basis around 20 cts. with steady buying than to maintain prices from 27 to 29 cts. until consumers can be forced to buy.

The above opinions are combated by views of producers who assert that the status of the market is as strong as could be wanted. In the first place, production over the rest of the year to the extent of about 70% is already sold. The warring powers are deferring copper buying until the results of the summer military operations can be studied so that a basis of opinion as to the war's duration can be formed. In the event that the conclusion is reached that the war will continue well into the summer of 1917, perhaps into the winter of next year, then a resumption of war material buying on a tremendous scale will be wit-

nessed. Producers of copper are banking on the war continuing into 1917. Explaining the maintenance of the present high copper prices one large producer asserted that the extensive orders now booked fully warranted the present level of values and as to there being a repetition of 1907, he scouted the idea, declaring that producers were doing all in their power to prevent a top heavy market.

New York bankers, buying for the allied European governments, have been heavy purchasers of brass goods and this is expected to result in some additional takings of raw copper against requirements.

The foreign view of the copper metal situation is contained in a recent issue of the *London Statist* which says:

The severe retrograde movement which manifested itself in metals a few weeks ago, mainly under the influence of political events, is looked upon as the natural reaction from the more hopeful feeling in connection with military and the protracted period of ridiculously inflated prices, except as regards tin. Uneasiness, all the same, has been and is still felt in this metal, where alone speculative commitments awaiting liquidation were open, since such operations in other metals have been forbidden for months past.

The conclusion is irresistible that an adjustment of refined copper prices must ensue on the part of American producers ere anything like a revival of buying can be looked for from consumers, especially in the United States, where probable needs were over-estimated and resales have been plentiful. What is now happening is precisely a reversal of the extraordinary conditions which prevailed so long as war and American demands were in the ascendant and the output inadequate. The pulse of the market can be to some extent gauged by the headlong fall in standard copper, thus forestalling successive and sharp price cuts that might ensue by first hands should anything happen to precipitate competition. Yet the value of standard copper cannot be regarded as a reliable index to the general position in the absence of a free market, or so long as dealings remain prohibited under the Defence of the Realm Act.

It is probable that American producers will make efforts to hold prices for a time, so as to prevent any serious dislocation of business in the domestic trades, where far forward requirements were covered at near the top of the huge rise. Resales of dear metal, however, may be indulged in to an extent sufficient to imperil the market. Then, again, much depends on the proportion of the unsold surplus that must accrue from the excessive output. There has been a big extension of refining capacity this year in the United States, in order to cope with the vast development of mine and smelter output; but steps may be taken to check production if unwieldy accumulations are threatened.

So long as American producers are able to realize over £100 a ton for their copper, it is hardly to be supposed, however, that any concerted action would be taken to cut down operations.

Shareholders Reap Rich Reward from Mine Investments.

Many who have made successful investments in other than mining securities express wonder at the readiness of the general public in placing their savings in mining shares. To these a study of the dividend review published elsewhere in this issue is commended, and which, by the way, is the most accurate and complete ever presented by any publication.

The mining and metallurgical industries were

found ready to meet the enormous requirements for metals by the warring nations, being in a better position than ever before to do this. At the same time these mines and works were in a better position than ever before to earn greater profits than were possible before the era of improved machinery and processes made possible the economic treatment under the supervision of advanced technical skill, of the vast low-grade deposits, particularly of the porphyries.

As a result of this great preparedness these mines and works to the number of 140 paid to fortunate shareholders during the 6 months' period no less than \$117,158,991, more than double the amount paid out during the entire year 1915. That the dividends of these companies are of regular occurrence is evidenced by the fact that since incorporation they have distributed the enormous sum of \$1,157,668,079.

Great as the profits mentioned above they represent only a part of the enormous wealth that was taken out of the mines during the half year of 1916. If it were possible to compute the enormous profits that are regularly distributed by the many private and close corporations, which are directly interested in the mineral industry, the fact would be emphasized that fabulous wealth is being created by American mines and metallurgical works. To report annually an output of minerals in excess of \$2,000,000,000 and a dividend record that will approximate \$300,000,000 in 1916 is a record to feel proud of.

Stockholders are not alone in sharing these vast profits earned by the mineral industry in 1916, for labor also was greatly benefited, mining companies having been generous in increasing wages to the extent of many millions.

Manufacturers of mining machinery, as evidenced by the testimony of the country's leading representatives, published elsewhere in this issue, have had an unusually successful half year. Then, too, there are the railroad and transportation companies which have fattened their purses as a result of increased mineral production.

In fact this country's prosperity, during the half year, should be credited largely to the great expansion in our mining and metallurgical industries.

The matter of transportation of ores from mines to railroads is an important factor to be considered in the operation of mines in out-of-the-way places not reached by railroads. It is often the cost of such transportation that determines whether or not profitable operation is possible. Where wagons hauled by horses or mules are used the weight of the load is rather limited and much time is consumed in transit. Since the introduction of the motor truck this efficient means of transportation of ores, etc., between mines, mills and railroads is steadily finding increased favor. By use of the motor truck or tractor in place of animals, haulage costs can be greatly diminished, and the haulage capacity increased.



MILL AND SURFACE PLANT OF MAGMA COPPER CO., ARIZONA.

The Half Year with United States Mines

From every metal producing state comes reports of unusual activities during the first 6 months of 1916. Copper and zinc-producing states, in particular, record a period of productiveness never before equalled. In the following, reviews by experts of the Survey conditions during the period, with approximate productions are given.

ALASKA.

The Alaska mining industry will have a very prosperous year in 1916, according to a statement by Alfred H. Brooks, covering the operations during the first 6 months of the year. Copper mining will probably show the greatest advances. About 15 Alaska copper mines are now shipping ore, and developments are being pushed on others, indicating that they may become producers before the end of the year. There is every reason to believe, therefore, that the Alaska copper output for 1916 will be greater than that for any previous year. The gold lode mines of Alaska will also make a larger production this year than last, but it is not now expected that the placer-mining industry of Alaska will show any marked increase. The shipment of antimony from Alaska is continuing, and some tungsten ores have already been shipped from the Fairbanks district.

ARIZONA.

The mines and smelters of Arizona have been working at a pressure so high in 1916 that they are probably making record productions of all metals. If they continue to work at the present rate during the year they will make an output of over 600,000,000 lbs. of copper, against about 450,000,000 in 1915, according to reports from Victor C. Heikes. A corresponding increase in the output of the precious metals and an increase in that of lead and zinc, which is probable, will, at the greatly increased prices, make the total value of the output in 1916 nearly double that of 1915, which was about

\$88,000,000. Thus Arizona not only retains first place as a copper producer, but is producing at a rate nearly double that of any other state. Aside from a general effort to take advantage of an unusually active market, several factors have aided this increase, such as the settlement of the strike at the Clifton-Morenci mines in January. The International smelter, which treats Inspiration ore, contributes the greatest part of the increase, for this plant is supplying about one-fourth of the total copper. Marked increases and improvements were made at the United Verde, Miami, Calumet and Arizona, and Old Dominion mines, and the Sasco plant in Pima county was again blown in. The railroad to Ajo was completed and work has been begun there on a 4000-ton leaching plant.

There is great activity in the production of gold, especially in Mohave county, and the high price of zinc has stimulated production at the Tennessee, Union Basin and Kingman zinc properties. The mill at the Union Basin mine was enlarged, and the work at the San Xavier mine in Pima county was resumed.

CALIFORNIA.

There has been much greater activity in the mining industry in California for the first 6 months of the year, as compared with the conditions in the first half of 1915, but it has been largely in the direction of the reopening of old properties which have been years idle. Charles G. Yale reports that the U. S. Mint at San Francisco, and local smelters and refiners are in receipt of \$366,000 less California gold, and 22,000 more ounces of silver, in the first 5 months of 1916, than in the corresponding period of 1915.

Aside from the gold, silver, copper and lead mining industries of California, there has been thus far in 1916 a heavy demand for such mineral substances as chrome, tungsten, magnesite, manganese, antimony, etc., and a great many mines of this character have been opened and are shipping. For the first time in history many of these mines are shipping crude material to the Eastern seaboard by rail, the high prices now permitting this.

There has been no noticeable increase thus far this year in the number of productive gold mines in the state. During



CHAMPION MINE, CALIFORNIA.

the first half of 1916 there has been greater gold mining activity in the Mother Lode counties of the state than has been the case for a long period. These five counties produced 61% of the annual California output of siliceous ore. The older active mines, are all doing well. In the Kennedy

at the bottom of the 3900-ft. vertical shaft they are working a large body of profitable ore, and are sinking 100 ft. more. The Argonaut, adjoining, has at a vertical depth of 3300 ft. a body of \$13 ore—very exceptional value for a Mother Lode mine. Ore yielding over \$1000 per ton is being taken



DREDGE OF THE ORO WATER, LIGHT AND POWER CO., CALIFORNIA.



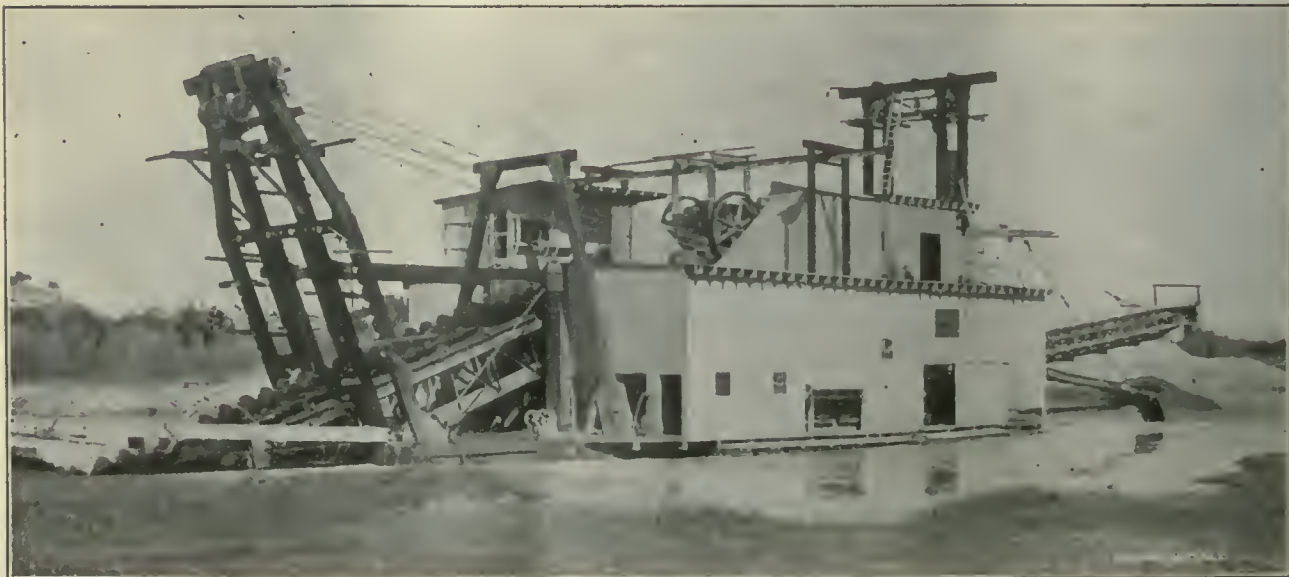
NATOMA NO. 10 DREDGE, CALIFORNIA.

out of an 18-in. vein at 1600-ft. depth in the Gold Cliff, part of the property of the Utica Mining Co. in Calaveras county. In the same county the Melones is in excellent ore. Very high grade ore is being taken from the mine of the Calaveras Development Co., near Mountain ranch. The most noteworthy feature of the situation in the Mother Lode counties is that a number of the old mines, long idle, are being unwatered and reopened, this being brought about by the success of the deeper mines which have continued work. At Sutter Creek, Amador county, the old Eureka, or "Hetty Green" mine, a famous producer 30 or 40 years ago, is being reopened by a strong company, and extensive operations have been inaugurated.

The Oneida mine, closed down for years, has been put in shape, and part of the stamps are running on ore from the mine. The Poundstone mine in the same district is being unwatered. The old Wildman & Mahoney properties in which are three shafts, and very extensive workings, and which have been for years idle, are being reopened by a new company. On the Zeila mine, Jackson, some time idle, a new shaft is being sunk to facilitate working good ore opened by long drifts from the old workings. The Argonaut is building a new 40-stamp mill, and a large reservoir for storage of tailings behind a concrete dam, 400 ft. long and 40 ft. high. The Amador Star, at Plymouth (formerly the Rhett and Bay State), has been reopened this year and a new vein of satisfactory ore found. In Calaveras county, a company has been formed to develop the Thorpe mine at Fourth Crossing, which has been idle 18 years. Several old

claims near the Melones mine have consolidated and are to be worked as one property by a new company. In Tuolumne county, the Tarantula mine, at Chinese, has been purchased by ex-Governor Gage, who will work it and the adjoining Jones group. The Rawhide and App mines, near Jamestown, formerly heavy producers, have come under new ownership and are being reopened and rehabilitated. The Patterson, near by, is also to be started up again. The Crystalline and Alabama mines, near Sonora, several years idle, are being reopened by Los Angeles men. The old Columbia, near Tuolumne City, is being reopened and the shaft sunk to 1000 ft. depth. In El Dorado county important discoveries have been made in the old Montezuma mine, near Nashville. In El Dorado district, near Placerville, the old Church-Union mine is again being developed, and the Oram, adjoining, has been started up again. After 35 years' idleness the Cedarburg mine, near Spanish Dry Diggings, is being reopened.

Deep mining outside the Mother Lode section of the state is also unusually active. In the Grass Valley district, Nevada county, both the North Star and Empire mines, the leading producers, are finding high grade ore in depth. In the Providence, of the Champion group, Nevada City, a strike of high grade ore, carrying telluride, has been made. In this section a number of small and idle mines are coming into possession of the larger companies in order to improve their position in the district. The old Murchie mine is to be unwatered and the shaft deepened. The famous old Allison Ranch mine, formerly a large producer, but idle since 1898, is being reopened by a new company. In Butte county,



DREDGE NEAR CAMANCHE, CALIF.

at Forbestown, the Gold Bank, Golden Queen, and Shakespeare, formerly producers, have been sold to Salt Lake men, who will reopen them. In the southern counties of the state, notably in the desert regions of Inyo, San Bernardino, and Riverside counties, there is a distinct revival of mining activity, largely brought about through the adoption of auto trucks for delivery of ore to railroad stations for shipment to reduction works.

The gold dredging industry of the state continues in a flourishing condition. The dredges produce 86% of the placer gold of California, and 38% of the total gold yield. The larger companies have been adding new machines to their equipment, and these are invariably of great capacity, several costing over half a million dollars each. The new dredge of the Natomas Con. in the Folsom district, designed to restore ground to its natural condition after dredging, permitting its use for agriculture, has demonstrated its efficiency. Extensive areas of placer ground near Redding have been bonded and are being prospected for dredging. Over 1500 acres of dredging ground along the Trinity river from Lewistown to Poker Bar have been acquired by capitalists, and one dredge will be in operation this summer; two more next year. Dredge machinery from Ohio, for the dredge near Carrville, Trinity county, amounting to 2000 tons, is being

the channel in the extension of the famous old Bald Mountain drift mine.

Copper mining in the state has been very active in 1916, owing to the high price of the metal. The larger companies have increased miners' wages in the form of a bonus while electrolytic copper sells at 20 cts. a pound or over. A number of new copper properties have been opened in Trinity, Siskiyou, Plumas, Madera, and other Northern counties, as well as in several of the Southern counties of the state. The Engels Copper Co. in Plumas county is using the flotation process to concentrate its ore before shipment to Nevada smelters. The Calaveras Copper Co., near Copperopolis, has increased the capacity of its flotation plant. The Bunker Hill copper mine, near Auburn, Placer county, which shipped ore to Swansea, Wales, 52 years ago, and has since been idle, has been reopened this year.

COLORADO.

During the first 6 months of 1916, according to returns received by the Survey, the output indicates a 15% decrease in the yield of gold, very little change in the production of



GOLD KING MILL, COLORADO.

hauled from the railroad at Redding, 62 miles into the mountains, 300 mules being used in the hauling work. The largest dredge in the world has been completed and set at work on the Yuba river, near Hammonton. It is the fifteenth dredge of the Yuba Con. Goldfields. The Pacific Dredging Co. is building a very large dredge near Smartsville, Yuba county, on ground extending along the Yuba and Bear river, and several other dredges are planned in the district not far from the holdings of the Yuba Goldfields. The Oro Water, Light & Power Co. is arranging to construct a third dredge in the Mokelumne river near Comanche, Calaveras county, extensive quantities of pay gravel having been found outside the main property of the company. Several small dredges have been put on "outside" ground in the mountain region this year.

Hydraulic mining has not been very active outside of Trinity and Siskiyou counties, but some new mines have started up in central California. A merger of hydraulic mining interests is being made in the Slate Creek district, Sierra county, and extensive work is contemplated, under supervision of the California Debris Commission. A mammoth restraining dam is to be put across Slate creek, which will permit, when completed, hydraulic operations at Scales, Port Wine, Whiskey Diggings, Gibsonville, La Porte, and other famous old camps, long idle. A revival of drift mining along the Magalia ridge, in Butte county, has brought about numerous changes, and the reopening of old properties. The old South Fork property, on Oregon creek, Sierra county, is now continuing the 6000-ft. bedrock tunnel to try and reach

silver, a small increase for lead, an increase of 30% for copper, and a small increase for zinc. As the average prices for silver, lead, copper, and zinc are much higher than in 1915, this output represents a considerably increased gross value.

Cripple Creek annually produces 60% of the state's output of gold, but in the first 6 months of 1916 the production there fell off appreciably from that of 1915, which was \$13,684,000, the largest since 1906. The San Juan region has not maintained the output of 1915, which was \$3,850,000 in gold and 2,280,000 ozs. of silver, the production having fallen off in La Plata, Ouray and San Juan counties, although there was an increase in the production of gold and silver in San Miguel county. The idleness of the Wanakah mine and smelter and the gradual decline of the Camp Bird mine caused a decreased output of all metals in Ouray county. The measurable ore reserves of the Camp Bird mine, according to the manager's report for the first quarter of 1916, are reduced to the almost negligible quantity of about 1200 tons, and there is little prospect of developing any more of consequence in the Camp Bird vein until after the 2-mile adit, now being driven, shall have reached the vein, some 450 ft. lower than the present workings. The time required to complete the adit is estimated at 27 months. Lake county has not maintained its gold production of 1915, which was \$2,200,000, but has increased its yield of silver, lead, copper, and zinc, and the gross value of all metals produced in 1916 promises to exceed greatly the \$14,000,000 output of 1915. With the unwatering of the Penrose shaft now complete, the un-



RICO MINES CO., COLORADO.

watering of the Harvard shaft approaching completion, the unwatering of the Wolfstone commenced, and the resumption in April of the Derry dredge, an increased yield for the latter half of 1916 may be expected. Eagle county's yield of gold showed a decrease, but operations at Red Cliff and at Eagle showed an increased production of silver, lead, copper, and zinc. Summit county dredges have not yet produced the proportion they did in 1915, but increased shipments of lead

and zinc ore and concentrates have been made from Breckenridge and Montezuma. Clear Creek county showed a decrease for gold but an increase for silver, lead, and copper, and Gilpin county's yield showed an increase for copper only. Mineral county's (Creede) production showed improvement, which may be expected to continue with the higher price of silver and the maintenance of milling operations, resumed after a period of idleness.



HUDSON MILL, COLORADO.

IDAHO.

Unusual conditions in Idaho make it impossible to estimate accurately the lead output of the state, but shipments are being made at the rate of about 360,000,000 lbs. of lead a year. There will be a correspondingly large output of silver and a great increase in the total value of the state's output of metals. This statement is based on reports received by the Survey from its field office at Salt Lake City. Some of the large mines in Idaho are greatly increasing their shipments, notably the Hercules, Hecla, and Morning. The Tamarack & Custer is temporarily closed, the Marsh is not now producing, and the output of the Stewart will probably be much below that of 1915. The mines of the Coeur d'Alene region are shipping lead ore and concentrates at the rate of over 30,000 tons a month, and zinc material at the rate of over 8000 tons a month. Blaine county has added little to the lead output, Lemhi county is far below the record of former years, and the Wilbert, in Fremont county, is also producing somewhat less.

Important changes are in progress in the metallurgical

stitution, Hercules, Colonial, and Highland Surprise were lesser shippers. A mill was built for the Constitution mine on Pine creek.

Receipts of gold bullion for the half year at Boise show an increase over the same period of 1915.

MONTANA.

The unusually high prices of metals in 1916 have stimulated mining to a marked degree in Montana, especially at Butte. At the present rate of production, there will be notable increases in the output of all metals, and a marked increase in the total value of the output. According to reports received from V. C. Heikes, the output is now being made at a rate which will give a total value of about \$140,000,000 to the year's metals instead of about \$87,000,000, the value in 1915. The production of gold from precious metal bullion is showing a large increase and will be augmented by gold from a much greater output of copper ore. The production of silver will doubtless keep pace with that of copper



BUTTE & LONDON PROPERTY, MONTANA.

industry. The Hercules ore and concentrates are treated at the plant at Northport, Wash., where two lead furnaces are in operation and two more are to be built. Preparations are also being made to build a lead plant at Kellogg for treating the ore of the Bunker Hill & Sullivan mine as well as custom ore. New mills are being constructed for the Ray Jefferson, Hypotheek, and Ida Continental, and one is planned for the Tamarack & Custer. As prices have become better, wages and dividends have been greatly increased.

Though the Snowstorm mine is no longer a producer the output of copper in Idaho is progressing at a better rate than in 1915, largely on account of increased shipments from the Empire property at Mackay. Other shipments came from the National, Caledonia, and Richmond. A mill was constructed on Little North Fork for the Horst Powell property.

Shipments of crude zinc ore and concentrate indicate a good increase in the output over that of 1915. The Con. Interstate-Callahan shipped over 15,000 tons of zinc material during the first quarter of 1916, a figure that indicates a rate of more than 51,000,000 lbs. of spelter a year for that mine alone. The Success, Frisco, Greenhill, and Morning contributed considerable amounts, and the Terrible Edith, Con-

and with the increased output of zinc. The production of copper, though below the normal in January and February, has been increased toward the middle of the year by both the Anaconda and East Butte companies. This gain indicates that the output of copper for the year may be 350,000,000 lbs. against 275,000,000 lbs. in 1915. The East Butte mine was averaging 1,300,000 lbs. a month the first 5 months and the Anaconda about 26,000,000 lbs. a month, with a better rate in April and May. The latter company has been busy remodeling its big concentration plant at Anaconda and constructing a zinc plant, as well as building a new refinery at Great Falls.

An increase of about 30% in the output of zinc during the year is indicated. For the first quarter of 1916 the Butte & Superior mine produced nearly 48,000,000 lbs. of gross zinc in concentrates, or at the rate of 192,000,000 lbs. a year. The Elm Orlu mine has also increased shipments of zinc concentrates to about 5000 tons a month and may increase this rate. The lead production will probably be increased because of the great amount of concentrates derived from lead-zinc ores. High prices of metal have given better wages and unusual profits, and may result in record outputs of all metals.



RAINBOW LODE DEVELOPMENT CO., MONTANA.

NEVADA.

Mine reports received from V. C. Heikes indicate that during the last 6 months the mining industry in Nevada has experienced one of its greatest revivals. Old mines closed down for years have resumed or are being put in shape for production, and the regular producers have increased their output to the fullest capacity. At many points the use of tractor engines, hauling on each trip as much as 30 tons of ore between mine and railroad, have helped to improve conditions, as formerly there were not teams enough for all purposes. The many milling plants of the state are reported to be in full operation, and a number have adopted the flotation process for increased saving. In the Yellow Pine district five dry mills are operated on zinc ores. Only one of the two copper smelters in Nevada was in operation.

Gold will likely show little increase. The declining production at Goldfield may be made up to some extent from the general increase in output of ores. No new gold deposits of note have been found. The placer-gold production at

Manhattan and Round Mountain is about the same, the latter making up for any decrease in the former. Silver may show a gain from increased operations made at Rochester, but the increase will probably be offset by the idleness of the mines in Churchill county. Little if any of the silver output is held in storage for higher prices compared to the quantity so held in 1915.

The production of ore containing lead has been greater than in recent years, principally from Pioche, Goodsprings, and Eureka. Ely produces most of the copper, and at the rate of production for the last 6 months will yield 92,000,000 lbs. of the metal in 1916. Copper properties in the vicinity of Luning and Yerington have been active in shipping low-grade ores to the Salt Lake smelters at the rate of about 2000 tons monthly. Deposits of zinc ore have been opened in Elko county, where about 600 tons is being produced and shipped to eastern markets every month. In Clark county, around Goodsprings, about 2800 tons of oxidized zinc ore was shipped in May and as much during the previous months. At Pioche a small output of zinc sulphides was recorded.

As the copper output has been increased more than 50%, the value of the output at present prices will be double that of the past year.



ROCHESTER MINES CO.'S MILL, NEVADA.



COUNTRY SURROUNDING ROCHESTER MINES, NEVADA.

NEW MEXICO.

The mines of New Mexico during the first 6 months of 1916 show small increases for gold and silver and appreciable increases for lead, copper, and zinc, according to Charles W. Henderson.

In the Mogollon district, Socorro county, which in 1915 produced 40% of the gold and 65% of the silver output of the state, the Fanney and the Last Chance cyanidation mills were operated continuously, and the Cleaveland-Weatherhead mill, idle in 1915, was placed in operation in April. Gold bullion and concentrates continued to be shipped from the Elizabethtown district, Colfax county, and gold bullion from the Whiteoaks district, Lincoln county. The output of silver was affected considerably by the idleness of the Cossak cyanidation mill, in the Cochiti (Bland) district, Sandoval county. Gold-copper ore continued to be shipped from the Orogrande district, Otero county. The purchase by the Phelps-Dodge Co. of a large area in the Organ Mountain district, Dona Ana county, promises a future production of all five metals. Silicious and copper ores carrying gold were shipped from the Lordsburg district in quantities that indicate an output nearly double that of 1915. The Santa Fe Gold & Copper Co.'s matting plant at San Pedro was operated continuously. The Burro Mountain Copper Co.'s flotation mill in the Burro Mountain district was placed in operation in April, 1916. The Chino Copper Co.'s mill, which in 1915 produced concentrates containing 68,293,893 lbs. of copper, yielded during the first quarter of 1916 a total of 16,267,450 lbs., the total quantity of ore treated for the 3 months being 714,400 tons, an average of 7850 tons a day, the highest average tonnage treated by the mill since it began operations. Shipments of copper from the Magdalena district increased. Lead ore was shipped from Cooks Peak and Tres Hermanas districts, Luna county; from the Central and San Simon districts, Grant county; and from the Magdalena district, Socorro county. Increased shipments of zinc carbonate and zinc sulphide concentrates were made from Magdalena, Haver, Cooks Peak, Florida, Tres Hermanas, and Pinos Altos districts. A mill was erected in the revived Steeplecock district, Grant county, and some shipments were made.

OREGON.

No changes of moment in the mining situation in Oregon are noted by Charles G. Yale for the first 6 months of 1916. The bullion receipts of the mint and smelters at San Francisco show that the output of gold has increased \$107,000 and that of silver 14,000 ozs. in the first 5 months of 1916 over the output of the corresponding period in 1915. The increase in gold is due entirely to dredging operations. The Powder River Gold Dredging Co., which in the first half of 1915 had but one dredge operating, near Sumpter, Baker county, has been working with two dredges during the first 6 months of 1916. With the exception of three deep mines, all in Baker county, this is the largest gold-mining enterprise in Oregon.

The properties of the Cougar Mining Co., near Sumpter, have been placed under lease and bond to the United Gold Mining Co. of Spokane, Wash. In addition to the 200-ton mill, tube mills and a cyanide plant are to be installed. The Queen of Bronze copper mine, which ships its ore from Waldo by team to Grant's Pass and thence by rail to smelters at Kennett and Tacoma has been sold to men who intend to extend a railroad to Waldo. After years of idleness work has been resumed on the Iron Dyke mine at Copperfield, which is shipping ore to Colorado for reduction. The Black Eagle property, near Grant's Pass, has been sold to men who are to erect a 50-ton mill.

There is notable activity in the hydraulic mining industry of the state, particularly in the counties along the northwest border of California. Many old properties have been reopened, and new ones have been put in shape for working.

The most productive deep mines in Oregon continue to be those of the Cornucopia Mines Co. and Baker Mines Co., in the Cornucopia district, Baker county; Commercial Mining Co., in the Mormon Creek district; Columbia Gold Mines Co., in the Cracker Creek district; Homestead Iron Dyke, in the Iron Dyke district; and Humboldt Con. Gold Mines, in Malheur county.

The largest producers among the placer mines are the Powder River Dredge Co., in the Cracker Creek district, Baker county; Columbia Mines placer, in the Placer district, Josephine county; Sterling hydraulic, in the Forest Creek



NEVADA DOUGLAS PROPERTY, NEVADA.



POWDER RIVER GOLD DREDGING CO.'S DREDGE, OREGON.

district, Josephine county; and Layton, in the Applegate district, Jackson county. Baker continues to be the most productive county in the state, containing nearly all the larger mines.

SOUTH DAKOTA.

The Homestake mines and mills and the other smaller mills in the Black Hills, South Dakota, have been operated continuously, according to reports received by the Survey, producing approximately \$3,700,000 in gold for the first 6 months of 1916.

TEXAS.

The Presidio silver mine of Texas was in continuous operation during the first 6 months of 1916, and mining was also carried on actively during that period in the Van Horn and Sierra Blanca districts, all in the trans-Pecos country. The net result was a small output of copper, lead, and zinc,

but a production of silver for the first 6 months of fully 340,000 ozs.

UTAH.

The high prices of metals during the last 6 months caused Utah producers to put all available miners to work getting out ore. In some of the snow-bound camps large quantities of ore were stored during the winter months and when this was released to the buyers a curtailment was requested by the smelters of all producers exceeding contract limits. During May and June hundreds of cars of ore, waiting to be unloaded, blocked the railroad lines to sampler and smelters. Much of the ore is stockpiled, as it is impossible to treat more than a certain quantity on account of the limited working capacity.

Reports received by the Survey indicate that no great increase in gold may be expected for 1916, but silver production, which is dependent largely on the production of lead, has gained over previous years, principally from Bingham. The lead output from ores produced at this camp will exceed all former totals.

At the present rate of output, fully 225,000,000 lbs. of copper will be produced in 1916, this estimate having been made from the increased tonnage being treated at the concentration mills near Garfield. The Utah Copper property mined and shipped in May 911,000 tons of ore, and during June the rate of output was greatly increased and about 34,000 tons of ore was treated daily. Other copper mines are



WASP NO. 2 MILL, SOUTH DAKOTA.



GOLDEN REWARD MILL, SOUTH DAKOTA.



WASATCH MINES CO.'S PROPERTY, UTAH.

producing to the capacity of their equipment. At the increased rate of production and higher price, the total value of the copper output will probably be double that of 1915.

Zinc production from sulphide concentrate and oxidized and sulphide ores will not largely exceed the 1915 output of 22,000,000 lbs., estimated as spelter. Park City, Bingham, Tintic, and Promontory district were the principal regions producing.

Among the metallurgical improvements is the establishment of sulphuric acid works at Garfield and the prospect for treating lower-grade copper ores by leaching. At Silver City, in the Tintic district, the chloridizing leaching plant has made

its third shipment of silver precipitates, and the process is now considered a success.

WASHINGTON.

The mines of Washington, for the first 6 months of 1916, promised increased production in the five important metals for the year. Though shipments of zinc ore were made in 1915, the rate has been increased so that probably 1500 tons of material will be marketed for the half year, according to reports received by the Survey. Shipments of crude ore from the Norman mines, near Northport, and concentrates from the lead-zinc property at Metaline will result in a considerable production of spelter. About 100 tons of lead ore per month was being shipped to British Columbia, largely from the Bonanza mine, and the Electric Point mine near Northport is beginning to ship high-grade galena. The new lead smelting plant at Northport has been active with its two blast furnaces, and is constructing two additional furnaces. Though the plant treats principally Idaho material, it will treat custom ore when its capacity allows.

The production of copper will also be considerably increased, as shipments of crude ore and concentrate indicate a 40% increase from the Chewelah district alone. Steady shipments of siliceous gold ore from Republic have averaged 3000 tons a month, and are being increased at the end of the period.

The mining industry generally seems to be in better condition than for several years past.



THE MAXFIELD MINE, UTAH.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

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II. ORES AND METALS

(I) METALS AND ORES

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Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

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Johnson, J. E., Jr.—*Blast Furnace Irregularities and Their Treatment*. [Tells of remedies for and discusses many things unusual in furnace operation, such as a chilled hearth.].—*Met. & Chem. Engg.* July 15 1916; p 69; pp 8*; 30c.

Lead

Dunlop, J. P.—*Secondary Metals in 1915*. [On the production of metals refined from scrap].—*Min. Res. U. S.* 1:3; pp 8.

Moore, E. S.—*Observations on the Geology of the Broken Hill Lode, New South Wales*. [A complete geologic description of the formation, ore deposits and nature of the ore, citing instances at particular mines].—*Eco. Geol.* June 1916; p 327; pp 22*; 60c.

Paige, Sidney.—*Silver City, New Mexico, Folio*. [Large separate maps of the quadrangle, with a geologic description of the formation and ore deposits].—*U. S. G. S. Folio No. 199*; pp 19*.

Ralston, O. C.; Allen, Glen L.—*The Flotation of Oxidized Ores*. [Discusses problems encountered in flotation different kinds of oxide ores. The results of some tests are given].—*Mg. World* July 22 1916; p 137; pp 3¼; 10c.

Silver

Moore, E. S.—*Observations on the Geology of the Broken Hill Lode, New South Wales*. [A complete geologic description of the formation, ore deposits and nature of the ore, citing instances at particular mines].—*Eco. Geol.* June 1916; p 327; pp 22*; 60c.

Paige, Sidney.—*Silver City, New Mexico, Folio*. [Large separate maps of the quadrangle, with a geologic description of the formation and ore deposits].—*U. S. G. S. Folio No. 199*; pp 19*.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Bancroft, Holland.—*The Bolivian Tin Industry*. [A paper read before the Pan-American Sci. Congress. Reviews the market conditions, production and prices, with information on methods of mining, milling and smelting].—*M. & S. P.* July 22 1916; p 119; pp 7*; 20c.

Dunlop, J. P.—*Secondary Metals in 1915*. [On the production of metals refined from scrap].—*Min. Res. U. S.* 1:3; pp 8.

Sohnlein, M. G. F.—*Combination Pulp Classifier*. [A paper to be read before the A. I. M. E. The machine was designed because neither mechanical nor hydraulic classification of tin ores in Bolivia were satisfactory].—*E. & M. J.* July 22 1916; p 182; pp 1*; 25c.

Tungsten

Gudgeon, C. W.—*Gold Scheelite Ore in New Zealand*. [Abst. from the bulletin of the Aust. I. M. E. The deposits and methods of concentration are described].—*M. & S. P.* July 22 1916; p 136; pp 1*; 20c.

Scott, W. A.—*Mining Operations at Johnston, Arizona*. [Reviews the opera-

tions of the tungsten and copper companies of the district].—*Mg. World* July 22 1916; p 141; pp 3*; 10c.

Wolf, H. J.; Barbour, P. P.—*The Boulder County Tungsten District, Colorado*. [Reviews the operations and conditions in the district. The principal companies are named, milling practice is described and a schedule of prices for tungsten ore is given].—*E. & M. J.* July 22 1916; p 165; pp 4¼*; 25c.

Zinc

Moore, E. S.—*Observations on the Geology of the Broken Hill Lode, New South Wales*. [A complete geologic description of the formation, ore deposits and nature of the ore, citing instances at particular mines].—*Eco. Geol.* June 1916; p 327; pp 22*; 60c.

Paige, Sidney.—*Silver City, New Mexico, Folio*. [Large separate maps of the quadrangle, with a geologic description of the formation and ore deposits].—*U. S. G. S. Folio No. 199*; pp 19*.

Ralston, O. C.; Allen, Glen L.—*The Flotation of Oxidized Ores*. [Discusses problems encountered in floating different kinds of oxide ores. The results of some tests are given].—*Mg. World* July 22 1916; p 137; pp 3¼; 10c.

— *The Profits in Zinc Smelting* [A financial discussion of the zinc smelting industry].—*Mg. Jnl.* July 8 1916; p 476; pp 1½; 35c.

— *Chinese Mineral Industry in 1915*. [A review of the production of refined metals].—July 8 1916; p 477; pp ¾; 35c.

— *Utilization of Zinc*. [Abst. from an article in the bulletin of the Imperial Inst. The uses of spelter, zinc dust, zinc alloys and pigments are taken up separately].—*Canadian Mg. Jnl.* July 15 1916; p 342; pp 2; 35c.

Miscellaneous Metals and Ores

Dunlop, J. P.—*Secondary Metals in 1915*. [On the production of metals refined from scrap].—*Min. Res. U. S.* 1:3; pp 8.

Richards, J. W.—*The Metallurgy of the Rarer Metals*. [Abst. from a paper read before the American Inst. of Chem. Eng. Discussing the importance of the future of magnesium, chromium and other metals].—*Mg. World* July 15 1916; p 93; pp 1¼; 10c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Ashworth, James.—*The Composition of Natural Gas*. [Discussion on coal mine gases].—*Coal Age* July 22 1916; p 146; pp 1¼; 20c.

Brown, J. F. K.—*Imagination Applied to Mining*. [A review of the possible future as regards the transmission of electric power, pumping, etc. The cases are purely hypothetical].—*Coal Age* July 22 1916; p 142; pp 2¼; 20c.

Burrell, G. A.; Seibert, F. M.—*Gas Analysis as an Aid in Fighting Mine Fires*. [Discusses the change in air during a mine fire and the effects of gas on the fire and its origin. Methods of sampling and analyzing are given].—*U. S. Bur. of Mines Tech. Paper* 13; pp 16*.

Gray, F. W.—*The Coal Trade in Nova Scotia During the First Half of 1916*. [Figures on production and a review of the conditions of the trade].—*Canadian Mg. Jnl.* July 15 1916; p 339; pp 1¼; 35c.

Yuvenalief, N.—*On the Liberation of*

Gas in Mines. [From the Gorno-Savodskoie Dielo, explaining the causes for the liberation of mine gases].—*Coll'y Guard.* July 7 1916; p 17; pp 1½*; 35c.

— *Chinese Mineral Industry in 1915*. [A review of the production of refined metals].—July 8 1916; p 477; pp ¾; 35c.

Coal and Coke By-Products

Hamilton, Robert.—*Recovery of By-Products from Blast Furnace Gases*. [Brief reviews of several methods and the progress being made in this work].—*Jnl. of Soc. of Chem. Ind.* June 30 1916; p 663; pp 2¼; 35c.

Hamilton, W. R.—*The California Gasoline Industry*.—*Bull. A. I. M. E.* June 1916; p 1073; pp 5; 35c.

— *Smokeless Fuel, Gas, Oil and Ammonia Production*. [A description of equipment used and some details on the methods of operation].—*I. & C. Tr. Rev.* July 7 1916; p 10; pp 2*; 35c.

Petroleum

Arnold, Ralph.—*Conservation of the Oil and Gas Resources of the Americas*. [Reviews the deposits and possibilities of each country separately].—*Eco. Geol.* June 1916; p 299; pp 28; 60c.

Hopkins, Oliver B.—*Structure of the Vicksburg-Jackson Area, Mississippi*. [Geologic review of the area, bringing features showing the possibilities of oil and gas].—*U. S. G. S. Bull.* 641-D; pp 28*.

Stebinger, Eugene.—*Possibilities of Oil and Gas in North-Central Montana*. [Reviews the geologic structure and formation similar to that of other nearby fields].—*U. S. G. S. Bull.* 641-C; pp 43*.

— *Chinese Mineral Industry in 1915*. [A review of the production of refined metals].—July 8 1916; p 477; pp ¾; 35c.

Natural Gas

Arnold, Ralph.—*Conservation of the Oil and Gas Resources of the Americas*. [Reviews the deposits and possibilities of each country separately].—*Eco. Geol.* June 1916; p 299; pp 28; 60c.

Hopkins, Oliver B.—*Structure of the Vicksburg-Jackson Area, Mississippi*. [Geologic review of the area, bringing features showing the possibilities of oil and gas].—*U. S. G. S. Bull.* 641-D; pp 28*.

Johnson, R. H.; Huntley, L. G.—*Principles of Oil and Gas Production*. [Treats on the nature and genesis of the deposits, methods of drilling and prospecting, methods of operating and last an economic geological review of oil and gas].—*Wiley & Sons*; book; pp 371*; \$3.75.

Stebinger, Eugene.—*Possibilities of Oil and Gas in North-Central Montana*. [Reviews the geologic structure and formation similar to that of other nearby fields].—*U. S. G. S. Bull.* 641-C; pp 43*.

(B) STRUCTURALS AND CERAMICS

Cement

Brantly, J. E.—*A Report on the Limestones and Marls of the Coastal Plain of Georgia*. [The geology of the formation and descriptions of deposits by counties. The uses and preparation of the rock are also given].—*Georgia Geol. Surv. Bull.* No. 21; pp 300*.

Stone, Ralph W.—*Gypsum in 1915*. [Reviews the uses, methods of refining and production].—*Min. Res. of U. S.* 11:14; pp 9.

—Mason City, Iowa, Plant of the Northwestern States Portland Cement Co.—Chem. Eng. & Mfg. July 1916; p 6; pp 1¼; 30c.

Clays, Ceramics

Arbogast, C. O.; Sheridan, L. J.—*Throwing the Searchlight on the Clay Plant Pyrometer*. [A description of the pyrometer and its uses].—B. & C. Rec. July 18 1916; p 123; pp 3½*; 35c.

Greaves-Walker, A. F.—*The Path to Success in Operating a Continuous, Coal-Fired Tunnel Kiln*.—B. & C. Rec. July 18 1916; p 133; pp 2½; 35c.

Concrete

Hool, G. A.—*Reinforced Concrete Construction*. [Details on the design and construction of all types of concrete structures].—McGraw-Hill Co.; book; pp 688*; \$5.

Hunner, H. H.—*Concrete Idler Stands*. [A type constructed and used at the Isabella mine, Palmer, Mich. Some costs of construction are given].—E. & M. J. July 22 1916; p 179; pp 1*; 25c.

Lime

Brantly, J. E.—*A Report on the Limestones and Marls of the Coastal Plain of Georgia*. [The geology of the formation and descriptions of deposits by counties. The uses and preparation of the rock are also given].—Georgia Geol. Surv. Bull. No. 21; pp 300*.

Donaldson, R. D.—*Application of Central Station Power to Lime Plants and Quarries*.—National Lime Mfg. Assn. May 1916; pp 15.

—The Plant of the Dolomite Products Co., Narlo, Ohio. [The plant description includes excavating in the open-pit, on surface and haulage of the broken materials].—Excavating Eng. July 1916; p 371; pp 4*; 20c.

Stone

Bowles, Oliver.—*The Technology of Marble Quarrying*. [Takes up methods of operation and accounting with a study of the mineralogical constituents of the rock which tend to vary its properties and grade].—U. S. Bur. of Mines Bull. 106; pp 174*; 40c.

Brantly, J. E.—*A Report on the Limestones and Marls of the Coastal Plain of Georgia*. [The geology of the formation and descriptions of deposits by counties. The uses and preparation of the rock are also given].—Georgia Geol. Surv. Bull. No. 21; pp 300*.

Hicks, H. L.—*Compressed Air at Rockland Lake Quarry, New York*. [Describes drilling and blasting operations, with some information on the general operation of the quarry].—Comp. Air July 1916; p 8035; pp 4*; 20c.

III. TECHNOLOGY

MINES AND MINING

Prospecting

De Kalh, Courtenay.—*Surficial Indications of Copper*. [Discussion on a paper of the same title by Frank H. Probert].—M. & S. P. July 22 1916; p 115; pp 1¼; 20c.

French, Harold.—*Prospecting: A Suggestion*. [Describes a theoretical method of systematic prospecting for a syndicate].—M. & S. P. July 22 1916; p 117; pp 1½; 20c.

Storms, William H.—*Outcrops and the*

Prospector. [Tells of the geologic nature and appearance of an outcrop and what the same would signify. In most instances particular cases are cited].—M. & S. P. July 22 1916; p 129; pp 4*; 20c.

Drilling and Boring

Balcomb, J. C.—*A Remarkable Tunnel Rapidly Driven in Brazil*. [Gives details of operation, with drawings. A bonus system and unusual method of blasting are described].—Comp. Air July 1916; p 8040; pp 5*; 20c.

Hicks, H. L.—*Compressed Air at Rockland Lake Quarry, New York*. [Describes drilling and blasting operations, with some information on the general operation of the quarry].—Comp. Air July 1916; p 8035; pp 4*; 20c.

Warren, H. M.—*Electrical Distribution and Application in Mines*. [Speaks of the use of electricity for pumps, hoists, locomotives, drilling and air compression].—Coal Age July 22 1916; p 138; pp 4*; 20c.

Explosives and Blasting

Balcomb, J. C.—*A Remarkable Tunnel Rapidly Driven in Brazil*. [Gives details of operation with drawings. A bonus system and unusual method of blasting are described].—Comp. Air July 1916; p 8040; pp 5*; 20c.

Hicks, H. L.—*Compressed Air at Rockland Lake Quarry, New York*. [Describes drilling, and blasting operations, with some information on the general operation of the quarry].—Comp. Air July 1916; p 8035; pp 4*; 20c.

Tunnels and Tunneling

Balcomb, J. C.—*A Remarkable Tunnel Rapidly Driven in Brazil*. [Gives details of operation, with drawings. A bonus system and unusual method of blasting are described].—Comp. Air July 1916; p 8040; pp 5*; 20c.

—*Ingenious Special Devices for Tunnel Surveys*. [Abst. from Eng. News. Instruments and devices for marking are described].—E. & M. J. July 22 1916; p 180; pp 1¼*; 25c.

Pumps and Pumping

Brown, J. F. K.—*Imagination Applied to Mining*. [A review of the possible future as regards the transmission of electric power, pumping, etc. The cases are purely hypothetical].—Coal Age July 22 1916; p 142; pp 2¼; 20c.

Warren, H. M.—*Electrical Distribution and Application in Mines*. [Speaks of the use of electricity for pumps, hoists, locomotives, drilling and air compression].—Coal Age July 22 1916; p 138; pp 4*; 20c.

Mine Gas

Ashworth, James.—*The Composition of Natural Gas*. [Discussion on coal mine gases].—Coal Age July 22 1916; p 146; pp 1¼; 20c.

Burrell, G. A.; Robertson, I. W.—*Effects of Temperature and Pressure on the Explosibility of Methane-Air Mixtures*. [A review of the results of experimental work].—U. S. Bur. of Mines Tech. Paper 121; pp 14*; 15c.

Burrell, G. A.; Seihert, F. M.—*Gas Analysis as an Aid in Fighting Mine Fires*. [Discusses the change in air during a mine fire and the effects of gas on the fire and its origin. Methods of sampling and analyzing are given].—U. S. Bur. of Mines Tech. Paper 13; pp 16*.

Yuvnalieff, N.—*On the Liberation of Gas in Mines*. [From the Gorno-Savodskoie Dielo, explaining the causes for the

liberation of mine gases].—Coll'y Guard. July 7 1916; p 17; pp 1¼*; 35c.

Hoists and Hoisting

Hunner, H. H.—*Concrete Idler Stands*. [A type constructed and used at the Isabella mine, Palmer, Mich. Some costs of construction are given].—E. & M. J. July 22 1916; p 179; pp 1*; 25c.

Warren, H. M.—*Electrical Distribution and Application in Mines*. [Speaks of the use of electricity for pumps, hoists, locomotives, drilling and air compression].—Coal Age July 22 1916; p 138; pp 4*; 20c.

Power Shovels and Excavators

Brantly, J. E.—*A Report on the Limestones and Marls of the Coastal Plain of Georgia*. [The geology of the formation and descriptions of deposits by counties. The uses and preparation of the rock are also given].—Georgia Geol. Surv. Bull. No. 21; pp 300*.

—The Plant of the Dolomite Products Co., Narlo, Ohio. [The plant description includes excavating in the open-pit, on surface and haulage of the broken materials].—Excavating Eng. July 1916; p 371; pp 4*; 20c.

Transport

McBride, Wilbert G.—*Motor Truck Operation at Mammoth Collins Mine, Schultz, Arizona*. [Abst. from the proceedings of the A. I. M. E., reviewing costs and what can be done with a motor truck].—Mg. World July 22 1916; p 145; pp 1¼; 10c.

Warden-Stevens, F. J.—*Coal Shipping from South Africa*. [Describes several shipping appliances and arrangements].—Coll'y Guard. June 30 1916; p 1229; pp 2¼*; 35c.

Production

Bancroft, Holland.—*The Bolivian Tin Industry*. [A paper read before the Pan-American Sci. Congress. Reviews the market conditions, production and prices, with information on methods of mining, milling and smelting].—M. & S. P. July 22 1916; p 119; pp 7*; 20c.

Dunlop, J. P.—*Secondary Metals in 1915*. [On the production of metals refined from scrap].—Min. Res. U. S. 1:3; pp 8.

Gray, F. W.—*The Coal Trade in Nova Scotia During the First Half of 1916*. [Figures on production and a review of the conditions of the trade].—Canadian Mg. Jnl. July 15 1916; p 339; pp 1¼; 35c.

Northrop, John D.—*Asphalt, Related Bitumens and Bituminous Rock in 1915*. [Reviews the production and industry for United States and foreign countries].—Min. Res. of U. S. 11:13; pp 16.

Stone, Ralph W.—*Gypsum in 1915*. [Reviews the uses, methods of refining and production].—Min. Res. of U. S. 11:14; pp 9.

—*Aluminum*. [On the production and conditions of the trade, with some information on the refining of the metal].—Engg. July 7 1916; p 9; pp 1; 35c.

Mining Costs

Balcomb, J. C.—*A Remarkable Tunnel Rapidly Driven in Brazil*. [Gives details of operation with drawings. A bonus system and unusual method of blasting are described].—Comp. Air July 1916; p 8040; pp 5*; 20c.

French, Harold.—*Prospecting: A Suggestion*. [Describes a theoretical method of systematic prospecting for a syndi-

cate].—M. & S. P. July 22 1916; p 117; pp 1½; 20c.

Hunner, H. H.—*Concrete Idler Stands*. [A type constructed and used at the Isabella mine, Palmer, Mich. Some costs of construction are given].—E. & M. J. July 22 1916; p 179; pp 1*; 25c.

Accounting and Engineering Show Results. [Argues that the accounting, executive and engineering departments should work in harmony].—Coal Age July 15 1916; p 104; pp 2¼; 20c.

Mining Miscellany

Scott, David B.—*Stoping Methods of the Miami Copper Co., Arizona*. On the methods of haulage and stoping used in extracting this large body. Several stoping methods are being used].—Bull. A. I. M. E. June 1916; p 1031; pp 17*; 35c.

Young, G. J.—*Nomenclature of Mining Methods*. [The names commonly used for different mining methods are classified and a description is given of the systems named by terms of common usage].—E. & M. J. July 22 1916; p 175; pp 3¼; 25c.

MILL AND MILLING

Crushing, Grinding, Etc.

Brantly, J. E.—*A Report on the Limestones and Marls of the Coastal Plain of Georgia*. [The geology of the formation and descriptions of deposits by counties. The uses and preparation of the rock are also given].—Georgia Geol. Surv. Bull. No. 21; pp 300*.

Flotation

Ralston, O. C.; Allen, Glen L.—*The Flotation of Oxidized Ores*. [Discusses problems encountered in flotating different kinds of oxide ores. The results of some tests are given].—Mg. World July 22 1916; p 137; pp 3¼; 10c.

Concentration: Sorting, Sizing, Washing

Bancroft, Holland.—*The Bolivian Tin Industry*. [A paper read before the Pan-American Sci. Congress. Reviews the market conditions, production and prices, with information on methods of mining, milling and smelting].—M. & S. P. July 22 1916; p 119; pp 7*; 20c.

Gudgeon, C. W.—*Gold Scheelite Ore in New Zealand*. [Abst. from the bulletin of the Aust. I. M. E. The deposits and methods of concentration are described].—M. & S. P. July 22 1916; p 136; pp 1*; 20c.

Sohnlein, M. G. F.—*Combination Pulp Classifier*. [A paper to be read before the A. I. M. E. The machine was designed because neither mechanical nor hydraulic classification of tin ores in Bolivia were satisfactory].—E. & M. J. July 22 1916; p 182; pp 1*; 25c.

Wolf, H. J.; Barbour, P. P.—*The Boulder County Tungsten District, Colorado*. [Reviews the operations and conditions in the district. The principal companies are named, milling practice is described and a schedule of prices for tungsten ore is given].—E. & M. J. July 22 1916; p 165; pp 4¼*; 25c.

CHEMISTRY AND ASSAYING

Chemistry

Young, S. W.; Moore, Neil Preston.—*Laboratory Studies on Secondary Sulphide Ore Enrichment*. [Confined to copper sulphides and the generation of hydrogen sulphide].—Eco. Geol. June 1916; p 349; pp 17; 60c.

Analysis

Burrell, G. A.; Seibert, F. M.—*Gas Analysis as an Aid in Fighting Mine Fires*. [Discusses the change in air during a mine fire and the effects of gas on the fire and its origin. Methods of sampling and analyzing are given].—U. S. Bur. of Mines Tech. Paper 13; pp 16*.

METALLURGY

Electrometallurgy

Efficiency in Electrolytic Extraction. [Describes the Greenawalt system of electrolytic extraction, patent 1,179,522].—Mg. World July 22 1916; p 147; pp 1¼*; 10c.

Thermic Metallurgy

Bancroft, Holland.—*The Bolivian Tin Industry*. [A paper read before the Pan-American Sci. Congress. Reviews the market conditions, production and prices, with information on methods of mining, milling and smelting].—M. & S. P. July 22 1916; p 119; pp 7*; 20c.

Brantly, J. E.—*A Report on the Limestones and Marls of the Coastal Plain of Georgia*. [The geology of the formation and descriptions of deposits by counties. The uses and preparation of the rock are also given].—Georgia Geol. Surv. Bull. No. 21; pp 300*.

Bregman, A.—*Operating a Small Copper Blast Furnace*. [Details of furnace operation and construction which cause trouble in a small plant and methods used for getting around the same].—E. & M. J. July 22 1916; p 171; pp 4*; 25c.

The Profits in Zinc Smelting. [A financial discussion of the zinc smelting industry].—Mg. Jnl. July 8 1916; p 476; pp 1½; 35c.

POWER AND MACHINERY

Electricity

Brown, J. F. K.—*Imagination Applied to Mining*. [A review of the possible future as regards the transmission of electric power, pumping, etc. The cases are purely hypothetical].—Coal Age July 22 1916; p 142; pp 2¼; 20c.

Seede, J. A.—*Electric Arc Welding Finds Many Uses in Mines and Mills*. [The author cites and describes practical applications of repairing parts with the electric arc].—Mg. World July 22 1916; p 133; pp 3¼*; 10c.

Warren, H. M.—*Electrical Distribution and Application in Mines*. [Speaks of the use of electricity for pumps, hoists, locomotives, drilling and air compression].—Coal Age July 22 1916; p 138; pp 4*; 20c.

Hydro-Electric

Pierce, H. J.—*Federal Water-Power Legislation*. [An address before the National Elect. Light Assn. on the conservation of coal and oil by using hydro-electric power and the lack of congress to provide for such development].—U. S. Senate Document 468; pp 12.

Compressed Air

Balcomb, J. C.—*A Remarkable Tunnel Rapidly Driven in Brazil*. [Gives details of operation, with drawings. A bonus system and unusual method of blasting are described].—Comp. Air July 1916; p 8040; pp 5*; 20c.

Buffum, F. D.—*Compressed Air for Sinking a Shaft*. [Abst. from Coal Age. Deals with methods of piping and handling the compressed air which was used entirely for power. Remedies for diffi-

culties encountered are given].—Comp. Air July 1916; p 8048; pp 3*; 20c.

Hicks, H. L.—*Compressed Air at Rockland Lake Quarry, New York*. [Describes drilling and blasting operations, with some information on the general operation of the quarry].—Comp. Air July 1916; p 8045; pp 4*; 20c.

Warren, H. M.—*Electrical Distribution and Application in Mines*. [Speaks of the use of electricity for pumps, hoists, locomotives, drilling and air compression].—Coal Age July 22 1916; p 138; pp 4*; 20c.

Steam and Steam Engines

Dorman, H. R.—*Data on the Use of Water Softener for Boiler Feed Water*. [A paper read before the Wisconsin Soc. of Eng.].—Chem. Eng. & Mfg. July 1916; p 22; pp 1¼*; 30c.

Steam Flow Into a Compound Steam-Turbine. [Deals with the development of several formulas by use of calculus].—Engg. July 7 1916; p 1; pp 2*; 35c.

Gas Producers, Producer Gas

Trautschold, R.—*Gas Producer Control*.—Pract. Eng. July 15 1916; p 614; pp 1½; 20c.

Miscellaneous Power and Machinery

Brown, J. F. K.—*Imagination Applied to Mining*. [A review of the possible future as regards the transmission of electric power, pumping, etc. The cases are purely hypothetical].—Coal Age July 22 1916; p 142; pp 2¼; 20c.

IV. MISCELLANEOUS

Miscellaneous Costs

McBride, Wilbert G.—*Motor Truck Operation at Mammoth Collins Mine, Schalltz, Arizona*. [Abst. from the proceedings of the A. I. M. E., reviewing costs and what can be done with a motor truck].—Mg. World July 22 1916; p 145; pp 1¼; 10c.

Testing

Ralston, O. C.; Allen, Glen L.—*The Flotation of Oxidized Ores*. [Discusses problems encountered in flotating different kinds of oxide ores. The results of some tests are given].—Mg. World July 22 1916; p 137; pp 3¼; 10c.

Young, S. W.; Moore, Neil Preston.—*Laboratory Studies on Secondary Sulphide Ore Enrichment*. [Confined to copper sulphides and the generation of hydrogen sulphide].—Eco. Geol. June 1916; p 349; pp 17; 60c.

Metallography

Harley, Andrew.—*Testing Malleable and Cast Steel*. [An address before the British Foundrymen's Assn. An English view on the scientific manufacture of small castings].—I. Tr. Rev. July 20 1916; p 121; pp 7*; 25c.

Conservation

Arnold, Ralph.—*Conservation of the Oil and Gas Resources of the Americas*. [Reviews the deposits and possibilities of each country separately].—Eco. Geol. June 1916; p 299; pp 28; 60c.

Pierce, H. J.—*Federal Water-Power Legislation*. [An address before the National Elect. Light Assn. on the conservation of coal and oil by using hydro-electric power and the lack of congress to provide for such development].—U. S. Senate Document 468; pp 12.

Ore and Metal Markets; Prices-Current

New York, Aug. 3, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Aug. 2 were as follows:

		New York. Cts.	London. Pence.
July	27.....	63¾	30¾
	28.....	63¾	30 5/16
	29.....	65¾	30 5/16
	31.....	64¾	30 9/16
Aug.	1.....	64	30½
	2.....	64	30½

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London		
	High.	Low.	Avg.	Standard Oz.	1916.	1915.
January	57½	55½	56.775	48.890	26.875	22.744
February	57	56½	56.755	48.477	27.000	22.769
March	60¾	56½	57.935	49.926	27.080	23.650
April	73½	60¾	64.415	50.034	31.375	23.259
May	71¾	68¾	73	49.915	34.182	23.580
June	68¾	62¾	64.175	49.072	31.038	21.677
July	.....	.....	.....	47.619	.....	22.950
August	.....	.....	.....	47.178	.....	22.760
September	.....	.....	.....	48.68	.....	23.600
October	.....	.....	.....	49.385	.....	23.923
November	.....	.....	.....	51.713	.....	24.640
December	.....	.....	.....	55.038	.....	26.232
Year	.....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—A reaction from the feeling of despondency which characterized the attitude of sellers a week ago appears to have set in. Early in the period the tone suddenly changed for the better, prices showing a steady advance from day to day. The change followed the making of sales in the open market of approximately 6,000,000 lbs. at a fraction over 24c, and, while no similar buying has since been done, the orders have been coming in increasing number and size up to the present time. With the growing movement, sellers have been encouraged to raise their prices, and are now standing firm on the basis of 24¾c for third quarter of the year delivery. The fact that the large interests have not changed their nominal quotations, though credited with having recently closed some substantial contracts for deliveries over the last quarter at prices a cent and a quarter a pound below those they quote, is accepted as a good sign.

There has been some buying done for export, but sales in that direction have not been important. The general expectation seems to be that export contracts must come before long. This view is shared by at least one of the leading trade authorities, who says: "We may get a big export order next week, and it may come a month later, but it is surely coming. For our part it would please us better if this business did not come until late in September or October. We are sold so far ahead that it is difficult for us to keep our heads above water. When you consider that the largest sellers are practically booked up for the remainder of the year you can realize the excellent undercurrent of the market. We are not worrying about orders at present because it is not usual to book so far ahead, and we have in hand business for a period longer than ever before in our history. In years past we would have considered it abnormal to take business for 90 days ahead and now we could accept orders for at least the first quarter of next year, or nearly 9 months ahead. With the placing of expected foreign orders the domestic consumers will come along with large purchases. This is copper trade history. Users in this country will not enter the market during a dull period, despite the possibility of concessions in prices, but when the quotation has been established firmly because of some large contract, the manufacturers in this country who use the metal become the leading purchasers and bid the price up against one another."

There are some who are disposed to attribute the sudden

change in sentiment here to the jump of £5 in the price of standard copper in London last Friday, but, while that no doubt was a potent influence, the improvement had begun to make itself evident before that. Inquiries had been and are still coming from all consuming quarters of the country, some of them for round lots, and in the aggregate the amount of business that is being offered to dealers is quite large. A number of the smaller sellers who had been seeking orders for nearby copper at 25@26 cts. are now demanding and getting ½ ct. a pound more than those figures. Producers and dealers who may be called middle class, are asking up to 27 cts. for October and 26¾ cts. for November and December.

Despite the recent upturn in prices, representatives of the leading producing interests intimate that a readjustment of market values on a lower level is a probability of the near future. One of them is quoted as saying that the next important buying movement, which is expected between the present time and the middle of next month, will be on the basis of 23@25 cts. a pound. Europe, it is believed, will be in the market for large tonnages of copper within that period, and that this will be a signal for price readjustment resulting in a market on which consumers can do business. On the other hand, the opinion is expressed by prominent consumers that prices will remain near the present level for months to come, although it is possible that slight concessions may be made, which, however, bring out buying orders in such number as to immediately cause a hardening of the market for last quarter metal.

Not a little of the buying done on home account during the past few days was against business already done by manufacturers who had not anticipated requirements in copper to cover their orders for finished goods. Others who are said to be receiving some good orders from agents of the allies involving material for use in making munitions are contracting for copper to cover this business.

Casting copper has shared in the general improvement, some lots of considerable size having changed hands. Early in the week 24½ cts. was accepted, but later sales were at 25 cts. The larger interests were said to be the sellers.

Quotations for copper per pound at New York for the week ending Aug. 2 were as follows:

(For Third Quarter Delivery.)

		Lake.	Electrolytic.
July	27.....	24¾	24¾
	28.....	24½	24½
	29.....	24½	24½
	31.....	24¾	24¾
Aug.	1.....	24¾	24¾
	2.....	24¾	24¾

Quotations for copper per ton at London for the week ending Aug. 2 were as follows:

		Standard		Electrolytic.
		Spot.	Futures.	
July	27.....	£105 0 0	£103 0 0	£123 0 0
	28.....	111 0 0	108 0 0	124 0 0
	29.....	111 0 0	108 0 0	124 0 0
	31.....	111 0 0	104 0 0	124 0 0
Aug.	1.....	108 0 0	103 14 0	124 0 0
	2.....	106 0 0		

MONTHLY AVERAGE PRICES OF COPPER.

Month	New York—Lake Superior.			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	16.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	.....	.....	.....	19.423
August	.....	.....	.....	17.472
September	.....	.....	.....	17.768
October	.....	.....	.....	17.925
November	.....	.....	.....	18.856
December	.....	.....	.....	20.375
Year	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.707
February	23.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	.....	.....	.....	19.08
August	.....	.....	.....	17.222
September	.....	.....	.....	17.705
October	.....	.....	.....	17.859
November	.....	.....	.....	18.826
December	.....	.....	.....	20.348
Year	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York—1916			London—1916		1915.
	High.	Low.	Avg.	Avg.	Avg.	
January	24.25	22.00	23.065	88.008	60.760	.....
February	27.00	24.12½	26.031	102.760	63.392	.....
March	27.75	25.50	26.210	106.185	66.235	.....
April	28.00	26.75	27.70	103.681	77.461	.....
May	27.75	26.00	26.692	104.794	77.360	.....
June	24.00	25.25	24.38	94.316	82.350	.....
July	.....	.....	.....	.....	74.807	.....
August	.....	.....	.....	.....	67.350	.....
September	.....	.....	.....	.....	63.660	.....
October	.....	.....	.....	.....	72.577	.....
November	.....	.....	.....	.....	77.400	.....
December	.....	.....	.....	.....	80.400	.....
Year	.....	.....	.....	.....	.....	.....

Tin.—The brighter prospects of a week ago have not been enhanced by any pronounced increase in the buying of either spot or future tin. While some trading in both positions has been done the aggregate volume of business has not been large. However, the undertone has been strong throughout and there has been a gradual advance in prices of straits tin, which, however, the recent arrival of 1300 tons of Banca may have a tendency to hold in check. At the present price, however, sellers do not seem to be eager to do business, because of the light arrivals of straits during the past month and the limited quantity of it that is available for immediate delivery. While spot trade is restricted within narrow limits, business recently done for future delivery has been of fairly large volume, though much of it was handled by a few sellers. The effect of these transactions has been to impel the cheap sellers to withdraw and the market for futures closes at least 1 ct. a pound above the low point.

Quotations on tin per pound at New York and at London per ton for the week ending Aug. 2 were as follows:

	New York.	London.	Singapore.
	Spot.	Straits, spot.	
July 27	38¼	£165 0 0	£168 10 0
28	38¼	168 0 0	169 0 0
29	38¼	168 0 0	169 0 0
31	38½	168 10 0	173 0 0
Aug. 1	38½	167 15 0	173 0 0
2	38½	167 5 0	173 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	62.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	.....	.....	.....	37.498
August	.....	.....	.....	34.386
September	.....	.....	.....	33.13
October	.....	.....	.....	33.077
November	.....	.....	.....	39.375
December	.....	.....	.....	38.755
Year	.....	.....	.....	38.664

Lead.—The orders for export which for a time imparted a better tone to the market, having been neither many nor large, the market has relapsed into the condition of apathy which had previously characterized it. While no actual weakness has been shown by selling pressure at price concessions there is an undertone of weakness which is attributable to the belief that while no official notice has been given of an impending change the American Smelting & Refining Co. is on the eve of reducing its quotations. The

buyers sensing this have been withholding orders except those made necessary by requirements of the moment.

Quotations on lead per pound at New York and per ton at London for the week ending Aug. 2 were as follows:

		New York		London	
		Indpts.	A. S. & R. Co.	Spot.	Futures.
July	27.....	6.20c	6.50c	£28 0 0	£26 15 0
	28.....	6.20c	6.50c	28 5 0	26 15 0
	29.....	6.20c	6.50c	28 5 0	26 15 0
	31.....	6.20c	6.50c	28 10 0	27 0 0
Aug.	1.....	6.20c	6.50c	28 7 0	27 5 0
	2.....	6.20c	6.50c	28 0 0	27 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York—1916			London—1916		1915.
	High.	Low.	Avg.	Avg.	Avg.	
January	6.20	5.50	5.926	5.730	31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	22.010
April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	6.75	6.88	5.875	29.760	25.750
July	.....	.....	.....	5.738	.....	25.611
August	.....	.....	.....	4.750	.....	22.150
September	.....	.....	.....	4.627	.....	22.953
October	.....	.....	.....	4.612	.....	23.932
November	.....	.....	.....	5.152	.....	26.240
December	.....	.....	.....	5.346	.....	28.884
Year	.....	.....	.....	4.675	.....	23.099

Lead Ore.—Conditions during the week ended July 29 were practically as during the previous week in the Missouri-Kansas-Oklahoma district. The prices were as during the previous week also and most of the ores brought \$70, though some few lots brought \$72. Concentrates produced in the district during the week totaled 1,908,630 lbs., bringing the total for the year to date at 62,776,212 lbs. Their values were given as \$68,790 and \$2,739,471.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9375	69.00
August	.....	.....	.....	47.50
September	.....	.....	.....	48.25
October	.....	.....	.....	51.80
November	.....	.....	.....	63.00
December	.....	.....	.....	71.375
Year	.....	.....	.....	53.34

Zinc Ore.—As with lead, zinc ores in the Missouri-Kansas-Oklahoma district during the week ended July 29 were as during the previous week, except for the lower grades, which showed a stronger condition. The better grades sold at \$75 and the lower grades sold at \$55 as against \$50 of the previous week. Concentrates produced in the district during the week amounted to 9,101,550 lbs. and the total for the year was 402,805,244 lbs. These were given values of \$302,478 and \$18,639,268.

Calamine.—No change was noted in this market, and ores continued to sell at from \$40 to \$50 during the week. There were produced 132,920 lbs. of concentrates and the total for the year was given at 19,160,420 lbs., these being valued respectively at \$2904 and \$707,752.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.60	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.60	77.00	116.00
July	80.00	50.00	65.00	111.00
August	.....	.....	.....	60.25
September	.....	.....	.....	76.75
October	.....	.....	.....	82.40
November	.....	.....	.....	92.50
December	.....	.....	.....	87.00
Year	.....	.....	.....	102.95

Spelter.—The little boom started a week ago by inquiries from Great Britain and France seems to have petered out. It is true that some export business resulted, but its effect was not supplemented by any domestic buying to speak of. Since then the market has gone off and shows a tendency to recede further. In the opinion of some people in the trade, however, the depression is not expected to last, as the foreign demand promises to be a factor to reckon with, and they believe that it is going to manifest itself in additional export buying of a more pronounced character than that of last week before very long. In the meantime the home trade is apathetic and the market closes dull and easy.

Quotations for spelter per pound at New York and per ton at London for the week ending Aug. 2 were as follows:

	New York.		London.	
	Spot.	Spot.	Spot.	Futures.
July 27.....	10c	£59 0 0	£53 0 0	0 0
28.....	9½c	60 0 0	53 0 0	0 0
29.....	9½c	60 0 0	53 0 0	0 0
31.....	9½c	60 0 0	50 0 0	0 0
Aug. 1.....	9½c	55 0 0	50 0 0	0 0
2.....	9½c	50 0 0	50 0 0	0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1915	1916	1915	1916	1915
January	19.42½	17.30	18.801	6.519	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.60	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July	.....	.....	.....	20.803	.....	98.150
August	.....	.....	.....	16.110	.....	68.250
September	.....	.....	.....	14.493	.....	64.400
October	.....	.....	.....	14.196	.....	64.196
November	.....	.....	.....	16.875	.....	88.240
December	.....	.....	.....	16.675	.....	89.153
Year	.....	.....	13.914*	.....	66.959	.....

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—The expectation of a further decline was realized on Saturday when selling agents made a cut of \$2 a flask in their price. But at \$78 there appears to be no greater interest felt in the metal than at the lower figure. With no demand from the ammunition makers, and other consumers buying from hand to mouth, the indications point to a further recession, for while there have been no further arrivals of consequence there is understood to be a good deal of unsold stock on the market, and recently there have been current reports of reselling by makers of explosives.

Antimony.—There have been some inquiries in the market, but so far they do not appear to have resulted in business. The downward trend of prices has continued and offerings are now made at 14¼ cts., or ¾ ct. below the price quoted a week ago.

Nickel.—There is very little demand from home consumers and not much inquiry for export, but the market remains steady, with ordinary forms quoted at 45@50 cts. per pound as to size and terms of order. Electrolytic is held at a premium above these figures.

Aluminum.—Demand has been only fair, deliveries on contracts appearing to be sufficient to cover most of the current requirements of consumption. Quotations are maintained at 59@61 cts. per pound for No. 1 ingots, New York.

Platinum.—Without further change in price, the market is dull and lacks strength. The nominal quotation is \$60.

Pig Iron.—Foreign inquiries for Bessemer and for high and low phosphorus iron are still coming in, but nothing much has come of them during the past week, or at least no reliable reports of actual business are heard. On domestic account, however, some trading has been done, but the quantities changing hands were not important. The tone of the market continues strong and among leading trade authorities

no material change in the situation is expected for some time to come.

Ferromanganese.—The situation presents no new features. With little demand the market is steady on the contract basis price of \$175. Spiegeleisen also lacks movement of consequence, but is held steadily at \$45@50 for 20% at the furnace.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	3.00	to	3.25
Muriatic, 20 deg.....	3.25	to	3.50
Nitric, 36 deg.....	.07½	to	.08½
Nitric, 40 deg.....	.09	to	.09½
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured, 183 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.71
Alum—Powdered, lb.....	.05½	to	.08
Lump, lb.....	.04	to	.06½
Ground, lbs.....	.041	to	.07½
Ammonia—			
Muriate, white grain, lb.....	.08½	to	.08½
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06½	to	.06½
Red, lb.....	.55	to	.60
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.14	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	5.00	to	5.75
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	2.50	to	2.75
Foundry.....	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese—Spot.....	200.00	to	225.00
Last half.....	175.00	to	.....
Ferroallicon, 50%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.60	to	.70
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
White crystals.....	.15½	to	.15½
Broken, cakes.....	.14½	to	.15
Powdered.....	.17	to	.17½
Lead—Granulated, lb.....	.15	to	.15½
Brown sugar.....	.13½	to	.14
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13	to	.14
20 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 20 gr.....	.37½	to	.38
Wood grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.32½	to	.33½
Benzine, 59 to 62°, gal.....	.29	to	.29½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	\$0.00	to	\$4.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Richomate.....	.39	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.48	to	.50
Prussiate, yellow.....	.95	to	1.00
Prussiate, red.....	3.50	to	4.00
Salt peter—Crude, lb.....	.15	to	.15½
Refined.....	.27	to	.29½
Soda—Ash, 58% (43% basis), bbl.....	1.25	to	1.50
Strontia Nitrate, casks, lb.....	.47	to	.48
Sulphur—			
Crude, ton.....	28.00	to	29.00
Flowers, 100 lbs.....	2.10	to	2.50
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.29½	to	.30
Oxide, lb.....	.44	to	.46
Zinc Chloride.....	.15	to	.22

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization			
					Paid in 1918	Total to date	Latest							Paid in 1918	Total to date	Latest	
							Date	Amt.								Date	Amt.
Acacia, g.....	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01		Golden Eagle, g.....	Colo.	480,915	\$1	\$.....	\$99,916	Sept. '01	\$0.01	
Adams, s i c.....	Colo.	80,000	10	778,000	Dec. 18, '09	.04		Golden Star, g.....	Ariz.	400,000	5	120,000	Mar. 15, '10	.06	
Adventure, c.....	Mich.	100,000	25	60,000	July 20, '16	.50		Gold Com. Fra., g.....	Nev.	922,000	1	92,111	Oct. 16, '09	.10	
Ahmbeck, c.....	Mich.	200,000	25	1,200,000	5,250,000	July 10, '16	3.00		Goldfield Con., g.....	Nev.	3,558,148	10	28,999,831	Oct. 31, '15	.25	
Alaska Goldfields, g.....	Alaska	250,000	5	403,250	Jan. 10, '15	.15		Good Hope, g. s. l.....	Colo.	600	100	941,250	Jan. '03	.25	
Alaska Mexican, g.....	Alaska	180,000	5	3,607,381	Nov. 28, '15	.10		Good Sp. Anchor, z. s.....	Nev.	550,000	1	33,000	119,756	June 15, '16	.01	
Alaska Mines Sec., U. S.....	U. S.	600,000	5	90,000	Nov. 1, '06		Grand Central, g. s.....	Utah	600,000	1	1,545,200	Dec. 23, '15	.02%	
Alaska Treadwell, g.....	Alaska	200,000	25	250,000	15,780,000	May 29, '18	.50		Grand Gulch, c. s.....	Nev.	239,845	2.50	9,594	11,992	June 1, '18	.03	
Alaska United, g.....	Alaska	180,200	5	54,060	2,045,270	Feb. 28, '16	.30		Oranite, g.....	Alaska	430,000	1	17,200	17,200	May 10, '16	.03	
Allouez, g.....	Mich.	100,000	25	450,000	650,000	July 15, '16	2.00		Gwin, g.....	Cal.	100,000	10	481,500	Feb. '06	.25	
Amalgamated, c.....	Mont.	1,538,929	100	109,444,983	Aug. 30, '15	3.77		Hazel, g.....	Cal.	900,000	1	1,114,000	Jan. 5, '15	.01	
Am. Sm. & R. com	U. S.	600,000	100	1,500,000	30,933,337	June 1, '16	1.76		Hecla, s. l.....	Idaho	1,000,000	0.25	800,000	4,555,000	July 3, '16	.16	
Am. Sm. & R. pf.	U. S.	600,000	100	1,750,000	66,646,386	June 1, '16	1.60		Hercules, g.....	Idaho	1,000,000	1	1,650,000	12,400,000	July 15, '16	.20	
Am. Sm. Sec. B. pf.	U. S.	170,000	100	785,006	11,455,000	July 1, '16	1.50		Hidden Treasure, g.....	Cal.	80,000	10	457,452	Sept. '00	.10	
Am. Sm. Sec. B. pf.	U. S.	300,000	100	1,125,000	16,635,000	July 3, '16	1.25		Holy Terror, g.....	S. D.	600,000	1	172,000	Sept. '00	.01	
Anaconda, c.....	Mont.	2,331,250	50	6,993,750	171,321,771	May 20, '16	1.50		Homestake, g.....	S. D.	251,180	100	1,141,778	36,848,486	July 25, '16	.85	
Annie Laurie, g.....	Utah	25,000	100	439,561	Apr. 22, '05	.50		Hope Dev., g.....	Cal.	500,000	1	5,000	Dec. 31, '16	.01			
Argonaut, g.....	Cal.	200,000	5	1,680,000	June 27, '15	.10		Horn Silver, l. & z.....	Utah	400,000	1	40,000	June 30, '16	.06			
Arizona, c.....	Ariz.	.....	.....	621,164	20,212,164	Apr. 1, '11	.....		Imperial, c.....	Ariz.	600,000	10	300,000	June 24, '07	.20	
Atlantic, c.....	Mich.	100,000	25	.....	990,000	Feb. 21, '06	.50		Independence Con., g.....	Cal.	2,600,000	1	251,375	Apr. '01	.04	
Bagdad-Chase, g. pf.	Cal.	84,819	5	202,394	Jan. 1, '09	.10		Inspiration Con., g.....	Ariz.	920,687	20	3,091,233	3,091,233	July 31, '16	2.00	
Bald Butte, g. s.....	Mont.	100,000	25	1,354,646	Nov. 1, '07	.04		Inter'l Nickel, com. U. S.....	1,673,354	25	5,438,498	30,941,338	June 1, '16	2.00			
Baltic, c.....	Mich.	100,000	25	.....	7,960,000	Dec. 31, '13	2.00		Inter'l Nickel, pf. U. S.....	89,126	100	267,378	5,614,824	May 1, '16	1.50	
Barnes-King, g.....	Utah	1,000,000	0.10	.....	940,000	Nov. 15, '07	.02		Intern'l Sm. & Ref. U. S.....	100,000	100	.....	4,100,000	May 2, '14	2.00	
Beck Tunnel Con., g.....	Utah	400,000	1	60,300	70,000	July 15, '16	.06		Interstate-Calahan	Cal.	1,666,567	10	1,394,971	3,952,416	June 30, '16	1.60	
Big Four Expl., g.....	Utah	228,689	5	.....	960,493	Dec. 20, '16	.20		Iowa Tiger, g. s. l.....	Colo.	3,000	1	270,187	Jan. 31, '15	.00%	
Bingham-N. Haven	Wla.	120,000	1	.....	78,000	Jan. 15, '11	.06		Iron Blossom, l. & g.....	Utah	1,000,000	1	250,000	Jan. 15, '16	.50	
Board of Trade, z.....	Colo.	300,000	1	1,425,000	Oct. 28, '11	.20		Iron Cap pf. c.....	Ariz.	33,481	10	6,422	29,803	July 1, '18	.35		
Bonanza Dev., g.....	Nev.	399,395	5	349,949	June 25, '16	.06		Iron Clad, g.....	Colo.	1,000,000	1	.....	50,000	Nov. '06	.05	
Booth (Reorganized)	Nev.	408,600	1	40,850	Dec. 10, '14	.10		Iron Silver, g.....	Colo.	600,000	20	.....	5,050,000	Dec. 31, '15	.10	
Boss, g.....	Colo.	15,000	10	402,350	Oct. '02	.75		Isabella, g.....	Colo.	2,250,000	1	742,500	Mar. '01	.01			
Boston & Colo. Sm.	Mont.	100,000	25	63,225,000	May 15, '11	4.00		Isle Royale, c.....	Mich.	150,000	25	150,000	300,000	July 31, '16	1.00		
Bot. & Mont. Con.	Colo.	200,000	25	.....	220,000	Dec. 15, '13	.10		Jamison, g.....	Cal.	390,000	10	378,300	Jan. '11	.02	
Breece, l. s.....	Cal.	800,000	1	.....	203,315	Sept. 15, '15	.06		Jerry Johnson, g.....	Cal.	2,500,000	10	187,500	Nov. 5, '14	.00%	
Brunswick Con., g.....	Utah	100,000	10	2,768,400	June 1, '16	.10		Jim Butler, g.....	Nev.	1,718,020	1	171,802	343,804	Feb. 2, '16	.10		
Bullwhacker, c.....	Mont.	450,000	1	10,000	July 1, '07	.01		Joplin Ore & Spelter	Mo.	400,000	5	62,000	62,000	July 22, '16	.04%		
Bunker Hill Con., g.....	Cal.	200,000	1	855,000	July 4, '16	.02%		Jumbo Ext., g.....	Nev.	1,550,000	1	194,000	694,998	June 30, '16	.05		
Bunker Hill & Bull.	Idaho	327,000	10	17,754,007	July 4, '11	.10		Kendall, g.....	Mont.	600,000	5	50,000	1,555,000	June 30, '16	.10		
Butte Alex Scott, g.....	Mont.	75,000	10	814,662	Apr. 10, '16	10.50		Kenofick Zinc.....	Mo.	200,000	.....	60,000	60,000	June 30, '16	.10	
Butte-Ballaklava, c.....	Mont.	250,000	10	125,000	Aug. 1, '10	.50		Kennecott, g.....	Alas.	250,000	10	7,000,000	12,000,000	June 30, '16	1.50		
Butte Coalition, c.....	Mont.	1,000,000	15	4,700,000	Dec. 1, '11	.25		Kennedy, g.....	Cal.	100,000	100	1,801,001	June '06	.06			
Butte & Superior, z.....	Mont.	272,697	10	11,383,017	June 30, '11	10.75		King of Arizona, g.....	Ariz.	200,000	1	395,000	Aug. 2, '09	.12			
Caledonia, l. z. c.....	Idaho	2,605,000	1	1,429,781	July 15, '16	.03		Klar Piquet, z.....	Wis.	20,000	1	167,600	Dec. 16, '12	.25			
Calumet & Ariz., c.....	Ariz.	641,923	10	2,565,675	June 20, '18	2.00		Kuob Hill, g.....	Wash.	1,000,000	1	70,000	Aug. 1, '13	.00%			
Calumet & Hecla, c.....	Mich.	100,000	25	3,000,000	June 23, '16	15.00		La Fortuna, g.....	Ariz.	250,000	1	1,200,600	Oct. '02	.01%			
Camper Bird, g.....	Colo.	1,750,000	25	113,584	Jan. 1, '16	.17%		Lake View, g.....	Utah	600,000	.06	60,000	114,600	June 2, '16	.01		
Cardiff, l. s.....	Utah	600,000	1	125,000	June 1, '16	.25		Last Dollar, g.....	Colo.	1,600,000	1	180,000	Feb. 23, '03	.02			
Cardiff, s. c.....	Utah	600,000	25	80,000	Dec. '06	.01		Liberty Bell, g.....	Cal.	133,551	5	176,795	Jan. 31, '16	.05			
Centennial Eureka, g.....	Utah	100,000	25	100,000	Apr. 25, '17	1.00		Lightner, g.....	Cal.	102,255	10	331,179	June '06	.06			
Center Creek, l. z.....	Mo.	100,000	10	595,000	July 1, '16	.15		Linden, z.....	Wis.	1,020	10	15,000	Dec. 31, '11	3.00			
Central Eureka, g.....	Cal.	100,000	1	799,159	Mar. 5, '06	.05		Little Bell, s. l.....	Utah	300,000	1	11,200	Apr. 21, '16	.05			
Ceolury, g. s. l.....	Utah	1,000,000	25	392,08	Feb. 15, '16	.06		Little Florence, g.....	Nev.	1,000,000	1	430,000	Jan. '06	.06			
Champion, c.....	Mich.	100,000	25	14,389,000	July 7, '16	6.40		Lost Packer, g.....	Idaho	150,000	1	37,600	Oct. 23, '13	.25			
Chlet Con., g.....	Utah	892,960	1	439,212	May 15, '16	.05		Lower Mammoth, g.....	Utah	1,000,000	1	67,000	Dec. 15, '16	.01			
Chino Copper c.....	N. M.	869,950	5	3,041,930	June 30, '16	2.25		MacNamara, g. s.....	Nev.	734,576	1	46,800	Apr. 23, '06	12.00			
C. K. & N. g.....	Colo.	1,431,900	1	171,825	Nov. '04	.01		Magma, c.....	Ariz.	240,000	5.00	240,000	480,000	June 30, '16	.50		
CLIF, g.....	Alaska	100,000	1	115,000	Feb. 5, '14	.05		Mammoth, g. s. c.....	Utah	400,000	.10	80,000	2,380,000	June 30, '16	.06		
CLIF, s. l.....	Utah	300,000	100	80,000	Jan. 1, '13	.10		Manhattan-Big 4, g.....	Nev.	762,400	1	30,248	Aug. 15, '11	.02			
Climax, g. s.....	Colo.	200,000	100	1,000,000	Dec. '06	.30		Mary McKinney, g.....	Utah	1,304,282	1	1,169,306	July 28, '14	.02			
Colo. g. Dredging.....	Utah	1,000,000	0.20	2,600,000	Mar. 15, '13	.03		May Day, g.....	Colo.	800,000	0.25	40,000	284,000	May 26, '16	.02		
Colorado, s. l.....	Utah	293,540	5	212,623	Oct. 14, '07	.20		Mary Murphy, g. s. l.....	Cal.	370,800	5	25,067	93,106	May 1, '16	.07		
Columbus Con. l. & c.....	Utah	320,000	1	673,000	Dec. '06	.15											

Dividends of Mines and Works—Continued

NAME OF COMPANY	Number Shares Issued	Par Val	Dividends on Issued Capitalization			
			Paid in 1916	Total to Date	Latest	
					Date	Amt.
Petro, g. s.	Utah..	600,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04
Pharmacist, g.	Colo..	1,600,000	1	91,500	Feb. 1, '10	.00%
Phelps, Dodge & Co	U. S..	450,000	100	53,771,527	June 30, '15	6.00
Pioneer, g.	Alaska	500,000	1	2,041,526	Oct. 7, '11	.03
Pittsburg, I. z.	Mo..	1,000,000	1	20,000	July 15, '07	.02
Pittsburg-Idaho, I.	Ida..	1,000,000	1	249,104	July 15, '13	.04
Pitts Silver Peak, ..	Nev..	2,790,000	1	840,600	Dec. 1, '14	.02
Platerville, I. z.	Wis..	600	60	179,800	June 15, '07	10.00
Plumas Eureka, g.	Cal..	150,625	10	2,331,294	Apr. 3, '01	.08
Plymouth Con.,	Cal..	240,000	6	231,060	Apr. 10, '14	.24
Portland, g.	Colo..	3,000,000	1	10,447,080	July 20, '16	.03
Prince Con., s. l.	Nev..	1,000,000	2	250,000	July 1, '16	.05
Quartette, g. s.	Nev..	100,000	10	375,000	July 31, '07	.20
Quicksilver, pf.,	Cal..	45,000	100	1,931,411	Apr. 8, '03	.03
Quill, g.	Wash.	1,600,000	1	67,000	Feb. 1, '12	.01
Quincy, c.	Mich.	110,000	25	22,547,500	June 30, '16	4.00
Ray Con., c.	Ariz..	1,571,279	10	6,144,468	June 30, '16	5.00
Red Bird, g. s. c. l.	Mont.	300,000	6	72,000	Apr. 9, '04	.01
Red Metal, c.	Mont.	100,000	10	1,200,000	Apr. 27, '07	.00
Red Top, g.	Nev..	1,000,000	1	128,175	Nov. 25, '07	.10
Republic, g.	Wash.	1,000,000	1	85,000	Dec. 23, '10	.01%
Richmond, g. s. l.	Nev..	54,000	1	4,453,797	Dec. 23, '00	.01
Rocco-Home, I. s.	Nev..	300,000	1	152,500	Dec. 22, '05	.02
Rochester Ld. & L.	Mo..	4,900	100	190,645	July 1, '12	.50
Round Mountain, g.	Nev..	889,018	1	363,964	Aug. 25, '13	.04
Sacramento, g.	Utah..	1,000,000	5	308,000	Oct. 22, '08	.00%
St. Joseph, I.	Mo..	1,464,798	10	10,972,631	June 20, '16	.25
St. Mary's M. L.	Mich.	160,000	25	6,560,000	July 23, '16	2.00
Schoenbr-Wal'n, z. l.	Cal..	10,000	10	90,000	Sept. 20, '11	.20
Scratch Gravel,	Cal..	1,000,000	1	20,000	Feb. 1, '15	.02
Seven Tr. Con., g. s.	Nev..	1,415,000	1	252,632	Apr. 1, '15	.02%
Shannon, g.	Ariz..	300,000	10	760,000	Jan. 30, '13	.25
Shattuck-Ariz., c.	Ariz..	350,000	10	4,200,000	July 20, '16	1.25
Silver Hill, g. s.	Nev..	108,000	1	85,200	June 24, '07	.05
*Silver King Coal'n	Utah..	1,250,000	5	14,147,485	July 1, '16	.15
Silver King Con., ..	Utah..	637,582	1	942,373	July 22, '15	.10
Silver Mines Expl.,	N. Y..	10,000	100	250,000	June 15, '10	2.00
Sioux Cons., I. s. c.	Utah..	745,369	1	872,105	July 20, '11	.04
Skidoo, g.	Cal..	1,000,000	5	365,000	Oct. 2, '14	.01
Smuggler, s. l. z.	Colo..	1,000,000	1	2,235,000	Nov. 22, '06	.03
Snowstorm, c.	Idaho	1,600,000	1	1,169,610	Oct. 10, '13	.01%
Socorro, g.	N. M..	377,342	5	177,205	June 1, '16	.05
South Eureka, g.	Cal..	299,931	1	1,388,776	July 15, '16	.07
So. Swansea, g. s. l.	Utah..	300,000	1	257,500	Apr. 5, '04	.01%
Spearfish, g.	S. D..	1,600,000	1	65,600	Jan. 7, '05	.01
Standard Coal, g. s.	Cal..	173,394	10	5,274,408	Nov. 17, '13	.25
Standard, C.	Ariz..	425,000	1	69,600	Sept. 3, '05	.50%
Stewart, I. z.	Idaho	1,238,362	1	2,043,297	Dec. 31, '15	.05
Stratton's Crip. Ch.	Colo..	2,000,000	1	300,000	Sept. 6, '08	.02%
Stratton's Ind.,	Colo..	1,000,000	5	5,028,568	Dec. 23, '06	.12
Str'n's Ind. (new) g.	Colo..	1,000,000	.30	691,250	Jan. 31, '15	.16
Strong, g.	Colo..	1,000,000	1	2,275,000	July 9, '05	.02
Success,	Ida..	1,600,000	\$1	\$345,000	July 23, '16	\$0.03
Superior & Pitts, c.	Ariz..	1,499,792	10	10,318,568	Dec. 21, '15	.38
Swansea, s. l.	Utah..	100,000	6	334,600	Apr. 23, '07	.06
Tamarack, c.	Mich.	60,000	25	9,420,000	July 23, '07	4.00
Tamarack-Cluster, ..	Idaho	2,000,000	1	80,000	June 1, '16	.02
Tennessee, c.	Tenn.	200,000	25	6,206,250	Apr. 15, '15	.75
Tightner,	Cal..	100	100	160,000	Jan. 3, '14	.24
Tomboy, g. s.	Colo..	310,000	6	3,861,555	June 30, '16	.24
Tom Reed, g.	Ariz..	909,555	1	2,555,934	Sept. 5, '15	.01
Ton-Belmont, g.	Nev..	1,500,000	1	8,206,527	July 1, '16	.12%
Ton-Extension, g. s.	Nev..	1,272,301	1	1,400,856	July 1, '16	.15
Tonopah, g. s.	Nev..	1,000,000	1	13,450,000	July 21, '16	.15
Tonopah Midway, g.	Nev..	1,000,000	1	250,000	Jan. 1, '07	.06%
Tremm,	Cal..	200,000	2.50	234,000	Apr. 23, '15	.02
Tri-Mountain, c.	Mich.	100,000	25	1,100,000	Oct. 30, '12	3.00
Tuolumne, c.	Mont.	800,000	1	495,525	Apr. 15, '13	.10
Uncle Sam Con., s.	Utah..	500,000	1	470,000	Sept. 20, '11	.05
Union, g.	Colo..	1,250,000	1	44,244	Jan. 27, '03	.02
Union Basin, z.	Ariz..	835,330	10	157,070	Nov. 15, '10	.30
United, c. pf.,	Mont.	60,000	100	1,600,000	Oct. 21, '07	3.00
United, c. com.,	Mont.	450,000	100	6,125,000	Aug. 6, '07	1.75
United, z. l. pf.,	Mo..	19,658	25	21,527	Oct. 15, '07	.60
United Copper, c. s.	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01
United (Crip. Ch.)	Colo..	4,009,100	1	440,435	Jan. 1, '10	.04
United Globe, c.	Ariz..	23,000	100	3,335,000	June 30, '16	18.00
United Metals Sell.	U. S..	60,000	100	11,000,000	Sept. 23, '10	6.00
United Verde, c.	Ariz..	300,000	10	38,047,000	Oct. 9, '16	.75
U. S. Red & R., com.	Colo..	59,188	100	414,078	July 9, '03	1.00
U. S. Red & R., pf.	Colo..	39,458	100	1,775,938	Oct. 1, '07	1.50
U. S. R. & M., com	USMx	351,115	60	7,590,745	July 15, '16	1.00
U. S. R. & M., pf.	USMx	486,350	60	18,084,366	July 15, '16	.87%
Utah, c.	Utah..	1,624,490	10	41,650,000	June 30, '16	3.00
Utah, s. l. (Fish Sp.)	Utah..	93,000	10	283,720	Oct. 21, '10	.02%
Utah-Apex, s. l.	Utah..	528,200	6	254,100	Jan. 3, '16	.25
Utah Con., c.	Utah..	300,000	5	9,600,000	June 26, '16	.75
Utah-Missouri, z.	Mo..	10,000	1	10,000	May 29, '16	1.00
Victoria, g. s. l.	Utah..	250,000	1	207,500	Apr. 23, '10	.04
Vindicator Con., g.	Colo..	1,500,000	1	135,000	May 25, '16	.03
Wasp No. 2, g.	S. D..	500,000	1	649,466	May 15, '16	.02%
Wellington, I. z.	Colo..	10,000,000	1	1,050,000	July 1, '16	.02
West End Con.,	Nev..	1,788,486	1	536,545	Jan. 15, '16	.05
West Hill,	Wis..	20,000	1	40,000	May 29, '16	.20
West Knob, g. pf., ..	Ida..	200,000	10	170,000	May 29, '16	.10
Wilber, c.	Ida..	1,000,000	1	30,000	May 1, '16	.01
Wolverine, c.	Mich.	60,000	25	8,760,000	Apr. 1, '16	6.00
Wolverine & Ariz., c	Ariz..	118,674	15	63,403	Apr. 1, '15	.25
Work, g.	Colo..	1,500,000	1	1,597,685	Apr. 31, '12	.02
Yak,	Colo..	1,000,000	1	2,127,685	June 30, '16	.07
Yankee Con., g. s. l.	Utah..	1,000,000	1	167,500	Feb. 1, '13	.01
Yellow Aster, g.	Cal..	100,000	10	1,167,789	July 6, '16	.02
Yellow Pine,	Cal..	1,000,000	1	1,543,005	July 25, '16	.15
Yosemite Dredg.,	Cal..	24,000	10	102,583	July 15, '14	.10

Corrected to August 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675,000

Dividends of Foreign Mines and Works

NAME OF COMPANY	Number Shares Issued	Par Val	Dividends on Issued Capitalization			
			Paid in 1916	Total to Date	Latest	
					Date	Amt.
Aluchitlan,	Mex..	50,000	\$ 5	\$237,500	July 1, '13	\$0.25
Amistad y Concordia g s	Mex..	9,600	60	429,358	July 15, '08	1.28
Amparo, s. g.	Mex..	2,000,000	1	2,132,175	May 10, '16	.05
Barloilo de Medina Mill	Mex..	2,000	25	108,591	Aug. 1, '07	.60
Batopilas, s.	Mex..	445,268	20	55,870	Dec. 31, '07	.12%
Beaver Con., s.	Ont..	2,000,000	1	710,000	Apr. 29, '16	.03
Boteo, s.	Mex..	120,000	20	721,871	May 6, '11	5.00
British Columbia, c.	B. C..	591,709	5	515,399	Jan. 5, '13	.15
Buena Tierra,	Mex..	330,000	5	160,380	Jan. 30, '15	.24
Buffalo, Ont.,	Ont..	1,000,000	1	2,787,800	July 1, '14	.05
Canadian Goldfields, ..	Can..	600,000	0.10	237,099	July 15, '14	.01%
Cananea Central, c.	Mex..	600,000	10	360,000	Mar. 1, '12	.60
Cariboo-Cobalt,	Ont..	1,000,000	1	295,000	Sept. 1, '15	.09
Cariboo-McKinnley, g.	B. C..	1,250,000	1	65,250	Dec. 1, '08	.00%
City of Cobalt,	Ont..	500,000	1	138,375	May 15, '09	.01
Cobalt Central, s.	Ont..	4,751,500	1	192,845	Aug. 24, '09	.01
Cobalt Lake, s.	Ont..	3,000,000	1	465,000	May 29, '14	.02%
Cobalt Silver Queen, ..	Ont..	1,500,000	1	315,000	Dec. 1, '08	.03
Cobalt Townsite, s.	Ont..	199,282	5	1,042,259	Aug. 20, '14	.24
Coniagas, s.	Ont..	800,000	5	5,040,000	Feb. 5, '16	.25
Con. M. & S. M., g. s. c.	B. C..	55,050	100	2,740,654	July 1, '16	2.50
Crown Reserve, s.	Ont..	1,999,957	1	6,102,408	July 15, '15	.03
Dolores,	Mex..	400,000	5	1,374,865	July 24, '11	.22%
Dome Mines, s.	Ont..	400,000	10	690,000	June 1, '16	.50
Dos Estrellas, (El Oro)	Mex..	300,000	0.50	15,405,000	Sept. 30, '13	1.50
El Favor,	Mex..	3,500,000	1	210,000	Apr. 30, '14	.24
El Oro, g. s.	Mex..	1,147,500	5	9,135,842	July 11, '13	.24
El Rayo, g. s.	Mex..	260,020	2	140,410	Apr. 24, '11	.15
El Triunfo, c.	Mex..	200,000	1	12,621,250	Dec. 31, '15	.10
Esperanza, s. g.	B. C..	149,985	100	6,050,341	May 29, '16	1.50
Granby Con. C. g. s.	Mex..	474,411	100	1,458,527	May 29, '16	2.00
Greene-Cananea, c.	Mex..	1,000,000	10	12,544,000	July 25, '16	1.00
Greene Con., c.	Mex..	300,000	10	194,871	Mar. 28, '07	.40
Guanaquato, c.	Mex..	540,000	5	600,000	Oct. 8, '06	.07%
Guanaquato Dev., pf.	Mex..	10,000	100	274,356	Jan. 1, '11	8.00
Gugenheim Explorat.,	Mex..	833,732	25	34,032,760	Apr. 3, '16	11.85
Hallebury, s.	Ont..	60,000	1	60,000	Apr. 5, '11	.50
Hedley,	B. C..	120,000	10	1,943,520	June 30, '16	.50
Hinds Con., g. s. l.	Mex..	5,000,000	1	88,000	Feb. 27, '18	.02
Hillinger,	Ont..	800,000	5	5,130,000	July 14, '16	.20
Jimilco,	Ont..	10,000	100	970,000	Feb. 27, '11	1.00
Kerr Lake, s.	Ont..	600,000	5	5,420,000	June 1, '16	.25
La Blanca,	Mex..	140,000	20	2,775,700	Mar. 31, '13	.90
La Republica, s.	Mex..	400,000	5	110,000	Aug. 15, '11	.06
La Rose Con., s.	Ont..	1,498,827	5	5,611,913	July 20, '16	.05

NEW YORK

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MINING WORLD

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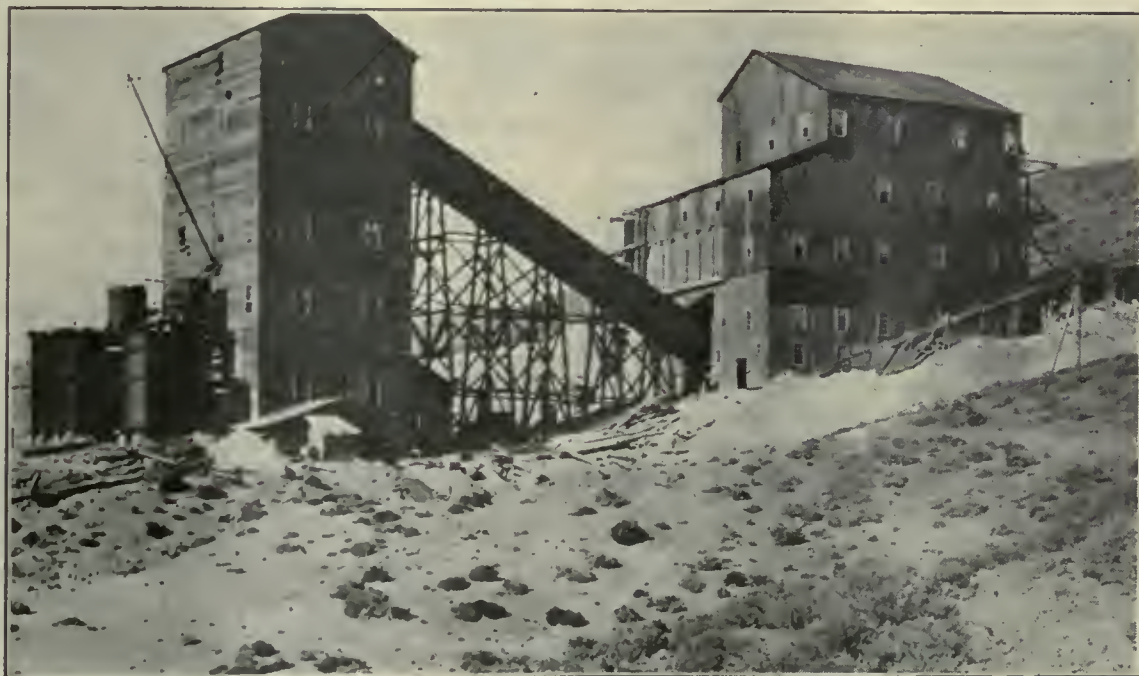
August 12, 1916.

Nevada Douglas Mines and Mill

By W. A. SCOTT.

Nevada Douglas Con. Copper Co. controls the Ludwig, Douglas Hill, Copper Casting and other mines in Yerington, or Mason district, Nevada. This group is on the western slope of the range of hills separating Mason valley from Smith valley. A railroad was built several years ago from Wabuska to Yerington, Mason and Ludwig, the last named being the terminal

are accomplished by running drifts southward on the vein from all 100-ft. stations. A plunger pump, on the 800-ft. level, lifts 100 gals. of water per minute, during 8 hour shift, keeping the lower workings free of water and supplying sufficient for mill work. The Ingersoll-Rand electric-driven air-compressor furnishes power for 30 piston and Vaughn drills.



MILLING PLANT OF NEVADA DOUGLAS CON. COPPER CO.

station, situated at Nevada Douglas mines. This railroad is operated and controlled by Nevada Douglas interests. It connects with the Southern Pacific at Wabuska, and affords good transportation facilities to the upper Walker river region.

The Ludwig is the company's principal mine, so far as current operations are concerned. It is operated through an 800-ft. shaft, sunk at an inclination of 50°. It has two compartments, in which two 2-ton skips are operated by a Wellman-Seaver-Morgan double-drawn electric hoist. The position of the shaft corresponds to the dip of the contact vein in which the copper ore occurs. Development and production

The principal vein is at the contact of granodiorite and limestone, the vein material being limonite, hematite and silica. The one, from the surface to the 600 level, consists of oxides and carbonates of copper, with some silicate of copper. There occurs here the red and black oxides, and secondary chalcocite. Water was found at a depth of 600 ft. on the incline, and the one between the 600 and 800 consists of chalcopryrite, and a secondary chalcocite. The ore body on the 800 level has a width of 200 ft. and a length of 700 ft., striking north and south. At this depth the vein walls are clearly defined. The company is now mining and hoisting 150 tons of ore per day, working

two shifts. About 50 tons of this runs 14% copper, being carbonates and oxides, and is shipped to Utah smelters; the other 100 tons of the daily production, consisting of carbonates, oxides and sulphides, carries 5% to 5½% copper, and is taken to the mill in steel side-dump cars. All ore carrying 7% copper or lower is reserved for mill treatment. The data given above relate to the Ludwig mine.

Concerning the Douglas Hill, which adjoins the Ludwig on the south, there is much of interest. Since it was opened 8 to 10 years ago, 75,000 tons of oxide and carbonate ore, running 5 to 7% copper, has been shipped to smelters. Its ore bodies were opened by two tunnel levels, one of them 150 ft. and the other 400 ft. below the apex of the contact, the sulphide ore having been cut into by the lower level. It is estimated that 100,000 tons of ore has been exposed by existing workings. This part of the property is well situated for conveying ore to the mill by gravity. The Copper Casting mine, still farther south, has been developed through a 350-ft. vertical shaft. A big tonnage of 8% copper ore was mined and shipped some years ago. Ernest Warr, mine superintendent, states that not much timbering is necessary in Ludwig mine, because the shrinkage system is employed, whereby the stopes are filled and the ore drawn out through chutes below.

Crushing and Leaching.

The most important and most interesting phase of the Nevada Douglas operations is its copper extraction plant and the method employed. The crushing plant contains no unusual features. The crushing, screening and pulverizing, reducing the ore to minus 60 mesh, and delivering it to the fine ore bins, is a dry process. Through this stage of the operations the sulphides are kept separate from the carbonates and oxides. The ore from the mine is dumped from haulage cars into six bins of 200 tons capacity each, about one-fourth of their capacity being for sulphide ore and three-fourths for oxides, carbonates and mixed ores. The ore is drawn from the bins through feeders to a 175-ft. belt conveyor, which carries it upward at an angle of 40°, discharging it upon grizzlies, the oversize from which passing to a Blake crusher, and the undersize first to toothed and then to corrugated rolls. This product is elevated to a set of grizzlies, undersize of which is further reduced by intermediate rolls, the oversize being returned to the corrugated rolls. The product of intermediate crushing, reduced to ½-inch size, is passed to intermediate bins, and from them is fed to Sturtevant 60-mesh duplex rolls. This last roll product is run dry through Newago vibrating screens, the undersize going direct to the fine ore bins; the oversize is returned to rolls and thence to a tube mill, the product of the latter going to the fine ore bins.

The metallurgical process by which the fine ore is now treated is best described by George C. Westby, chemist and metallurgist for the company, who furnishes the writer the following:

"The fine ore leaves the crushing plant in two streams. The sulphide ore is conveyed to the Wedge roasters, and the oxidized ore is discharged directly to the fume absorption tanks. The sulphide ore, consisting of about one-fourth of the total ore treated, is given a sulphatizing roast, which oxidizes the iron and copper minerals and develops large volumes of sulphurous acid smoke. The calcined material is sluiced to the absorption tanks and the acid smoke is, by means of an acid fan, driven into the absorption tanks; thus, again being brought into contact with material from which it was developed. At the same time, dry oxidized ore is discharged from the fine ore bin directly into the absorption tank, bringing about a mixture of sulphurous smoke, calcine, fine oxidized ore and water, or barren liquors.

"The absorption tanks, in which the mixture occurs, consist of a series of tanks through which the pulp and smoke pass in opposite directions, the pulp passing progressively to the discharge from the highest tank to the lowest in the series. The interior of the tanks contains a lattice work of slats, which is designed to form a large contact surface over which the pulp is caused to spread in films. The pulp is maintained directly in the path of the acid gases by means of four large sand pumps, which draw the fallen material from the bottom of the tanks, and again return it to distributing devices at the tops of the tanks. A fractional portion is caused to flow continuously from each tank to that next below it. The contact of hot acid gases with the pulp causes rapid action on the soluble constituents of the ore. The discharge from the lowest absorption tank is conveyed to the washing and clarifying system. The material treated in this part of the process consists of fines ground to minus 60 mesh. In order to completely utilize the last traces of the gas, the impoverished gases are passed into sulphurizing towers in which complete neutralization is effected."

The rich solution is passed through a Trent filtration tank, and the copper is precipitated on scrap iron, recovering 75 to 80%. The intention is to install electrolytic cells for depositing out the copper electrolytically, thus dispensing with the old precipitation method. Additional equipment is being put in by which the plant capacity may be brought up to 250 tons per day. W. C. Orem, Salt Lake City, is general manager; A. J. Orem, being in direct charge and as general superintendent.

Tennessee Co. Improvements.—The Tennessee Coal, Iron & Railroad Company announces plans for several improvements. One is the installation of an electric furnace at Ensley for pre-heating ferromanganese and another is the doubling of the blowing capacity for the Bessemer end of the duplexing plant at Ensley by the installation of a spare engine. Further items on the program are the building of employees' bathhouses and school buildings at a number of the company's operations.

Ore Sampling Conditions in the West

By T. R. WOODBRIDGE.*

(Continued from page 185)

The investigation has been limited to the sampling of the ores of gold, silver, lead, copper and zinc. The sampling plants visited were in Colorado, Utah, Montana, Washington, Nevada and California. In all 48 mills, of 23 companies, were examined. At each plant a study of the equipment and practice was made and a flow sheet was prepared. In every instance except one the heartiest co-operation was shown and every assistance rendered for a thorough understanding of the plant and practice. A lively and most gratifying interest in the purpose of the investigation was shown and a large proportion of the men interviewed expressed a desire that some way might be found of eliminating inaccuracies and uncertainties. In almost every plant some idea that was the result of local experience, or experiment had been applied that would be of value to ore sampling practice as a whole, should the information be generally disseminated. On the other hand, in many of the mills were found one or more practices that elsewhere had been laboriously proven to be incorrect. Such information should also become a matter of general knowledge.

The very nature of the business of ore sampling is such that it can have no trade secrets. Costs can be and are guarded as a matter of business policy, but no concern can long exist in the ore-sampling business if the methods it employs are at all mysterious. Therefore much is to be gained by a full comparison of methods and the results of experimental work; it is a matter for each individual in the business to decide to what extent he wishes to co-operate. In accordance, it was agreed not to publish names or information that would serve to identify plants visited during the investigation, and in the discussion that follows the intent is to keep within the spirit of this understanding.

The flow sheets are intended to show the path of the ore from the car or receiving bin to the final sample sent to the assayer. Each flow sheet does not necessarily represent a separate sampling concern. One plant, for instance, has three distinct methods of obtaining what may be termed the first sample, but adopts a single method, that of coning and quartering, for the final reduction; hence the work of this plant is represented by four separate flow sheets. The method employed seemed to be the only feasible one for properly classifying the various systems.

In the practice of ore sampling there are many variations in the application of general theories, and in the construction and manipulation of the machines. In most of the plants visited these variations are clearly in the line of progress and tend to produce better and more dependable results, but in some plants these

variations are distinctly retrograde and lead to inaccuracies. A disinterested observer is more or less in doubt as to whether the plant he visits is attempting, if the plant treats its own ore, to show an apparently better extraction of metals, or, if it buys ores, to assure a safer margin for the ore-purchasing department.

In a number of plants the laws controlling the separation of the finer from the coarser particles seem to be well understood and their application well worked out, but in other plants these vital points are apparently not clearly understood. Long-used methods are continued, because it seems wise not to disturb conditions heretofore satisfactory from the operator's point of view, because of an unwillingness to acknowledge that a new method can be as good or as reliable as an older one, or because of the lack of dependable information on the general principles of sampling. In confirmation of the reasons given for the existence of these variations, it was noted that, although a number of them worked to the buyer's advantage, there were several instances where they were decidedly to his disadvantage.

In presenting the flow sheets and describing methods the author has attempted to show some of the good points as well as some of their inherent or special weaknesses. Some deductions as to the effects of certain practices on the accuracy of the various sampling methods employed are made and ways of obviating or mitigating these effects are suggested.

Even after an approved sampling system using accurately built machines has been installed and proper rules and regulations have been established, there still remains one disturbing factor—the personal equation of the workmen. Advantage is taken of certain of the conditions of sampling that may result in hardship to one or the other of the interested parties, whether through the instant of the workman to protect the interest of the buyer, his employer, or through the ore watcher, who represents the seller, not being inclined to call attention to any operation which would cause an excessive valuation; or through enjoyment of a shrewd bargain causing either party to take undue advantage where possible.

To impress the workman with the fact that perfect fairness to both buyer and seller is the important feature of the work is one of the most difficult problems. It does not belong to mechanics, nor is it entirely moral, but possibly would come under the heading of "psychology of ore sampling."

It is not the intention or desire of the author to place blame for this condition on any particular buyer or seller of ore, company, superintendent, or group of workmen; neither does he claim that such practices are confined to any particular locality or that erroneous

*Bureau of Mines. Excerpt from advance proofs, Technical Paper 86.

results are intentionally obtained at any particular plant. Decision regarding these matters must necessarily be left to the judgment of the individual in his relation with the plant. However, it is thought proper to discuss the effects of certain practices, whether intentional or accidental, on the accuracy of sampling, in the hope that a clearer understanding of them may work to the mutual advantage of both the buyer and seller of ores.

The Weighing of Loaded Ore.

Ore is generally weighed on railway platform scales, which vary in capacity from 60 to 100 tons. The scales are either placed under cover or in the open, and may be near the unloading plant or as much as half a mile from it. In the past 10 years the practice of weighing has improved greatly. In many districts the scales are tested at frequent though irregular intervals by the Western Weighing Association. These tests are made by the use of cars built especially for this service, and have resulted in general satisfaction. Where these cars are not available, it is necessary to use the 50-lb. test weights, of which every plant has 20 to 40. This system is far from satisfactory, for an undetected difference of 20 lbs. in a 2000-lb. weight would result in a 2000-lb. error in weighing 200,000 lbs.

It is the general practice to cover the space between the coping and the scale platform with a piece of old belting to prevent accidental jamming of the platform with pieces of rock. However, this practice is by no means universal, for some operators assert that the belting does not exclude the rock and prevents the constant inspection necessary to insure the free movement of the platform.

In most of the plants visited the weighing is carefully done, but a very bad practice noted in some instances is undue haste. Hasty weighing means that the weights and the rider must be rapidly shifted. In weighing the loaded car, the rider may be thrown far to the overweight position and then rapidly shifted back to a position of balance, the reading being taken as the indicator passes the center on the way up. This will cause the scales, especially if they are sluggish, to register too low a weight. If the tare weight be taken by first throwing the rider to an underweight position, the total difference may be seriously below the correct weight. If the practice is reversed, the net weight will be correspondingly too great.

A practice that has been ordered discontinued by the Western Weighing Association is that of weighing a slowly moving train of cars while coupled together. As the scales must be balanced and read quickly, frequently with the scale beam oscillating rapidly, the possibilities of error due to this practice are apparent. With scales that are too short for some of the longer cars it is customary to weigh separately the load on each set of trucks.

Everything connected with the scales should be kept

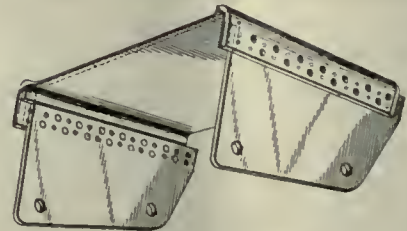
as free from dust as possible. At many plants the scale beam is situated in a closed room, far from the disturbing effects of the mill vibration, but unfortunately this practice is not universal. An old plan, which possibly is nowhere in use, was to keep on the rider several ounces of fine ore that was added to or taken from in balancing the scales. An error of several thousand pounds can be caused in the indicated weight of a carload of ore by this system. The weight of the rider is absolutely fixed at the factory and usually a seal is placed where the adjusting material is added or removed. This rider should be kept free from dust or dirt.

When ore is delivered to the plant by wagon, the roadway for a short distance at each end of the scale platform should be level. When the loaded or unloaded wagon is weighed the wagon brakes should be loose and the harness tugs slack. Several hundred pounds may be added to the net weighing by the horses straining in their collars when the loaded wagon is being weighed, or backing into the breeching when the empty wagon is being weighed. The driver and his assistant should occupy the same position during the weighing of the empty wagon as in the weighing of the loaded wagon.

(TO BE CONTINUED.)

Hoisting Bucket Compensates for Wear.

The cutting edges of shell-bottom hoisting buckets wear away rapidly, permitting leakage of the material between them. When the shells are in one piece, the whole bucket must be discarded when the edges are worn out. To obviate this difficulty, Carl Jacobson of Hamburg, N. Y., has designed a bucket with the



A NEW SHELL BUCKET.

bottom plates adjustable longitudinally, and his idea has been patented (No. 1,187,626).

The illustration shows one shell of the bucket. It is seen that the side walls are fastened to the bottom plate by means of a double set of rivets. When the cutting edge becomes worn, the rivets are removed and the side walls set back a short distance as shown, and then fastened by riveting through the second set of holes. The projecting edge of the bottom plate is then trimmed off flush with the side walls and the shell is as good as new.

Mining Possibilities in Colombia, S. A.—V

By MATT. W. ALDERSON.

In testing a placer property in Colombia I drilled 96 holes in 91 working days. The number of feet drilled was 2372, an average per day of 26. The deepest hole was 93 ft., and the average of all 24.8 ft. The total cost for labor and material was \$973.40, or a trifle more than 41 cts. a foot. Results speak more emphatically than anything else, and nothing I can say could be more complimentary to the native workman than the above figures.

I had in my employ in this work from 8 to as high as 16 men. Very few of these men were ever tardy. Several never missed a day. One who lived $3\frac{1}{2}$ miles away missed one day—when he stayed at home to pay his road tax. He left home at 4 o'clock every morning and got home at 7 every night.

The machine I used was not new. It had been shipped in 6 years before, used a few days and then left out in the weather. When the pipe was pulled out of the last hole it was pulled up bodily instead of being disconnected at the joints, so most of it was in too long lengths. It was impossible to disconnect the lengths without first heating in the fire and hammering. A native blacksmith did this for me and re-tempered the connections.

When I hear anyone speak in anything but complimentary terms of the laboring class in Colombia I am forced to the conclusion that he simply does not know how to manage men.

The man who contemplates placer mining in Colombia must expect to use native labor and he must know his ground. If he believes in the old theory that the gold in his deposit came from the milling down of quartz deposits higher up, and that he will be able to follow the gold up to this source, he will some day be most woefully undeceived. If he thinks when he once has bedrock all he has to do is to continue up stream and the bedrock will still be with him, he may be subjected to a very great surprise. The bedrock may drop out of sight; in other words, be 50 or even 100 ft. beneath the level on which he is working. Instead of going up or down stream, the deposit may go up hill on one side of the stream channel, and deep down under it, and be entirely disconnected from other deposits up or down the river. Ideas based on observations of channel deposits in some gulches in the western part of the United States will be revolutionized with experiences here. The old theories do not fit, and cannot be made to fit in any practical way, or by any possible stretch of the imagination.

When I was in Colombia a party was fitted out to explore a large tract of land where it was believed there was still unworked placer ground of value. The party went prepared to sink holes and pump wa-

ter with native pumps made of bamboo. Failure to get results that would be at all reliable or thorough could be foretold of such an expedition before it started. It wouldn't be possible for the present party to get to as low a depth as the natives could have reached, for the natives would have first pulled the stream flowing through the ground down to its lowest drainage level, which these people would not. If they found anything of value it would be by accidentally stumbling onto a piece of pay ground that the natives had overlooked, and they haven't overlooked very much.

There is only one way to test the placer ground of Colombia, or any other part of the world, and that is with a drill. In this way only can one be sure of being able to get to bedrock under water, whatever its depth may be, and it is under water only where he will be sure of finding pay. There is a drill made especially for this work. It does it to perfection. And when work is to be done, why not do it thoroughly, in the manner that its importance deserves?

Drilling holes in ordinary gravel is a very simple proposition; more trouble is experienced where the wash is compact and heavy, but it is here where the gold content is likely to be greater. In ordinary gravel the shoe at the foot of the drill tube is practically self-sharpening. Occasionally gravel will be found that is almost entirely pure quartz. In drilling gravel of this character the shoe wears off very rapidly on the outside, and thus becomes practically unfit for doing good work. The shoe must be put into the forge and the cutting edge turned out, or it may be sharpened to be as good as when new by cutting off the worn edge and cutting out places between the teeth with a cold chisel. Skill is required, of course, to properly retemper the shoe.

I found the greatest difficulty in drilling through sand. This I obviated to some extent by having everything in such shape that it would stand severe strain, then putting in two sweeps 20 ft. in length each, and several men on the end of each sweep. Even then I have pulled out of holes without having touched bedrock because I was afraid of putting more strain on the machine than it would stand.

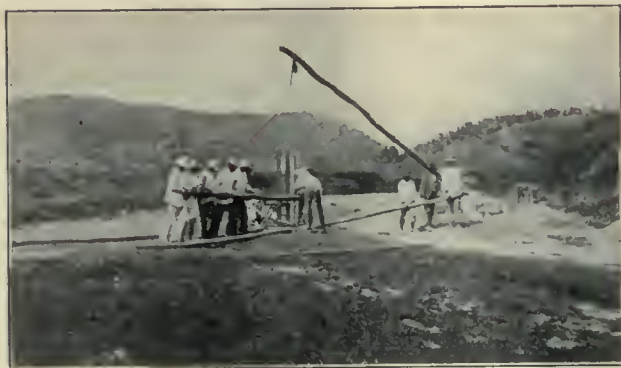
A very compact, reddish or yellowish clay is very bothersome in some cases, particularly where the shoe is rounded on the outside edge. The reason for this is that the shoe cuts a smaller hole than the size of the pipe, and the pipe must force its way by making the hole larger. One drill man told me he had never been able to penetrate more than 6 ft. into clay of this character. Drilling this clay caused me much trouble, no matter what I attempted, until I



DRILLING A DEEP HOLE WITH A SPRING POLE.



NATIVES WASHING GOLD IN BATEAS.



UNSCREWING TUBE WITH CHAIN WRENCHES.



NATIVES CARRYING GRAVEL TO WASH.



METHOD USED IN DRIVING THE TUBE.



A SKILLED WORKER WITH BATEA.

had the shoe sharpened with the teeth pointed out so the shoe would cut a hole a quarter of an inch wider than the pipe. Then there was no more trouble, except that of pumping. Where the clay would work up in the water, progress could be made with little bother; but where it was so tough that it filled the pump with linked-sausage-like chunks we oftentimes concluded it best to stop.

To make any kind of progress, it is necessary at times to drive the pipe. The illustration shows clearly the best contrivance yet evolved for this purpose. It consists of a piece of hard wood $3\frac{1}{2}$ ft. in length with a strong iron band around the bottom. A piece of $\frac{3}{4}$ -in. gas pipe goes through it at 14 ins. from the bottom, and another piece sticks out from the top. The men on the platform use this driver easily and effectively.

Where it is necessary to drill deeper than 30 or 40 ft. the work on the men becomes so severe that poor progress will be made unless one has a drill especially fitted for deep work. I did not have, so rigged up a spring pole, as will be observed in accompanying illustrations, and had no difficulty in making borings as deep as it was necessary for me to go—75 to 93 ft.

Improvement in Crushing Machines.

A crushing roll which will not clog is described in a patent (1,187,549) granted to Axel G. J. Rapp of Chicago, Ill., and assigned by him to the Link Belt Co. It is designed for comparatively soft materials, such as coal, being of the concave-plate, rotating-roll type, the latter being provided with crushing lugs and pointed, removable teeth as shown in Fig. 1. These facilitate the passage of the material through the roll when operating in conjunction with the peculiarly formed concave plate shown in Fig. 2.

The cutters or teeth and the method of mounting them in the removable jackets on the face of the roll are shown in Fig. 3. They are provided with serrated sides, and by means of the unique wedging arrangement are made adjustable to wear and grinding.

The concave Fig. 2 is made up of a series of separate, irregularly curved surfaces. These are tilted, and the bounding lines converge as indicated so that they tend to feed or discharge the material centrally from both sides toward parallel lines. The arrangement of the device is such that these parallel lines toward which the material is fed are the lines along which the teeth are located. The result is that the objects or particles fed into the machine, as they pass down toward the crushing point, are fed across the concaves toward the lines of action of the grabbing or feeding teeth.

The long feeding teeth catch this material and draw it down into the gradually decreasing space between the concave and roll so that it may be crushed and broken by the small knobs on the roll (Fig. 1). But

experience shows that when the concave is flat or truly cylindrical it is possible for pieces of material to lock themselves between the separate feeding teeth and stay there bouncing about without being positively caught by one of the teeth. The shape of this con-

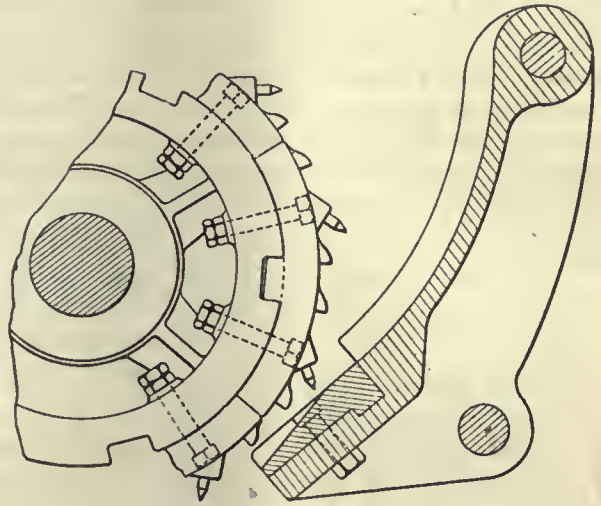


FIG. 1.

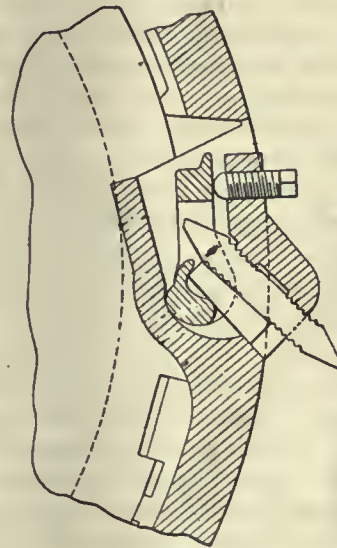


FIG. 2.

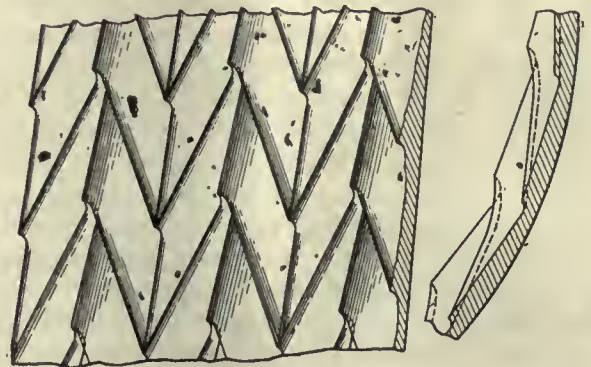


FIG. 3.

cave, however, is such that it cannot happen. The material resting on the high points must of necessity pass down to one side or the other into the channel or groove and there be caught by the feeding tube.

Air and Temperature in Deep Mining

The deepest mine works in any part of the world are in Brazil. One of the mines of the St. John del Rey Mining Co., Ltd., has reached the vertical depth of 5826 ft., and since the vein shows no sign of losing its size or value the company is considering means of continuing to a vertical depth of 7626 ft. The question seems to be one of temperature and air supply. Supt. G. Chalmers, in his report of the Morro Velho mine, discusses ventilation of the workings at these depths.

The system of distribution of the air is becoming, as greater depth is attained, defective, and requires modification. On rare occasions the downcast air at the bottom of the mine is comparatively low in moisture, by the time it has passed over two horizons. Consequently the efficiency of the men on the stopes above is considerably impaired; in fact, 86° wet bulb (which represents the conditions of, say, horizon 16, at any rate during the rainy season) is supposed to be the limit at which men can work with full efficiency, and as the mine deepens this will, of course, be more seriously felt. But by largely increasing the volume of air passing through the deepest explorations, and by leading the allotted quantity (after it has passed over the stopes of one horizon, or at the outside two) directly to the upcast and away to the surface, instead of passing it over the stopes above as in the old and existing system, the best possible conditions will be obtained.

Due to the fact of our now being in a much better position as regards the mainway into depth, namely, of its being in advance of the explorations, Captain Watts has proved that it is possible to work each block by one vertical winze only, and our calculations show that this one winze and a steel pipe of 3 to 4 ft. in diameter will, with the eastern paved airway, give ample ventilation to the stopes during the working out of a block of mineral. Consequently, one winze for mineral and filling to act as a temporary upcast, which during the working out of each block disappears as the mineral is removed, is sufficient for the mining operations, and by sinking another vertical winze from one horizon to the other, never less than 50 ft. from the average line of the north wall of the lode, and some connecting tunneling, a permanent return airway will be formed at a cost no greater than that of the old system of working out each block with two vertical winzes and a western wood-block airway and the eastern paved airway, as the large saving in the temporary western airway in the form of a 3 to 4 ft. steel pipe over the wood-block airway formerly used is more than sufficient to pay for the tunneling between the top of one permanent upcast winze and the bottom of the next, and that connecting the temporary winze with the permanent. There is another advan-

tage in this system—namely, that when it is completely established we have a second permanent way into depth from horizon 17 down.

It was difficult to determine the point at which the improved system should commence, but for various reasons No. 23 winze offers the best opportunity for an independent upcast airway, and consequently it has been decided that the new system should commence from this point.

The benefit of the proposed alteration in the ventilating system will not be felt on the blocks of mineral to be worked out from horizon 17 up, but from 17 down. Those of us who have been responsible for the reopening of this mine from surface to its present depth of 5826 ft. have had the opportunity of realizing the steady rise in temperature as the depth has increased and have been frequently reminded of the difficulties in store for us, especially at such times when an inadequate volume of ventilating air had been passing over the stopes or through explorations, caused by the partial closing of airways, the failure of fans, or by the explorations progressing more rapidly into depth than the main ventilating system. However, for many years it was possible to keep down to a reasonable figure the temperature to which the miners were subjected, and it appeared that by increasing the volume this condition could be maintained.

In the first place, natural ventilation was sufficient, later, furnaces had to be adopted during the hot season to assist the natural ventilation. As the mine became still deeper a Capel fan was installed at the top of the upcast "C" shaft to ensure a more constant volume of air. Finally, a Sirocco fan of large capacity was installed in place of the former, the output of which could be increased by additional power when required. Besides this, auxiliary fans are used on all explorations beyond the main system.

The existing ventilating system, which is referred to above as not satisfactory at the present depth, was forced upon us at a time when a more elaborate one of an entire independent airway from surface down, which naturally recommended itself, would have been too expensive. The former represented the cheapest means of ventilation, and until quite recently met the case satisfactorily. As depth has been attained the necessity for modification in the distribution of the air becomes imperative. The lode has so far shown no signs of failure in size or value in the lowest explorations. The prospects of this company being able to work it profitably to a great depth seem only to be limited by cost of winding, hauling, handling, mineral, and other engineering matters.

It was decided some years back to institute investigations with the object of obtaining information as to the increasing air and rock temperatures and add

to cost the deeper the mine is sunk. Bore holes were made, and the temperatures taken.

From the temperature readings we were able to construct a rock temperature grade as a guide to what we might expect in depth.

As before stated, without this rise in temperature from the rock and other causes, the probable running engineering expenses in working the mine down would not mean a very serious increase, and this has proved itself in practice as far as we have gone. Supposing the lode continues the same in size and value to horizon 20 (a vertical depth of 7626 ft.) it could be worked profitably to that point and even to a much greater depth, but from the grade on our temperature chart the rock at horizon 26 would be no less than 126.5° F. at the moment of opening.

We have, of late, realized from practice that the best we can now expect in the absence of artificial cooling would be a point where the efficiency of the men would be affected.

The temperature of the rock that had been laid open and exposed to the ventilation for some time year by year fell to some extent, but the deeper we went the cooling effect of the ventilating air would become less efficient, as we were year by year largely increasing the rock area; but beyond certain reasonable limits we could not increase the volume of the air, and consequently, unless the air could be artificially cooled on surface, advantage being taken of the operation to deprive it of some of its moisture, the possibility of working the mine to horizon 26 would be small, unless the working hours were reduced by the introduction of four shifts in the place of three. It was decided to make further efforts in obtaining more reliable information as regards this important question so as to arrive at the most economical and efficient means of reducing both the temperature and moisture of the atmosphere within the mine.

The increase of air temperature, due to the air becoming more dense as it passes down the mine, showed under normal conditions an increase in rock temperature of approximately 1° F. for every 180 ft., while the increase in rock temperature is approximately 1° F. for every 125 ft.

During the cold season an experiment was tried by night, when the temperature was considerably below the normal, in which a known volume of air was passed through a measured distance of the adit tunnel into the mine, the rock temperatures being taken throughout the distance of the tunnel and period of trial, and at the end of 5 hours it was interesting to find that a considerable fall in the rock temperature had taken place, and it would no doubt have continued to do so to some extent had it been possible to maintain a supply of cool air, but as the sun rose the air became warmer and the rock rose again to its original temperature.

The drying of the air has always been considered necessary in conjunction with the cooling operation, but its importance was not so fully understood until

information was gained from a valuable paper by Prof. John Cadman. Unfortunately, the drying of the atmosphere is somewhat antagonistic to a satisfactory solution of the dust question, which necessitates watering of the roads and stopes to keep down the dust. However, the proposed distribution of the air, previously referred to, will apparently do far more to overcome the dust trouble than the drying of the air will make against our efforts in this respect, as the allotted quantity of air, after passing one stope or at the outside two, will go directly with what dust it has taken up, to the upcast and away to surface, instead of the present system, in which the same air passes the bottom stopes, thence over the remaining stopes, with some slight addition of fresh air at each horizon, but accumulating dust all the way, until it finally reaches the highest stope, and thence goes to surface.

The actual necessities as regards cooling and drying to ensure that as greater depth was attained the miners would work in a perfectly healthy atmosphere (even more so than in the upper sections) having been appreciated, the next point to determine was where the operation of cooling and drying should take place. Some advice had been offered to the effect that it would be most advantageous underground, and it is true that some benefit would be derived from this; but the increase in mechanical appliances underground represents a serious obstacle to our particular form of mining operations, and, further, on account of our principal cooling agent (water) being found on surface in abundance, while underground there is very little, and that at a high temperature it has been decided that the cooling plant should undoubtedly be installed on surface.

Eric Davies, whose duty it has been to carry out the investigations, has also been entrusted with the designing of a plant which we consider most suitable for the purpose, and careful study has led to the proposing of this plant, not for extreme cooling or drying of the air, but one in which each operation will be performed to the most economical point, at the same time making use of ordinary cooling appliances which in practice have long since proved their reliability in cold storage, dry blast for furnace and other installations, and in consequence it represents a thoroughly practical scheme, which will effectually remove the one serious obstacle against the company being able to work the mine to a great depth. As regards the necessary power for driving the plant, this is not excessive, amounting to approximately 400 hp., and as to the provision of this power, with that of 200 hp. for ventilation, and other additions necessary for the working into depth, it has been satisfactorily arranged for.

The mine captain considers the efficiency of the miners is very little affected so far, and the writer is inclined to think that men who have been used to the damp, hot climate of Brazil for some years are probably more capable of working efficiently in 86° wet

bulb temperature than men in England accustomed to a damp, cold climate on surface. Often enough in the hot season here the change from surface to the bottom of the mine is only slight, but the change in England would, of course, be a far more severe trial. Even in the hottest places in the mine the contractors are eager to work 12 hours, and had it not been for our complying with this to some extent we should have lost our men. It is, however, evident that in spite of the apparent possibility that this climate is favorable to the efficiency of men working in hot mines, 8 hours is quite sufficient for steady workers at the present depth.

Anaconda's Many Improvements in Methods of Operation.

A summary of the many changes adopted in the methods of operation of the Anaconda Co. is embodied in a pamphlet recently published by Eugene Meyer & Co., New York. According to this pamphlet Anaconda is mining, reducing and marketing today at the rate of 330,000,000 lbs. of copper annually—approximately one-fourth of the copper produced in the United States, and one-seventh of the copper produced in the whole world; in addition, it is refining and selling the mined product of other companies, in some of which it has part ownership to the extent of 240,000,000 lbs.; thus making a grand total of 570,000,000 lbs. of copper—more than one-third of all the copper product of the United States and nearly one-fourth of the total copper production of the world—which it treats and markets.

Anaconda, besides its copper, is producing annually 13,000,000 ozs. of silver, 150,000 ozs. of gold; is smelting and refining at its custom plants an additional 4,000,000 ozs. of silver and 100,000,000 lbs. of lead; it will, within a few months, be producing at the rate of 70,000,000 lbs. per annum of high-profit zinc.

By end of 1916 Anaconda will be using 126,000 h.p. or 700,000,000 kilowatt hours annually.

Electrification has meant a saving of from \$3,500,000 to \$4,000,000 annually.

Prior to 1915 Anaconda found it impracticable to separate more than 82% of the copper in the ore. With slime flotation machines installed, the recovery of copper in concentrates has been increased to 96%.

The leaching plant in which tailings are treated has a capacity of more than 2000 tons per day and recovers about 85% of the metal content of the tailings. Its annual recovery amounts to 7,000,000 lbs. of copper at a cost of 8½ cts. per pound.

As the old tailing piles contain more than 20,000,000 tons, there is enough of this material available to enable the leaching plant to continue production at the present rate for nearly 30 years. These tailing piles are capable of being converted into 200,000,000 lbs. of copper.

Anaconda's new processes, summed up, have brought about a net recovery of more than 90% of the available metals in the ores as against a recovery of only 77% a year ago—without a penny of extra expense.

Not only have they made possible the recovery of this high percentage from the ores which are now being mined and which are to be mined; they have made possible, in addition, the recovery of the 13%—formerly considered impossible to extract—from practically all the ores which Anaconda has mined since the beginning.

They have made present reduction methods 17% more efficient; and have made available more than 230,000,000 lbs. of copper which under the old processes were thrown away.

By a new process made possible by cheap electric power and cheap sulphuric acid, Anaconda's metallurgists have found a way not only to extract high percentages of zinc economically, but also to recover the gold and silver values which occur in the zinc ores and either the lead or copper—whichever may prove more profitable.

It is a conservative assumption that Anaconda will in the near future, with normal prices of zinc, be able to earn a profit of 2 cts. per pound on its 70,000,000-lb. output—an annual net earning of \$1,400,000 from this new source.

These earnings should be in full effect in the year 1917, and there is an excellent outlook for much larger profits than this as the rate of operations increase.

All told, Anaconda will enjoy, under normal metal prices, an income from its security holdings of more than \$6,250,000 per annum.

Allowing for a probable decrease of production at Anaconda after the war, it appears reasonable to estimate about as follows:

Earnings in Montana—	
300,000,000 lbs. copper annually at cost of 9 cts. per lb., copper at 14 cts.....	\$15,000,000
70,000,000 lbs. of zinc annually at a cost of 3½ cts. per lb., zinc at 5½ cts.....	1,400,000
	\$16,400,000
Other income—	
Return from security holdings.....	\$ 6,250,000
Total	\$22,650,000
Per share	9.72

The company should within the next few years begin to realize on its investment in Chile. It is fair to assume a production of 100,000,000 to 150,000,000 lbs. of copper annually at a profit around 5 cts. per pound under normal metal prices. Anaconda owns 75% of the operating company in control of the Chilean deposits. They should return an amount equivalent to at least \$2 per share per annum on Anaconda's stock. The period when this return will commence is several years distant.

Excess of current assets over current liabilities on Dec. 31, 1915, was \$20,106,910. It is probable that the market value of copper and lead on hand at that date was around \$17,000,000 above the figures at which they were carried.

Spelter: Its Grades and Uses

By G. S. STONE.*

Spelter, like all commercial metal, contains impurities, but, unlike most other metals, none of these impurities are advantageous for any of the purposes for which it is used. The effects of these impurities on different products made from it vary greatly, hence the necessity for several grades differing in purity. Spelter is used for the following purposes, in quantities in the order mentioned: galvanizing, alloys, rolling, ornamental castings and miscellaneous uses.

For ordinary galvanizing the effects of the common impurities is not very great. Iron is objectionable as causing a loss in dross and in making the coating more brittle and liable to crack and peel off. Lead, up to the limit found in commercial spelter, has no serious effect, but is objectionable when present in large quantity, as it liquates in the bath and does not enter the coating and is, therefore, wasted. Lead is usually worth less than zinc and the purchaser does not wish to pay for it at zinc prices.

The four higher grades of spelter chiefly used for alloys and the specifications were principally made for the alloy makers and do not, in all cases, call for metal suitable for some of the other purposes for which it is used.

Aluminum.

In alloys, aluminum is frequently very injurious, 0.01 per cent in many cases making brass useless for the purposes for which it is intended. In the few instances where its presence is desired, it is more satisfactory to add it directly than as a constituent of the spelter. The specifications (as proposed for the American Society for Testing Materials in 1915), therefore, require that the four higher grades of spelter shall be entirely free from aluminum.

Iron.

Iron is always present in spelter, but is very undesirable in brass and similar alloys, making them harder and greatly increasing the hardness due to cold working. The increased hardness is very objectionable, causing a greater consumption of power and endangering the rolling mills and drawing presses.

Lead.

Lead is very objectionable in some alloys and essential in others, and the main variation in the different grades of spelter is in the allowable amount of lead. High-grade spelter, which is used for alloys that are to be subjected to the most severe spinning and drawing operations, can be rejected if it contains over 0.07% of lead, as lead reduces the ductility of brass.

Intermediate spelter, with a lead limit of 0.20% is used for alloys that do not have to undergo as severe treatment, and also very largely for alloys like manganese bronze that are used both cast and wrought.

Brass special has a lead limit of 0.60%, and is mainly used for brasses where the maximum ductility is not required. The lead and iron are limited to 0.60% and 0.03%, respectively, because brass made from such spelter is used for ordinary drawing, spinning and forming work where the requirements are not especially severe.

Selected spelter carrying the maximum 0.80% of lead and 0.04% iron is used by brass manufacturers for making alloys to which lead is added in order to secure free cutting qualities. Material of this kind is usually made into rods and heavy sheets for the manufacturing of small articles by turning, milling and drilling operations. Such brass must contain sufficient lead to reduce the strength of the material and cause the chips to break easily.

Owing to the fact that brass is usually made in crucibles in small quantities, uniformity in the spelter is of the greatest importance. As lead segregates badly, and more markedly the higher the proportion, the lead limit of the average sample is made low enough to allow for this tendency without injurious effect on the product. Even when the brass manufacturer adds lead, he does so in known amounts and thus obtains a uniform alloy from the different pots, which would not be possible if all the lead needed were contained in the spelter.

Cadmium.

There is very little doubt that cadmium in zinc is very injurious for some of the purposes for which it is used, as it renders it harder and much more brittle. There is, however, considerable difference of opinion as to how far these undesirable properties persist in alloys made from zinc containing cadmium. The majority of the brass makers are of the opinion that the high temperature of the brass pots cause so much of the cadmium to volatilize that the residual amount has very little deleterious effect.

There is no doubt that large amounts of cadmium, say 1 or 2%, make brass hard and brittle. We have no reliable information at present showing the effect of small amounts of cadmium on the alloys, and the evidence on this point is extremely conflicting.

Cadmium, together with lead, seems to intensify the effect of the latter and also causes the brass to become more sensitive to the effect of overheating in the various annealing operations to which the wrought material is subjected.

Very little spelter is made containing as much cadmium as is allowed for intermediate and brass special

*A portion of the report of the Committee on Non-Ferrous Metals and Alloys, American Society for Testing Materials, Atlantic City, N. J.

and the specifications, therefore, put practically no limit on cadmium except for high grade. Whatever the facts may be for alloys, it is certain that the amounts of cadmium allowed by the specifications are much greater than are permissible for other purposes for which zinc is used. The question of cadmium in the better grades is complicated by the fact that until the last year and a half practically all the high-grade and most of the intermediate spelter was made by one company from ores that are free from cadmium. The alloy makers have, therefore, had no extended experience with the effect of cadmium in the better grades of spelter, and during the last 18 months conditions have been so abnormal that it is difficult to draw conclusions.

High-grade spelter is very extensively used for galvanizing telegraph and telephone wires which are required to stand sharp bending when making the "line-man's splice"; as it has been found that if impure spelter is used, the coating cracks and peels off the joint. The only high-grade spelter that has been used for this purpose is entirely free from cadmium. Cadmium being the element most likely to cause this trouble, it is very doubtful whether metal containing as much as is allowed by the specifications (0.05%) would be suitable for this purpose.

For rolling, cadmium causes such severe cracking that metal containing much of it is not economical; but as practically all the zinc rolling mills produce their own spelter, this matter is within their own control and the specifications do not affect them.

For ornamental castings no spelter described by the specifications would be satisfactory. The high-grade is all right as far as lead and iron are concerned, but with the maximum cadmium allowed, it would be impossible to make castings of many of the common shapes.

Cracking Oil.

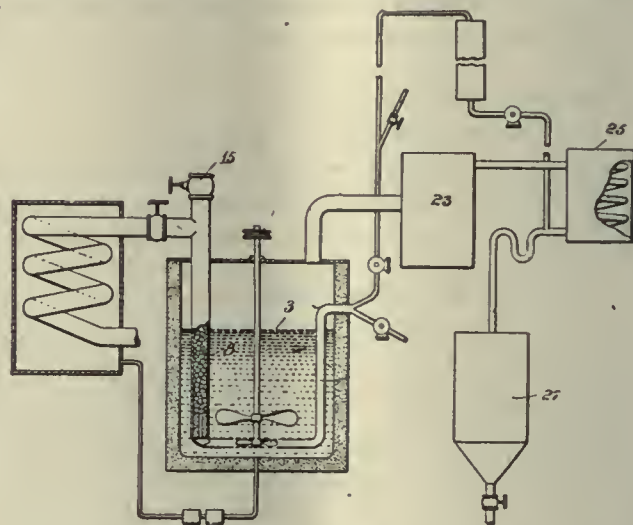
A new way of procuring gasoline from heavier oils has been patented by Alfred A. Wells of Montclair, N. J., and the patent (No. 1,187,874) assigned to the Ellis-Foster Co. Almost any type of petroleum oil may be treated in this apparatus, but kerosene or similar oil is preferably used, which may be fed into the apparatus without first vaporizing. The vaporization may be allowed to occur in the lower part of the apparatus but preferably the oil is not only vaporized, but is somewhat preheated to a point below the cracking point before it enters the metal bath. The temperature of the bath may be about 900 to 1000° F., but the temperature varies with the oil which is being treated.

In the decomposition which takes place in the latter, carbon is formed which floats to the surface and is either blown out of the apparatus or removed from the top of the bath. The particles carried over in the vapors are largely caught in a dust collector in which

the sulphide of lead is also collected when sulphur is present in the oil. The use of oils containing high percentages of sulphur is feasible with this apparatus as the sulphur is taken out quite effectively and the sulphide of lead may be collected and treated to recover the metal. Sulphur-containing Mexican or California oils may thus be used to advantage.

The oil or oil vapors are passed through a bath of molten metal which is maintained in agitation by mechanical stirrers, arranged so as to vigorously agitate the oil or vapors just on entry into the lead bath in order to prevent the formation of large particles of coke or coarse masses of tar and the like which cause difficulties in the operation of the apparatus.

The heating is applied internally by means of a burner, situated within the lead bath, of a character such that should the walls of the heating appliance give way, dangerous results would not occur. In the preferred form the heating appliance is of the surface combustion type and a mixture of oil vapors or gases



A NEW METHOD FOR CRACKING OIL.

resulting from the cracking operation or other suitable fuel is mixed with air and forced into a mass of refractory granular material contained in a tubular heating device situated in the metal bath. The waste gases from the cracking operation are used so that the whole apparatus operates as a unit and the residual gases which otherwise would be used more or less uneffectively or allowed to go to waste are employed usefully in the present process.

In the diagram, (3) is the lead bath, (8) the heating element, (15) is the outlet for the exhaust gases, which if desired may be by-passed through the heating coil as shown. The dust chamber and carbon collector is shown at (23). The condenser (25) has an outlet pipe at the bottom, through which the condensed material is carried to receiver (27).

The Yukon territory has a total area of 200,000 sq. miles. Of this, a district of less than 800 sq. miles has contributed to its gold production.

What the Mining Companies are Doing

U. S. Steel.

The United States Steel Corporation reports for the quarter ended June 30, 1916, showing total net earnings of \$81,126,048, after deducting all expenses incident to operation, including those for ordinary repairs and maintenance of plants and interest on bonds and fixed charges of subsidiary companies.

The statement for the quarter ended June 30 compares as follows:

	1916.	1915.	1914.
Net earnings	\$81,126,048	\$27,950,055	\$20,457,596
Sinking fund	9,745,826	6,031,013	5,646,170
Balance	71,380,222	21,919,042	14,811,426
U. S. Steel bonds	5,673,962	7,346,478	7,311,963
Balance	65,706,260	14,572,564	7,499,463
Preferred dividends	6,304,919	6,304,919	6,304,919
Balance	59,401,341	8,267,645	1,194,544
Common dividends	11,436,806		6,353,781
Surplus	47,964,555	8,267,645	*5,159,237
*Deficit.			

The United States Steel Corporation's income account for the 6 months ended June 30, compiled from the quarterly reports, compares as follows:

	1916.	1915.	1914.
Net earnings	\$141,539,672	\$40,407,864	\$38,451,977
Sinking fund	17,605,079	10,261,802	9,959,533
Balance	124,234,593	30,146,062	28,492,444
U. S. Steel bonds	13,015,461	14,658,440	14,623,926
Balance	111,219,132	15,487,622	13,868,519
Preferred dividends	12,609,838	12,609,828	12,609,838
Balance	98,609,294	2,877,784	1,258,681
Common dividends	17,790,587		12,707,562
Surplus	80,818,707	2,877,784	*11,448,881
*Deficit.			

After directors' meeting the following statement was issued: "Directors at meeting today authorized distribution of an extra dividend of 1% on the common stock. During the past quarter plants and properties of United States Steel were operated at maximum capacity. Both production and earnings exceeded those for any previous quarter. Its several subsidiary companies have many extensions and improvements under way calling for expenditure of a large sum of money. These improvements are mainly for purpose of diversifying products and increasing economic efficiency.

"Unfilled orders on hand at June 30, 1916, amounted to 9,640,458 tons, which will occupy the mills for several months. New business is coming in at a satisfactory rate, many contracts being entered for delivery of materials throughout 1917."

The preferred dividend is payable Aug. 30. Books close July 31, reopen Aug. 11. Common dividend is payable Sept. 29; books close Sept. 1, reopen Sept. 12.

Butte & Superior.

Butte & Superior's preliminary report for June on oil flotation plant compares as follows:

	Tons ore.	Costs per ton.	Zinc con- cen. tons.	Value per ton.
June	48,475	\$....	10,830	\$....
May	50,688	3.22	11,658	65.25
April	50,112	2.84	12,080	83.79
March	52,089	2.69	12,190	83.62
February	49,800	2.52	10,775	93.68
January	49,428	3.05	10,535	101.60
December, 1915	45,277	2.93	10,409	86.00
November	47,872	2.91	10,386	90.58
October	43,092	2.75	10,473	79.59
September	37,278	3.19	8,968	81.27
August	40,809	3.38	9,561	80.75
July	41,547	2.95	9,482	75.76

Utah Copper Co.

The present mill capacity of the Utah Copper Co. appears to have been reached with the recent performance of an 18,000,000-lb. production in a single month. Some late improvements at both mine and mill plants may, under favorable conditions, result in a small increase. Eventually capacity will be brought up to better than 20,000,000 lbs. monthly. This increased yield will be made gradually—possibly within

a year. An interesting feature of recent big production—when 44,000 tons of ore were handled in a day—is that the company will now build up a big bin capacity which will permit storing ores during summer months for treatment during the winter when weather conditions interrupt a large ore extraction. In this manner Utah Copper will overcome the big winter's handicap in ore shortage and to some extent relieve the situation by drawing on its ore reserves in the bins. By this method the company should be able to build up its average yield of copper so that there will not be so great a difference between the winter and summer months' production. The average yield by this plan should be at least 15,000,000 lbs. a month with present capacity of plants.

Calumet & Hecla, Mich.

The Calumet & Hecla Mining Co. is slowly but surely reducing the indebtedness incurred when it purchased the Bigelow holdings of Tamarack, Osceola, Isle Royale, etc. Since Jan. 1 the company has purchased \$1,000,000 of its 4% notes, which leaves but \$1,764,000 outstanding of an original issue of \$8,500,000. This is the only capital liability to represent Calumet's \$20,000,000 investment in subsidiary company shares. The present market value of the parent company holdings is about \$20,000,000, so that deducting the outstanding notes the equity is \$18,250,000, or \$182 per share on Calumet & Hecla's 100,000 shares.

The following table shows the present market value of Calumet's holdings in sub-company shares, quotations for which are available. This totals \$18,465,000, but the inclusion of White Pine, Seneca and others should easily bring the total up to \$20,000,000.

Company.	Shares owned.	Market price.	Value.
Ahmeek	98,043	95	\$ 9,414,560
Allouez	41,000	65	2,665,000
Centennial	41,500	15	622,500
Isle Royale	32,910	27	888,570
La Salle	152,977	3	458,931
Osceola	32,750	87	2,849,250
Superior	50,100	15	751,500
Tamarack	19,400	42	814,800
Total			\$18,465,111

St. Joseph Lead Co.

The condensed general balance sheet of the St. Joseph Lead Co. as of Dec. 31, 1915, follows:

Assets—	
Land	\$ 6,732,053.01
Building and equipment	3,980,013.06
Investments	8,641,496.74
Working and trading assets	413,951.17
Current assets	721,307.60
Due from affiliated companies	31,380.65
Deferred assets	318,294.23
Total	\$20,838,496.40
Liabilities—	
Capital stock	\$14,094,660.00
M. R. & B. T. Ry. loan due	2,359,769.16
Current liabilities	213,612.76
Due affiliated companies	559,918.36
Reserves	349,260.60
Surplus	3,261,275.58
Total	\$20,838,496.40

United States Smelting.

June earnings of the United States Smelting Co. were not far from \$700,000, bringing total net for the second quarter of the year to about \$3,100,000. This makes no allowance for income from the Mexican properties during June, though these were in partial operation and undoubtedly on the right side of the ledger. It has been impossible, however, to obtain late figures from across the border.

Other important considerations must be taken to correctly appraise the earnings. United States Smelting Co., in accordance with its custom, carries its unsold metals at far below market value. Copper, for instance, is carried at 13

cts., silver at 50 cts., and so on. In the present era of big production this factor of inventorying is all-important.

Net profits of \$3,100,000 for the second quarter after providing all interest charges for the \$12,000,000 notes, and after depreciation and exploration reserves, are equivalent to nearly \$8 a share for the common. Adding in profits for the first quarter, the showing for the half year is equivalent to \$14 a share for the common, which compares with but \$2 paid out in dividends. If it were not for the Mexican ructions, Smelting would have earned its common dividend nine or ten times over.

Kennecott Control of Braden.

The Kennecott Copper Corporation has acquired through exchange of stock nearly 99% of the outstanding capital of the Braden Copper Mines Co., or 2,564,164 out of 2,590,506 shares.

With the maintenance of production from its Alaskan mines at the rate of 10,500,000 lbs. of copper monthly, Kennecott will not have to depend upon Braden for assistance in meeting present dividend requirements.

Braden has been milling of late an average of 4500 tons of ore daily. By the first of next March the tonnage should be increased to 6500 tons.

Operating costs at Braden have increased heavily. Coke, which formerly cost about \$9 a ton to land in Chile, has risen to between \$25 and \$30 a ton. This has been due in part to higher water freight rates.

During the first three months of this year the average cost of producing copper was 9.67 cts. a pound. In the year ended Aug. 31, 1915, it cost the company an average of 9.18 cts. a pound. There has been a further increase in costs since March last.

Net earnings for the 3 months ended March 31 were \$1,900,000, while estimates place net for the June 30 quarter at somewhat better than \$2,000,000.

The Braden mill, while it has secured at times an 82% extraction, has not maintained this figure as an average. The estimates of Pope Yeatman, the company's consulting engineer, have been based on an 80% recovery.

International Nickel.

Profits of the International Nickel Co. for the June 30 quarter were \$3,305,574. At mid-year the company was in an extremely strong cash position, with over \$4,000,000 in the treasury, call loans exceeding \$1,000,000 and receivables of more than \$2,000,000. Accounts payable and preferred dividend declared but not payable until August totaled less than \$2,000,000.

The consolidated general profit and loss statement for the June 30 quarter follows:

Gross earnings	\$3,959,135
Other income	66,262
Total income	4,025,396
Administration and general expenses	222,422
Net income	3,802,974
Depreciation and mineral exhaustion	497,400
Profits	3,305,574
Preferred dividends	133,689
Surplus*	3,171,885

*Equal to 7.58% on the \$41,838,600 common stock for the quarter, or at the rate of 30.32% per year.

The balance sheet of the company as of June 30, 1916, is as follows:

Assets—	
Property	\$43,679,368
Investments	1,510,034
Inventories	4,649,941
Accounts and bills receivable	2,246,387
Loans on call	1,015,000
Certificates of deposit	2,030,000
Cash	4,137,633
Total	\$59,268,364
Liabilities—	
Preferred stock	\$ 8,912,600
Common stock	41,834,600
Accounts	1,728,187
Preferred dividend payable	133,689
Accident and insurance funds	193,208
Previous surplus	3,294,195
Profit and loss surplus	3,171,885
Total	\$59,268,364

Miscellaneous Company Notes.

Wolverine Copper Co. produced 493,378 lbs. of copper which compares with 495,437 lbs. in May.

Mohawk Mining Co. produced 1,103,793 lbs. of copper in June as compared with 983,413 lbs. in May and 1,048,081 in April.

It cost the Miami Copper Co. 8¾ cts. a pound to produce 4,696,260 lbs. of copper in June, or practically the same as in preceding month.

The June production of the Mass Con. Mining Co. was 452,700 lbs. of refined copper and net profits were \$66,199. In the previous month production was 492,248 lbs. refined copper and profits \$66,225.

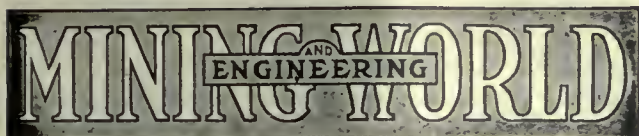
The Le Roi No. 2, Ltd., B. C., reports for May as follows: Josie mine—shipped 1515 tons ore; receipts from smelter, \$22,201, being payment for 1967 tons of ore shipped; umpires, \$1443; sundries, \$431; total, \$24,075. Estimated working cost—ore production—\$7800; capital expenditure, \$636; development including diamond drilling, \$3600; total \$4236.

In the 6 months ended June 1 Utah Metal & Tunnel Co. earned over \$600,000 net, or at the rate of nearly \$1 per share on the 677,000 shares outstanding. This was after unusually heavy expense for development. By July 1 the company should have close to \$1,300,000 cash and metals on hand. In the first 10 days of June the Bingham-New Haven property produced 1255 tons of milling ore, 105 tons of lead and 332 tons of copper smelting ore. Utah Metal department produced 746 tons of milling ore and 218 tons of copper ore which was shipped direct to the smelter. The company's mill during this period treated over 2000 tons of ore and produced about 900 tons of concentrates.

Another copper company which will soon enter the dividend-paying ranks is the Arizona Commercial. The company has accumulated a working capital of about \$500,000, which is ample for present and prospective needs. The earnings, therefore, which are now being realized are available for distribution to shareholders. Production is running from 350,000 to 450,000 lbs. of copper per month, and may be expected to remain around these figures until the new power plant is completed 3 months hence. An output of at least 500,000 lbs. per month will then be possible. On present production the company is earning from \$40,000 to \$50,000 per month, or at the rate of about \$2 per share per annum on the 260,000 shares outstanding.

Old Dominion's smelter output in June was about 3,800,000 lbs. of copper, a high record. Of this 3,000,000 lbs. represents the company's own output, the balance coming from United Verde Extension and Arizona Commercial. For the 6 months ended June 30 Old Dominion's production totaled 16,500,000 lbs. of copper. The full year is expected to show at least 35,000,000 lbs. Costs are somewhat higher than formerly, due to the increase in wages, but it is safe to say that Old Dominion laid its copper down in New York in the past 6 months at a cost of not much over 10¼ cts. per pound. On this basis earnings were close to \$2,700,000, or say \$9 per share on 300,000 shares outstanding. Dividends amounted to \$5.50 per share, or something over half the net.

The report of the Barnes-King Co. for June is regarded as very satisfactory in the placing of practically all the company's properties in a position to show substantial profits in the near future. North Moccasin mine was closed during the latter part of the month to permit the remodeling of the power plant purchased at the time the Kendall property was taken over last fall. The mill during the first 14 days of June treated 945 tons of ore. An incomplete clean-up netted \$7800; or an average of \$8.25 a ton, which was quite an improvement over the showing per ton in April and May. On July 1st the mine and mill resumed full operations. The August showing should be one of the best the company has ever made. All properties will be producing by that time. The final payment for the Kendall property will be made in September and the \$10,000 per month that has been paid on that account will be available for dividends.



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Record Dividend Disbursements Made by American Mines Works.

July, 1915, was considered an unusually good month in point of dividend payments of American mines and works, 51 companies disbursing \$8,688,980. The month of July, 1916, made a much better record, however, for 56 companies looking to profits from American mining operations paid dividends totaling \$14,217,760. Added to dividends paid previously in 1916 brings the total for the year to \$152,733,255. Since incorporation these 56 companies have total disbursements to their credit totaling \$1,154,951,516. This is a return of \$269,549,655 in excess of the companies' outstanding capital.

The gold-silver-lead-zinc producers, according to reports made to Mining and Engineering World, made the largest total disbursements during the month, 43 in this class dividing \$7,349,006. Added to previous 1916 disbursements, in which 105 companies participated, makes a total so far this year of \$54,738,490 and to date \$320,711,083, on an issued capital of \$278,-789,693.

Of the above 43 companies 30 operate properties in the United States, which during the month just ended disbursed \$6,387,283, making a total so far this year (82 companies participating) of \$48,234,258 and to date \$247,649,557. Nine Canadian companies declared dividends amounting to \$924,496. For the 7 months of the year (20 contributing) disbursements total \$5,669,057, and to date \$64,581,522. But one Mexican company reports a dividend payment in July. During the 7 months of 1916 three companies paid dividends totaling \$35,175 and to date \$8,480,014.

Copper properties are credited with dividend payments in July amounting to \$5,857,396. During 1916, with 33 companies contributing, disbursements were made totaling \$56,326,737. To date these 33 companies have paid dividends amounting to \$627,234,429, on outstanding capital of \$328,609,078.

The companies operating metallurgical works paid dividends of \$991,358 in July. During the 7 months of 1916 six of these are credited with payments totaling \$13,347,424 and to date \$207,005,994.

Companies classified as securities-holding corporations paid dividends last month amounting to \$630,000. So far this year eight of them have disbursed \$28,320,-604. To date they are credited with having paid \$145,-771,718.

In the following table is listed the companies paying dividends in July, with the date of payment, amount per share and amount paid:

Company.	July.	Amount per share.	Amount paid.
Adventure Con., Mich.....	1	\$0.50	\$ 50,000
Ahmeek, Mich.	10	3.00	600,000
Allouez, Mich.	15	2.00	200,000
Am. Sm. Sec., pfd. A.....	1	1.50	255,000
Am. Sm. Sec., pfd. B.....	1	1.25	375,000
Big Four Expl., Utah.....	15	.05	20,000
Bunker Hill Con., Calif.....	4	.02½	5,000
Bunker Hill & Sullivan, Idaho.....	3	.40	163,500
Caledonia, Idaho.....	5	.03	78,150
Center Creek, Mo.....	1	.15	15,000

Company.	July.	Amount per share.	Amount paid.
Champion, Mich.....	27	6.40	640,000
Cons. Mg. & Sm., Canada.....	1	2.50	210,687
Continental Zinc, Mo.....	1	1.00	22,000
Eagle & Blue Bell, Utah.....	24	.05	44,657
Golden Cycle, Colo.....	10	.02	30,000
Greene Cons., Mex.....	25	1.00	1,000,000
Hecla, Idaho.....	3	.15	150,000
Hercules, Idaho.....	15	.20	200,000
Hollinger, Ont.....	14	.20	240,000
Homestake, S. D.....	25	.65	163,254
Inspiration, Ariz.....	31	2.00	1,841,374
Iron Blossom, Utah.....	25	.10	100,000
Iron Cap, Ariz.....	1	.35	6,422
Isle Royale, Mich.....	31	1.00	150,000
Joplin Ore & Spelter, M.....	22	.04½	18,000
Kenefick Zinc.....	31	.10	20,000
La Rose Con., Ont.....	20	.05	74,931
Lucky Tiger, Mex.....	20	.08	57,227
McKinley-Darragh-Savage, Ont.....	1	.03	67,431
National Z. & L.....	31	.05	25,000
New Jersey Zinc.....	10	10.00	3,500,000
N. Y. Honduras-Rosario, C. A.....	24	.50	80,000
Nipissing, Ont.....	20	.25	300,000
North Butte, Mont.....	17	.75	322,500
Osceola, Mich.....	31	4.00	384,600
Peterson Lake, Ont.....	3	.01¾	42,032
Porcupine Crown, Ont.....	2	.03	60,000
Portland, Colo.....	20	.03	90,000
Prince Con., Nev.....	1	.05	50,000
St. Mary's M. L., Mich.....	28	2.00	320,000
Seneca Superior, Ont.....	15	.30	143,655
Shattuck-Arizona, Ariz.....	20	1.25	437,500
Silver King Coal'n., Utah.....	1	.15	187,500
Silver King Con., Utah.....	1	.10	63,758
South Eureka, Calif.....	15	.07	20,990
Standard Silver-Lead, B. C.....	10	.02½	50,000
Success, Idaho.....	23	.03	45,000
Temiskaming, Ont.....	22	.03	75,000
Tonopah Belmont, Nev.....	1	.12½	187,500
Tonopah Ext., Nev.....	1	.15	190,320
Tonopah Mining, Nev.....	21	.15	150,000
Tough Oakes, Ont.....	3	.12½	66,437
U. S. Sm., Ref. & Mg., pfd.....	15	.87½	429,556
U. S. Sm., Ref. & Mg., com.....	15	1.00	351,115
United Verde, Ariz.....	9	.75	225,000
Vindicator, Colo.....	25	.03	45,000
Wellington, Colo.....	1	.02	200,000
Utah Apex, Utah.....	1	.25	132,054
Yellow Aster, Calif.....	6	.02	20,000
Yellow Pine, Nev.....	25	.15	150,000

Preparedness a Large Factor in Successful Mine Operation.

In connection with all mine work, whether strip-ping, underground work or large construction projects, which involve heavy excavation, the building of a dam, laying of pipe lines, erection of a power plant, etc., so much machinery and other mechanical equipment are now used that it is necessary to provide corresponding facilities for their maintenance and repair. For all such undertakings, delays are costly; hence, it is the better part of wisdom to avoid, as far as possible, any absolute breakdowns, to provide for necessary repairs or replacements as speedily as practicable, and to keep all of the equipment up to a high standard of working efficiency—the last named point being particularly important.

For this, a fairly large assortment of tools, such as will be found in a general shop doing plate work, machinery, forging and some wood-cutting and finishing is essential; and the field for the use of the modern shop tools, as well as the employment of skilled mechanics, has been correspondingly broadened.

More Attention Should be Given to Roadways for Mines.

Wagon roads over which ore must be hauled, connecting mines with mill, smelter or railway, are factors in mine operation that too often do not receive the care and attention that they deserve and that economy of operation dictates. Wagon haulage is a slow

and expensive mode of transportation for freight and ore, but, unfortunately, it is sometimes the only means available. In mountainous or hilly regions where mines are usually situated it is impossible to avoid grades, but in many cases grades can be eased by changing the route, and thereby save horses and time and increase the haulage capacity of the road. This applies equally as well to motor haulage, the present day tendency being to adopt the use of automobile trucks. But good roads are just as necessary to the automobile as to the horse, when efficient transport is desired.

There is no economy in leaving roads to take care of themselves. It is less expensive to keep a road in good condition—grading, smoothing over the rough places and picking off the stones—than it is to do heavy haulage over a road that has been neglected. Precautions must be taken to protect roads from washing during rainy weather, and where the ground becomes soft when wet the road should be of corduroy construction or well ballasted with rock so that the wheels of heavily-loaded wagons cannot cut in deeply.

In many cases the length of haul can be considerably shortened by changing the course. Many wagon roads follow old trails and are followed from habit, when the benefits to be gained by a change of route would more than balance the expense involved.

Usually wagon roads leading to mills, railroads, etc., are used by several mining companies, which can to their own benefit co-operate in keeping them in good repair.

Making Accurate Mill Tests.

It is no uncommon thing to hear those who have had unsatisfactory mill tests made direct suspicion towards someone, with the insinuation that all was not honest. This is wrong. Such a test should always be made under conditions that practically guarantee honesty on the part of all connected with it. The mine owner should regard it as due to himself as well as to those working for him to provide every safeguard against fraud or mistake by checks and personal supervision, the latter preferably by himself.

Watching and checking is no insult to the employed and will rarely be so regarded by an honest man. In the occasional case where it is so regarded, it is better to replace the man if necessary, for it is a wrong principle of business to consider any employe, however competent or valuable, as absolutely essential to one's success. The owner of the mine must himself know his business sufficiently well to judge what is best, for when he trusts his all to others he risks his all.

Nor does this imply a lack of faith in human nature; it is simply acting under the guidance of the logic of experience. Many jail cells are occupied by men who are above the average in faithfulness and honesty, but who were unable to resist temptations far greater than those to which the ordinary man is ever subjected.

PERSONAL.

H. Foster Bain has returned to London, England, from a trip to South Africa.

F. Lynwood Garrison, New York, has left on a mining mission to Brazil.

Thomas Graham, chief inspector of mines, British Columbia, is in Joplin, Mo.

C. F. Burt, of Yerrington, Nev., is revisiting the Michigan copper country for a few days.

E. Fleming L'Engle has accepted the position of general manager of the Royal Zinc Co., Joplin, Mo.

G. F. Dyer, superintendent of the Silver Pick Con. Co., Goldfield, Nev., has been in San Francisco, Cal.

E. H. Mead, general manager of the Cash Boy mine, Tonopah, Nev., has been in Salt Lake City, Utah.

H. J. Rahilly, mining engineer with the U. S. Bureau of Mines, is now with rescue car No. 5 in Butte, Mont.

W. D. Hole, formerly general manager of the Poderosa mines, Chile, has resigned and is now in London, England.

Harry Jennings, mine foreman at the Niggins mine, Bisbee, Ariz., has returned from a trip to Santa Monica, Cal.

F. J. Longworth, smelter superintendent of the British Columbia Copper Co., Greenwood, B. C., has been in Spokane, Wash.

Charles Donahue, mining engineer, Boston, Mass., is now in Globe Ariz., relative to inspecting property in the Dripping Springs district.

Arthur Lakes, Jr., mining engineer, of Larson & Lakes, Spokane, Wash., has returned from a trip to Nelson, B. C., and Northport, Wash.

Fred H. Gartung, mining engineer for T. F. Lennan interests, Miami, Okla., has been in Chicago and will later go to Houghton and Detroit, Mich.

Floyd Weed, former manager of the McKane mine, Kirkland Lake, Ont., has left to assume a similar position in the iron fields of Birmingham, Ala.

J. V. Howell, assistant professor of geology at the Iowa State University, is in Leadville, Colo., continuing his inspection of the geology of the Lackawana district.

George J. Young has been appointed professor of metallurgy at the Colorado School of Mines. He was formerly professor of mining at the University of Minnesota.

James A. Barr, mining engineer with the International Agricultural Corporation, Mt. Pleasant, Tenn., is in Houghton, Mich., attending the Michigan College of Mines reunion.

R. E. Griggs, of the Transvaal Chamber of Mines, South Africa, is now in London, England, and will shortly leave for New York to arrange for shipment of mining supplies to the Rand.

Andrew C. Dawson, dean of the college of mining, University of California, has gone to Montana, where he will give professional testimony in several of the law cases now being tried in the state.

Van H. Manning, director of the Bureau of Mines, Washington, D. C., is now in Tucson, Ariz., relative to taking the final steps in starting the construction of an experimental station in that city.

Frank G. Boles, formerly manager of International Trade, published in Chicago by the Mining World Co., has been made vice-president of R. Martens & Co., New York, and will be in immediate charge of the affairs of the Russia Trade Corporation of America. This concern will specialize on all kinds of general merchandise and manufacturers are

invited to write concerning the possibilities for selling their products in this greatest of export trade fields.

M. H. Leonard, general manager, and J. C. Taylor, sales manager of the Denver Rock Drill Co., who have been visiting Edward Church, manager of the office at Houghton, Mich., returned to Denver, Colo., the 5th.

Eugene W. Richie has been appointed assistant to President Geo. E. Van Hagen of the Standard Forgings Co., Chicago. Mr. Richie returns to the latter company after two years in the sales department of the A. M. Castle Co., Chicago.

John W. Finch, mining engineer, Denver, Colo., has been engaged as general manager of the American syndicate which will exploit the mineral deposits of China. His headquarters will be Shanghai, China. He will leave this country Aug. 10.

Joseph W. Richards, professor of metallurgy Lehigh University and an official in both the American Electrochemical Society and American Institute of Mining Engineers, has been in Butte, Mont., on his way to San Francisco, Cal., and other Pacific coast cities.

John R. Champion, superintendent of the Yak. Mining, Milling & Tunnel Co., Leadville, Colo., has resigned and will retire from mining, having devoted 50 continuous years of his life to this vocation. The vacancy will be filled by Hugh C. Watson, formerly assistant superintendent.

S. W. Eccles, president of Nevada Con. Copper Co., visited the plants of the company at McGill and the mines at Ruth, near Ely, last week. General Manager C. B. Lakenan and Mill Superintendent Geo. C. Riser accompanied Eccles to Salt Lake City. Lakenan was recently elected a director of the company.

OBITUARY.

On July 8, 1916, Oscar Johnson, shift boss at the Ellamar mine, near Anchorage, Alaska, was killed. Johnson was working in the shaft when a descending skip hit a projecting, loose piece of timber causing the opposite end of the timber to strike him on the head.

Moris Davis, mining engineer and promoter, succumbed from the effects of cyanide poisoning in Chicago on Aug. 9, 1916. He was connected with the Royal Financial Corporation, Vancouver, B. C., and was in Chicago to dispose of his interests in a recent patent. While at the Congress hotel in company with his wife he took a drug into which he was unaware that cyanide of potassium had been sifted. Mr. Davis was born in Buffalo, N. Y.

Despondent because of financial and business difficulties, Phillip L. Eberhardt, 36 years old, of the firm of Harrington & Eberhardt, a member of the Spokane Stock Exchange, recently committed suicide in his apartments at the Spokane hotel. Eberhardt had been a resident of Spokane for about 6 years, having come there from Wallace, Ida., where he was employed by James A. Allen, now living in Spokane. For a short period during the oil boom in Alberta he was located in Calgary, where he represented his firm, then dealing extensively in oil stocks, but his brokerage activities were confined principally to Spokane and the surrounding camps.

SCHOOLS AND SOCIETIES.

American Institute of Chemical Engineers.—The 9th annual meeting of the institute will be held Jan. 10-13, 1917, at New York.

Colorado School of Mines.—The Board of Trustees has decided to hold the first annual Rocky Mountain Mine Rescue and First Aid Contest, at the campus in September. J.

C. Roberts, professor of safety engineering, is in charge of the arrangements for the contest and invitations will be sent Cripple Creek mining companies, inviting their attendance and participation. Entries are expected from Colorado, Utah, Wyoming, Montana, South Dakota, Arizona, New Mexico and possibly from California, Washington and Nevada. Only miners employed by the various companies will be eligible to compete. The rescue teams composed of students will be barred. The Rocky Mountain Coal Mining Institute and the Colorado Metal Miners' Association will donate cups, and it is expected the Cripple Creek District Mine Owners and Operators' Association will also. Manufacturers of the various mine safety devices will also probably offer prizes. The contests, which it is planned to make annual affairs, will it is expected serve to make the Colorado School of Mines, the center of safety engineering for the mining industry.

COMMUNICATIONS.

[This department is for the exchange of ideas bearing on all branches of the mining and metallurgical industries. Mining and Engineering World will not be responsible for the statements made nor opinions expressed by correspondents.—Ed.]

The Joseph Process for Treating Ores.

The Editor: I read an article in your paper stating that with a certain oil flotation process to extract gold, silver and copper from ore with creosote and pine oil, I believe it was, that the operator could extract those metals from ore carrying them for a cost of 8 cts. per ton, which seems very unreasonable to me, because creosote now commands a rather high price to treat railroad ties, even though it costs four times as much to treat ties as with the Joseph process, and is not even half as good for their treatment as my own method.

Also I cannot see how anyone can handle ores cheaper with creosote and pine oil in small tanks than he could in 500-ton tanks with the Joseph patented process, in using a small amount of sodium cyanide and ammonium carbonate with water; for the 500 tons of ore can quickly be filled into the tank by a gravity run, and delivered out of the tank into large cars underneath, with a Blaisdell excavator, and hauled away with locomotive to the dump ground for 2 cts. per ton, and dumped, after the ore is leached.

Neither oil nor creosote could possibly extract as much of the metals as the sodium cyanide and ammonium carbonate and water, which has extracted from some ores so much of the metals that not a trace could be assayed from the tailings by several attempts to do so. Therefore in handling large quantities of ore properly, everyone knows that it could be done cheaper than by small quantities. The Joseph process will extract the values from telluride ores, bismuth, arsenical, sulphurous, hard iron or soluble iron ores, which no other method will do, and cheaper than any oil method, and save more of the metals than any other method on low-grade ores known to me.

If the gentleman means that the labor will not exceed 8 cts. a ton to treat the ore with pine oil and creosote, I would say the labor to turn a crank to allow the fine ore to run by gravity from an ore bin into the 500-ton tank would not cost a tenth of a cent a ton, and only 2 cts. a ton to move the tailings into large self-dump cars under the tanks, and to be conveyed to the dump ground by a locomotive or a trolley line car and dumped, besides the creosote and oil used as the writer stated will certainly cost much more than the small amount of the sodium cyanide and the ammonium carbonate as named in the patented Joseph cyanide process. The metals can be precipitated therefrom with different strengths of electricity on to separate receptacles, or by any well known process. Thus as ores do not need to be roasted in order to obtain good extraction of their valuable metals such as gold, silver, nickel or copper, and as it could be used to extract more of the metals than any other method, and especially from the unroasted telluride ore, where a roasting heat of 335° would fume away out in the smoke nearly all of the telluride of gold, it does not take a prophet to say

that any oil method could equal the Joseph cyanide and ammonium carbonate process. Also if the operator who used our process at a royalty of 5 cts. a ton, and wanted to use compressed air aeration of the leaching ore, he could use our system of compressed air without any extra cost; whereas to roast base ore it would cost a few dozen times as much as our royalty, and waste several times as much more in fumes to roast a telluride of gold, and even then perhaps not save within several dollars per ton as much as the Joseph process.

I challenge anyone to produce a method that will beat the Joseph process, whether it be an oil or a creosote process or a smelting process, for cheapness and results of extraction of the gold, silver and copper from low-grade ores, either roasted or unroasted, base or oxidized, or ore that carries soluble iron, or sulphur, or arsenic, or bismuth.

DR. T. B. JOSEPH.

Goldfield, Nev.

NEW PUBLICATIONS.

Graphite in 1915. By Edson S. Bastin. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 11:11; pp. 13.

This is the usual annual report gotten out on the production of graphite and general conditions of the market and prices. The United States is first reviewed as a whole and later the states are separately reviewed as regards their production. In the case of California the review is made by counties.

Manganese and Manganiferous Ores in 1915. By D. F. Hewett. Washington, D. C., U. S. Geological Survey. Min. Res. of U. S. 1:4; pp. 15.

Domestic deposits are reviewed by states and foreign deposits by countries. Separate reviews are made of manganese from different sources both as ore and secondarily from scrap metal and residues. Prices, production and the nature of the different kinds are given, and the conditions, prices and production of the manganese industry in general are gone over.

Strength of Webs of I-Beams and Girders. By H. F. Moore and W. M. Wilson. Urbana, Ill., University of Illinois. Bulletin 86; pp. 50; illustrated.

The results of the tests herein described are both tabulated, plotted into curves and discussed. The investigations and tests were made to show that the web of a beam does sometimes buckle contrary to the general theory used in designing and also that there are complex stresses at the junction of the web and flange. At certain points it is also brought out that there are crushing stresses in the web.

Annual Report of the Smithsonian Institute, 1915. Washington, D. C. Smithsonian Institute. Annual Report 1915; book; pp. 544; illustrated. For sale by Mining World Co. \$1.50.

The operations, expenditures and conditions of the Institute for the year ending June 30, 1915, are given. Articles included are of a wide variety and have been contributed to by 22 different authors. Practically none of the articles are of direct interest to the mining profession but as regards the advancement of science each article will be found exceedingly interesting to all.

The Technology of Marble Quarrying. By Oliver Bowles. Washington, D. C., U. S. Bureau of Mines. Bulletin 106; pp. 174; illustrated. For sale by Mining World Co. 40c.

The bulletin might well be termed a text book on the subject. It was the aim in publishing the bulletin to bring before operators and others interested a review of up-to-date practice in marble quarrying and to do this the best methods of different operators have been reviewed. Accounting is gone into as also is the structure of marble and its relation to the quarrying process. Waste caused by imperfections in the rock and the wrong methods of quarrying are spoken of.

TRADE PUBLICATIONS.

Flotation Oils. The United Naval Stores Co., New York. Circular; illustrated.

The circular is entitled "Flotation" and contains considerable information on the use and properties of different oils now employed in the flotation process. It brings out that wood-cresote oil is rapidly supplanting pine-oil which was formerly considered so favorably, the cause being that pine-oil has increased in price and wood-cresote gives nearly the same results. Other discussion is brought out to show that wood products will become more popular in the future because of its lesser cost.

Nordberg Poppet Valve Engines. Nordberg Mfg. Co., Milwaukee, Wis. Bulletin No. 28; pp. 35; illustrated.

An unusual number of illustrations and drawings of the assembled engine, its parts and plant installations are shown. The construction of this type of engine is described in a complete manner in connection with details regarding its theoretical and practical operation. Here details of practical cases are gone into. Curves and indicator cards are reproduced. For non-condensing operations a full-poppet design is recommended in the bulletin, while in condensing service the pottet-uniflow and poppet-corriss designs are stated as being most adaptable.

Drill Column Hoist. The Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo. Booklet; pp. 15; illustrated.

This hoist has been designed to allow of a rapid and temporary installation in winze and stope work where it would be far more costly to install a small permanent hoist and very inconvenient to do hand hoisting. The driving electric motor, gear connections and drum are one body and this is equipped with a clamp in the back to secure the hoist to the drill-post. Two models are described and illustrated. The regular size weighs 200 lbs. and will handle a load of 700 lbs. at the rate of 80 ft. per minute. A separate section is given to the listing of repair parts.

Cyaniding-Precipitating Machine. Eureka Agency, Denver, Colo. Booklet; pp. 7; illustrated.

This machine, known as the Eureka cyaniding-precipitating machine, is one in which the leaching, filtering, clarifying and precipitation are accomplished in one machine. The machine is a long trough divided into three compartments. The entire machine is made to revolve in a vertical plant about the horizontal axis of the cell-case or trough. This rotation serves to agitate the solution and ore in the first compartment which filters through to the second. Here the pregnant solution passes through a finer textured filtering material into the third compartment for precipitation with zinc. The machines are made in three sizes of 20-ton, 40-ton and 60-ton capacities. A laboratory machine is made which will give complete tests on the ore for the cyanide process.

Concentrating Machinery. Deister Machine Co., Fort Wayne, Ind. Bulletins, 1, 2, 3, 4 and 5; pp. 36; illustrated.

In Bulletin 1 Deister's Ideal head motion is described. This is furnished all of the company's reciprocating tables. Bulletin No. 2 takes up a double-deck sand concentrator. It is also made in single deck types. The machine will handle materials from 8 to 100 mesh. Drawings are reproduced showing the plan and elevation of both right and left-hand machines and accompanying these are working drawings for the foundations of each type. A list of repair parts is also given. Bulletin No. 3 is confined to the Deister Simplex rougher and finisher. Drawings, etc., are given identical with Bulletin No. 2. It will handle materials varying in size from 8 to 200 mesh at the rate of 50 to 250 tons per day. Bulletin No. 4 describes a multiple deck tilting slimer with 6 or 12 decks. It is adapted for handling material ranging from 200-mesh to the finest slimes and overflows. It is gotten up in a form similar to the preceding two bulletins. Bulletin No. 5 is on a cone baffle classifier. A sectional drawing of the machine is shown on the cover and the following two pages are description and discussion.

INDUSTRIAL AND TRADE NOTES.

The Hirsch Mine Lamp Co., of Philadelphia, has recently manufactured a new "Hirsch" portable electric lamp outfit of high candlepower, suitable for shaft digging and mine work. The lamps are made in two sizes, 6 volts with three cells 20 to 25 cp., weighing 10 lbs. complete and 10 volts with 5 large cells 35 to 40 cp., and weighs 26 lbs.

The Sullivan Machinery Company, 122 South Michigan avenue, Chicago, and Salisbury House, London, England, has established an agency in Holland with Petrie & Co., Heeren-gracht, 141-145 Amsterdam, as its special representatives. Petrie & Co. will sell the Sullivan air compressors, rock drills, hammer drills, diamond core drills, quarrying and coal mining machinery in the Netherlands. This new arrangement replaces the Sullivan Machinery Co. agency previously at The Hague.

Users of belting should be interested in literature that has just been issued by the Gandy Belting Co., Baltimore, Md. This company was founded by Maurice Gandy, inventor of the stitched cotton duck type of belting, and he has been manufacturing belts of this type for over 36 years. During this period it naturally gathered together some interesting information on belt service—and has presented it in a folder entitled "A Chain of Evidence." The Gandy Belting Co., 726-740 West Pratt St., Baltimore, Md., will be very glad to send anyone a copy of the circular.

The capital stock of the Morse Chain Co., Ithaca, N. Y., has been increased from \$400,000 to \$1,500,000 for expansive purposes in the shape of new buildings and additions to old ones already under way. The remarkable growth of this company is well illustrated by the successive building operations made necessary by the demand for its single product—Morse rocker-joint power transmission. From a fair sized factory at Trumansburg, N. Y., in 1904, about the time when electric motors came into broad commercial use, the business commenced to spurt, and in 1906 was removed to Ithaca to a new factory built specially for the purpose and twice as large as the former one. In 1912 it again became necessary to enlarge and the floor space was more than doubled. Present plants contemplate again doubling the size of the plants. A large storage building is about completed, additions to the steel and wire mills and a new gas producer building are well under way, and another addition to the main building, increasing its total length to more than 900 ft., is soon to be started. When these buildings are completed, the Morse Chain Co. will have a total floor space of approximately 7 acres, all of which will be devoted exclusively to the manufacture of Morse rocker-joint power transmission.

PATENTS RELATING TO MINING.

Coal Jig. Michael J. Gasper, Hazleton, Pa. (1,192,296; filed Mar. 25, 1916.)

Pumping Device for Oil Wells, Herman R. Williams, Mannington, W. Va. (1,192,145; filed Dec. 31, 1915.)

Amalgamator. Albert E. Vandercook, Alameda, Cal., assignor to California Macvan Co. (1,192,478; filed June 16, 1914.)

Process of Utilizing the Waste Products of Garnet-Works. John Davenport, Brighton, Mass. (1,192,394; filed Jan. 27, 1915.)

Guiding Device for Conveyer Belts. Samuel D. Sibley, Detroit, Mich., assignor, by mesne assignments, to Semet-Solvay Co., Solvay, N. Y. (1,192,128; filed June 24, 1915.)

Brick-Drier Car. Lachlan W. McArthur, Montreal West, Quebec, Canada; assignor to himself, and Percival Stafford McKergow, Westmount, Quebec, Canada. (1,192,082; filed Feb. 21, 1916.)

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Anchorage.

The Alaska Crow Creek Mining Co. is now operating at the head of Crow creek under Manager and President D. B. Dawson, who is employing about 40 men at present. A clean-up is about ready to be made and Dawson states that the company is now realizing from its hydraulic operations after 9 years of hard work.

Fred Laubner and William Bartholf have secured control of the Goodel-Fern property on Archangel, in the Willow Creek district. They are planning extensive development work this summer. The work will be done on the Archangel group. Indications are favorable, and they will probably put on more men as work advances.

Isaac brothers have made a strike on Reed creek in the Willow Creek district. The strike was made on the extension of the Mable mine and is 4 miles east of the Alaska, Free Gold and the Independence mines. They have 3 claims staked and have stripped the ledge for 200 ft. The rock shows free gold and pans good. Development is to be started immediately.

Juneau.

According to the figures of the local customs office copper valued at \$17,443,111 has been shipped from Alaska during the first half of 1916. This is very favorable and points to a considerably larger output than during 1915.

Bart L. Thane, manager of the Alaska Gastineau Co., states that June 26 broke the milling record of the company. Eighty-seven hundred tons of ore were treated in 24 hours. Since the beginning of the operation of the mill, the average cost of mining and milling the ore has been under 75 cts. per ton, which was the original estimate made. Eminent engineers freely predicted that the costs could not be reduced to 75 cts. For the past few months the cost has been 65 cts. and under. The mill is at present being operated at a 6000-ton capacity, which was our original estimate, but its actual capacity is more than double that amount. As the mine development to the east progresses the mill will gradually be speeded up. Owing to the contour of the ground and the lay of the ore body on the west end, we must take the ore from certain places first in order that the mine producing capacity will not be impaired. The ore on the west end was of lower value than estimated, but it is ore that must be taken out at once. In order to keep the milling average up it was necessary to reduce the milling capacity until the eastern stoping ground is opened. This work is now progressing rapidly and large bodies of ore of a higher value are being opened for stoping. Within a short time the mill will be running at capacity as we are able to take the ore from the east end and mix it with the west end ore, bringing the average value of the ore to the correct milling point.

Katalla.

The Tanana Valley railroad recently bought the property of the Alaska Oil & Refining Co. Falcon Julin, president, is prepared to begin immediate work on the wells and refining plants in order to increase the output, which is far below the local demands. In his opinion, he easily can double the present production.

The coal properties of the Alaska Petroleum & Coal Co. in the Bering River district are to be worked again after laying idle for 6 years. Manager Davis has returned from a trip to the properties and says: "With but 2 men we are taking out 10 tons of coal per day from the face of the tunnel in vein No. 1. This vein shows 10 ft. wide, solid anthracite, and is widening as we go in. We have a

depth of 500 ft. and the coal is clean and free from rock and shale. It is being burned in the tents in sibley stoves without a stove pipe, as it is practically smokeless. We have no dynamite on hand, our old stock being worthless. As soon as our supply arrives from Seattle, we will have three shifts of men at work on the cross-cut to pick up the No. 2 east vein—a 5-ft. vein of clean, hard coal with a depth of 400 ft. Supt. Hutchinson is preparing to enlarge the tunnel to standard size and fit it with a double track, as No. 1 vein will be driven 1000 ft. this year. The Alaska Anthracite Coal railroad is now into the property. We have 50 tons of coal ready to ship and at present coal in the vicinity is selling at \$30 per ton."

ARIZONA.

Jerome.

The shaft of the Dundee-Arizona is now down more than 300 ft. and sinking is being pushed at the rate of 5 ft. a day. James A. Hubbard is in charge of the development work. The Dundee, formerly known as the Greenflower, lies on the south side of the "hogback," and just at the eastern edge of Jerome, within a few hundred feet of the workings of the United Verde Extension. Between the two lies that part of the Jerome Verde that is under development. Only two claims are included in the Dundee property, but the surface indications are among the best in the district. Work on the property will go ahead rapidly. A blanket of carbonate ore over the property has already been developed and a zone of rich conglomerate ore has been encountered near the surface.

Machinery for the Venture Hill property has been shipped. Work on the property is going ahead under the direction of John Reilly. The report of the strike on the Pittsburg-Jerome property has encouraged work on the Venture Hill holdings.

Unwatering of the old Arkansas and Arizona shaft is progressing rapidly. Little trouble is being encountered, even though the machinery and equipment being used in the work has lain idle for a long time, until the property was recently taken over by the Goodrich-Lockhart syndicate. Until the workings are drained it will be impossible for any real mining or development to be done. Under the direction of Supt. Galligan, the force of 16 men has reached the 900 level and will soon have the shaft completely unwatered.

The shaft of the Jerome Verde is now enlarged to three compartments down to the 325 level. A bulkhead, installed at that point to catch the rock taken out above it in the enlarging operations, was torn out several days ago and the pump started once more. Another bulkhead will be placed at the 390 level and enlarging resumed.

A stringer of yellow sulphide has been opened in the main shaft on the Jerome-Portland property. Although only a stringer formation, a few inches wide, the ore runs very high, in fact it is declared to be almost solid copper. The shaft is being sunk by hand, pending the installation of machinery, which is already on the ground.

Prescott.

The Big Ledge Development Co. has taken over the Gopher group of patented claims, near McCabe, the Hackberry mines and the old Boggs smelter, near the Hackberry property. The purchase of the Gopher was brought about largely by the good showing of the Henrietta mine, adjoining it on the north, which is operated by the Big Ledge people. The old smelter is to be modernized and thoroughly overhauled for treating the product of all interests owned by the

purchasers. Both the Gopher and Hackberry properties are attractively rated in gold and copper.

Sinking of the shaft on the Loma Prieta property in Copper Basin is going ahead steadily. A continuous ore body has been determined for more than 55 ft., and with every foot of increased depth the showing improves. A carload of high-grade chalcopryite ore has been shipped as a test from the Loma Prieta. All work at the mine is now under direction of John Livezey, who has taken up his residence at the camp.

Recent exploration in the old Senator mine has resulted in new and valuable ore being proven. In the zone where the Treadwell vein was penetrated a large tonnage was opened up, giving values of \$50 in gold and copper. The strike occurred at a point 2500 ft. in on the old tunnel. The Senator, one of the units of the Commercial Mining Co., was believed to have been worked out years ago. Another claim of the group, the Snoozer, is shipping daily to Douglas a large tonnage of high-grade copper.

Initial exploration movements on the McNulty-McBride properties, recently taken over under option by the Daly-Crawford-Levissohn syndicate, are under way. A. L. Johns of Globe has taken charge of the work, established a camp and is ready to go ahead with churn drilling as soon as one of the three drills to be used arrives. Three hundred acres of ground has been set aside for early exploration.

Throughout Yavapai many mines with which the public is not so familiar as with the larger producers, are doing good and making many improvements on their properties. Contracts have been let for the construction of six new buildings to accommodate a force of 50 miners at the camp of the Beehive Co., adjoining the Octave mine on the east. The Octave has made good during the last year and both mines will be operated during the coming year.

Operations on the Dolphin mines, on Turkey Creek, will be resumed in the near future, the owners having decided on a plan of rapid development after a recent inspection of underground conditions on the property.

A high-grade copper sulphide, carrying gold values, has been encountered in the old Bullwhacker mine. The property is now being developed to great depth, after having lain idle for many years.

Active work is under way on the project of the Arizona Deep Mining & Tunnelling Co. in the Bradshaws. The company plans to run a tunnel, approximately 17,000 ft. to explore six fissures in the mineral belt north of Crown King, in which are included the Lincoln, Nelson, Fairview, War Eagle, Gladiator, Crown King, Del Pasco and Wildflower groups. At certain points a depth of more than 1500 ft. will be given, and the exploration is declared to be the most extensive ever conducted in the southwest. The tunnel has been driven more than 50 ft. from the initial point selected by the engineers.

The first discovery of sheelite in this field was made several days ago in mines in the Hassayampa district owned by Louis Bernard, Valentine Allbarade and John Barnard. A 3-in. streak of sheelite was cut on a 40-ft. crescent from the main tunnel and, when analyzed, was pronounced as of exceptionally high grade. The property is under development for its silver values.

Oatman.

During the past week two events have occurred, one of them being the peaceable solution of the labor difficulties which had occasioned the Gold Road mine of the U. S. Smelting & Refining Co. to close down temporarily, and another one a financial deal of magnitude whereby the control of the Carter Mining Co. passes to Keith & Keith of Boston within thirty days if the option taken by them and upon which a large cash payment was made, is exercised.

It is also reported that a deal involving a large sum of money is under way for the Oatman Queen property, and that either Keith & Keith or the United Eastern interests are the possible purchasers. It is known that extensive sampling of this property by engineers close to these two interests has been under way for some days. The Oatman Queen has opened a very fine and somewhat extensive showing of pay ore on one level, and on account of surface con-

ditions is regarded as a highly promising property. It lies in the same zone of ore channels as the Pioneer, Carter and Lucky Boy.

Officials of the Lucky Boy state that they expect to resume operations by Aug. 15, and the Oatman Queen expects to resume on or before that time.

The Big Jim is steadily blocking out ore in east and west drifts on the 400 and 485 levels, and it is officially stated that the average gold value for more than 300 ft. of ore exposure maintains a level well above \$20. The ore body is 30 or more feet in thickness.

At a depth of 200 ft. the Arizona Central, which lies between the United Eastern and the United Western, has cut 12 ft. of vein which gave average values of \$5.58. The quartz is similar in appearance to that in the pay shoots in the Tom Reed, United Eastern and Big Jim. The shaft will be continued to 500-ft. depth, and then the vein will be explored at that depth.

On the 400 level of the Pioneer 1500 ft. of lateral work has been done during the past 90 days, and has opened 600 ft. of new ore shoots, averaging \$15. The ore body is known to average better than 8 ft. in width where opened.

The Jerome Oatman shaft, at a depth of 360 ft., is running into a change of vein matter which is said by the operators to show good pan values, which seems to indicate the proximity of an ore body. Operations were temporarily checked by the burning of the compressor house 2 weeks ago, but work is now well under way again.

The new headframe of the United Eastern is now completed, and the hoist will soon be working on the new main shaft, which is down 375 ft. The headframe is 75 ft. in height. Foundations for the new mill are completed, and machinery equipment is arriving daily. Underground development continues to add largely to known ore reserves.

The plant of the Wrigley Exploration Co. has arrived and is being installed. It consists of a 75-hp. oil-burning engine and a 14x12 Ingersoll-Rand compressor and drill. The company is engaged in driving a tunnel from a low level into one of the main elevations of the Black Range mountains, to cut at depths ranging from 500 to 1200 ft. the series of veins which outcrop at surface. Not only will the property of the company be explored by this crosscut tunnel, but it may be used as a means through which adjacent properties will be developed at depth, and at the same time mines lying above will be afforded drainage. The project is an ambitious one, as it is planned to drive the bore at least 2000 ft.

Two 100-hp. marine-type, oil burning boilers, have just arrived in Oatman and are now being installed, one of them on the Lazy Boy and the other on the Esperanza. They will generate power to drive hoist, compressor and pumps. Work will soon be resumed on these two properties.

Supt. Keating, who has so successfully handled the development of the Big Jim, has also been given complete charge of the development of the Ivanhoe. Preparations are now being made to start drifting on a 6-ft. vein of highly-mineralized quartz which was cut on the 500 level, and which showed high-pan values, said to average around \$5. This vein is in the immense quartz-porphry dike which cuts through the andesites and the underlying sedimentaries, as is shown on the 500 level. The operators anticipate important developments soon.

CALIFORNIA.

Grass Valley.

The Brunswick Con. hoist has been provided with a new drum and is operating at full capacity. The new vertical shaft has been carried to a depth of 1200 ft. and some excellent ore is being mined. Forty stamps are dropping. The old shaft will be kept in repair for use in emergencies.

Buildings for the hoist and other machinery have been completed at the Allison Ranch mine, and installation of equipment will start early in September. By means of an ejector the water in shaft will be lowered 200 ft. before the

pumps are in position. Sampling of the huge dump is proceeding with good results, and it is believed a large tonnage of this material can be profitably milled.

Dedrick.

Control of the Globe gold mine has passed from the Globe Con. Mines Co. to H. M. Hall, the original owner, and steps have been taken to resume operations. Although the mine is stated to contain considerable ore of good character and is splendidly equipped, it failed to satisfy the operators. Under the management of the owner deep work will be pressed and a portion of the 20-stamp mill operated.

Columbia.*

The Springfield Tunnel & Development Co. has acquired the Elliott property and will start developments shortly. A shaft is being sunk from the end of the 1200-ft. drift in the Ranch mine, where a large deposit of rich gravel was recently uncovered. It is planned to work this gravel while driving of the main tunnel is proceeding. The tunnel is now in 2800 ft. and will be driven about 2 miles further. As soon as it is completed a series of raises will be driven to facilitate mining of the various channels to advantage.

Redding.

The First National Copper Co., operating the Balaklala mine at Coram, has distributed a 25 ct. dividend, the first in its history. Shipments are going forward to the Mammoth smelter at the rate of 300 tons daily. A large amount of new development work has been recently performed with good results. The management has granted the employees the same wage scale that prevails at the Mammoth, Mountain Copper and other Shasta Belt mines.

The Gardella Dredging Co. has announced that its dredge at Lincoln will be moved to a point near Redding within a year. Two more dredges will be built in the near future. The original dredge has been operating several months, on land lying along Clear Creek and has won profits considerably in excess of values indicated by the drills. The success of this company has stimulated interest of other corporations in the local dredging field, and much explorative work is going on.

A strong company, represented locally by M. E. Dittmar, has taken a bond and lease on the Michigan group of copper claims on Bully Hill, and is preparing for extensive developments. The North Star, the principal claim, lies 600 ft. west of the Bully Hill mine, and is believed to contain the extension of the Rising Star ore body.

Sutter Creek.

Unwatering of the Old Eureka mine has attained a point 450 ft. deep. Three sinking pumps are in commission, and a fourth will be installed on the 600 level as soon as it is reached. Concrete foundations are being erected for the new electric hoist and steel headframe.

Sinking from the 3200 level of the Central Eureka has begun, and from the 3300 level drifts will be extended to intersect the vein which is yielding good ore at the 3200 point. Twenty stamps are dropping on quartz from the 2800, 3100, and 3200 levels, and 10 more will go into commission in a few days.

Amador City.

Cutting of a station on the 1800 level of the Keystone is going on, and from this point an east crosscut will be driven to the main ore body. Ore bodies of good width and fair values have been opened on the 1000, 1200, and 1400 levels, and 40 stamps are dropping constantly. In the first 6 months of 1916, 41,084 tons of ore were crushed, of a gross value of \$81,365. Total expenses approximated \$78,000.

Sierra City.

The Butte Saddle and Sacred Mound mines are being reopened by a strong company, with F. E. Barnett manager. Both mines have produced rich ore in the past and it is planned to press work on a broad scale. At the Cleveland 25 men are working and some good ore is exposed. The mine is controlled by the Gillespie interests of Pittsburgh, Pa.

Groveland.

A Tonopah syndicate, including Arthur Brown, Gurley Jones and J. H. Skelton, has taken over the Cosmopolite gold mine, about a half-mile from Groveland. The property

embraces 7 claims and millsite, and is equipped with a 5-stamp mill, compressor and other machinery. A large tonnage of fair-grade ore is blocked out above the main tunnel, and it is proposed to install a ball mill and other equipment, designed to increase the capacity of the mill to 50 tons per day.

Ophir.

The Mowitza, Enterprise, Good Friday, Green, Cornucopia and West Friday claims have been taken under lease and option by the Globe Con. Leasing Co., understood to be a subsidiary of the Crown Reserve Co., of Cobalt. Under direction of Supt. Burnett a Cameron pump, compressor, electric hoist and other machinery have been installed, and sinking is proceeding rapidly. At a depth of 300 ft. drifts will be sent out to intersect the Friday vein. The claims contain several veins carrying copper and gold, with copper predominating.

COLORADO.

Cripple Creek.

The ore shoot as exposed at the 1400-ft. level of Dillon shaft is now 550 ft. in. The 1600-ft. level, where the deeper continuation of the shoot shows, has recently been enlarged. The June production from this estate, comprising the Upper Granite, Monument, Dillon, Dead Pine and Coin mines was about 4000 tons. The company shipments from the Dillon mine are now holding at better than 2 cars daily. Bach & Co. on the Lower Dead Pine are mining a good average grade of ore, and a second set of lessees operating through the Dead Pine shaft are also producing. Carn-duff & Duncan operating through the Coin shaft continue to make steady production from the Dead Pine. Williams Brothers lessees on the Monument are shipping, and four sets of lessees on the Upper Granite mine are producing.

The Vindicator Con. in a letter to stockholders by President A. J. Zang says: "The operations of the second quarter of the year were characterized by extensive development, largely in preparing the Middle vein system of the Vindicator mine for stoping. This ore body has now been opened from the 18th level up to the 12th level, disclosing an immense volume of ore of better than average grade. Only a small portion of the work necessary to open the 19th and 20th levels of the Golden Cycle mine has been accomplished. The outline of the work planned extends well into 1917. Our engineering staff report that the flotation plant being erected below the Golden Cycle ore house will be completed about Sept. 1, and the results there obtained will govern the future policy of the company with respect to the handling of low-grade ores used in filling the stopes from the beginning of the development of the property. A lessened production during the second quarter over that of the first quarter was made necessary by the development referred to above. The tonnage shipped on company account was 14,877 tons, and that of the lessees was 16,276 tons. The net earnings for the quarter amounted to \$185,000, making the total for the half year \$410,000."

Leadville.

Reports of the district for the first half of 1916 apparently show favorably as regards operations in the district. To the end of June 402,250 tons of ore have been extracted from the mines in Lake county. Of this output, June showed the largest tonnage, with 82,250 tons, an average daily production of 2742 tons. May gave 73,000 tons, April 66,000, March 63,000, February 57,000 and January 61,000. The average daily output during the period was 2210 tons. It is conservatively estimated that the average gross value of the ore produced in the district is \$25 a ton. At this figure the district has produced \$10,056,250 for 6 months. In 1915 the total output for the year was 532,217 tons, with a value of \$15,895,229.99. Comparing these figures, which were considered a high mark last year, with the record made during the past 6 months gives an idea of what the totals are to be when added up for Jan. 1, 1917. During the past 6 months 29 old properties have resumed activity. Among these are several large mines that have been taken

over by important mining companies, including the Harvard and surrounding territory controlled by the United States Smelting, Refining & Exploration Co., the Mikado and an extensive tract now under the management of G. O. Argall; the McCormick recently purchased by the Empire Zinc Co., with the Robert Emmett and other properties; the Greenback owned by Patrick Mulrooney; the Home Extension in the Down Town section now producing a heavy tonnage of ore; and the Tarsus lease on Yankee hill where a rich strike has been made. The other properties that have resumed activities since the first of the year are scattered, and indicate the scope of an uplift in mining.

Boulder.

That there still is something else in the county besides tungsten was noted by a recent strike of gold at the Livingston mine. It is sylvanite-tellurium and is found in a winze from the 400 to the 500 level. The strike was made on a vein which is thought to be the Potato Patch vein which yielded such large returns from the surface to the 120-ft. level. The winze is being sunk on the Nyanza vein close to the intersection with the Livingston vein. The ore body is being followed and has now been opened to the width of the winze. At the present time the ore is not being worked except as they come in contact with it in the winze, which simply taps the edge of the body. The ore has been separated into two classes and the metal taken from the lower classes, which has not yet been shipped, will be clear, as sinking operations have been paid from the high-grade taken out. The shaft goes down along side a fault, fissure vein which carries much water. For this reason the winze on the Nyanza is being sunk off the fissure to avoid pumping. The winze is down 50 ft. and will be down 150 ft. when completed. This will come on the 500-ft. level. As soon as the winze is finished the shaft will be worked back up to the 400-ft. level. As soon as the 500 level is reached and dead work completed, the company will sink to the 600 level by the same system used in going to the 500. Work to the 600 will be finished by Jan. 1, 1917. This winze is being sunk by an air hoist and will continue this way till the 500 level is reached and the timbering finished. Two 50-gpm pumps are now keeping the mine dry and auxiliary pumps will be installed on the 400 and 500 levels to aid in this work later.

IDAHO.

Wallace.

That the Interstate-Callahan Mining Co. will be able to earn in excess of \$1,000,000 net, annually, with metals at the average prices that prevailed during the 10 years preceding the outbreak of the European war, is announced by officials of the company in their statement to the New York stock exchange, where the issue was listed recently. These prices, according to this report, were 4.548 cts. for lead, 5.6775 cts. for zinc and 57.844 cts. for silver. For the purpose of arriving at an approximation of earnings at these prices the output of the mine for May is taken as a basis, the production of the company for that month having been practically the same as that for several preceding months. The May output is given as 6000 dry tons of 49½% zinc ore and concentrates and 500 dry tons of silver-lead ore and concentrates, containing 50% lead and 20 ozs. silver. Under the terms of the long contracts for the treatment of its output, which takes effect in September at the prices above named, the zinc product would be worth \$34.29 a ton, or \$205,740, less a freight charge of \$63,150, leaving a net of \$142,590. The lead product on the same basis would be worth net, that is, with freight and treatment charges deducted, \$27.47 a ton, or \$13,735. This would make the total income \$156,325. From this sum are deducted production costs of \$9 a ton, \$61,578, and \$1000 for overhead expenses, making the net profit for the month \$90,747 and for the year \$1,088,964. To this is added \$72,000 for estimated profit during the year of the flotation plant, stated at 400 tons a month, worth \$15, making the total net income for a year \$1,160,964, or enough to pay dividends of \$2.50 a share of issued capital stock.

LAKE SUPERIOR.

COPPER.

Houghton.

Superior & Boston should arrive at the 14th level with its shaft about the middle of September and then a crosscut will be driven to the vein. A fine quality of ore is being taken from the Arizona Commercial, the next property west, and the Iron Cap still further in the same direction is earning from \$30,000 to \$40,000 monthly. These properties all had the same poor showing as the Superior & Boston at the same levels, and are making their success on the levels that the former is sinking to reach. It took quite a time to underwater the shaft and workings from the 8th to the 12th level, new pumps being installed for the purpose. The quantity of ore taken from the 6th and 8th levels is being increased steadily. Supt. Graham as the leases expire, has been working the ground and the company is doing all the work with quite a financial gain.

Keweenaw has called another assessment payable Sept. 2, of record Aug 12, and later the subsidiary, the Phoenix, 99½% of whose stock is owned by the Keweenaw, will assess so as to transfer the necessary portion of the money thus raised. The management is drifting on the 6th, 7th, 8th and 10th, 12th and 14th levels east to the footwall, and is finding a very good average of shot copper amygdaloid. On the 4th level the small diamond drill as found, when this drift was first extended two or three years ago in barren ground, that it proceeded between the two mineralized parts of the lode, that lying along the hanging-wall side and that along the footwall, both well mineralized, as is now met with every where either side has been developed. It will be recalled that the lode averages about 82 ft. in width perpendicular to its walls, and that horizontally it will average about 165 ft., there being a barren spot between the two mineralized stretches. This confirmation of the belief that the mineralization persists generally, as previously found, in two portions with the better grades in the footwall, assures the mine of a profitable future, if the mill test which will be begun some time this month, turns out as well as there is every reason to believe it will.

Isle Royale is averaging about 2900 tons daily and runs its own mill every Sunday from 7 p. m. to Monday 7 a. m.; and this record is being steadily held notwithstanding that from 1500 to 1700 ft. of new ground is being opened every month. The present policy will, when No. 7 shaft is completed, and No. 1's repairs are ended, and one or two new shafts are sunk to the south, make this mine one of the largest producers in this copper district.

New Arcadian has its new shaft holed from the surface down 50 ft. on the lode, which may be the Old Arcadian encountered by a crosscut 265 ft. west of the shaft located 1800 ft. south of principal shaft. This shaft will have the advantage of the latter, as it is in the lode and the cost of cutting a 150-ft. crosscut and the haulage there will be saved. A little drifting is being done to connect the crosscut with the new shaft and the same quality of abundant coarse stamp copper is appearing. The 900 level north has just reached the New Baltic and had met with for the last few weeks as good ground as has been cut through in any part of the mine.

Calumet & Hecla's daily tonnage is averaging about 10,200, or about 200 tons short, due to the scarcity of labor. The new furnace at Dollar Bay, and that at Lake Linden are nearing completion, and will go into active operation in a very short time; they will give an increase of about 8,000,000 lbs. annually.

Victoria produced 105 tons mineral for July as compared with 102 for June. The rails have been laid in the new skipway down to the 19th level, but they will soon be continued to the bottom, the 26th level, as the last dirt was taken out the 3d. The small hoist good for 1000 ft., or so used in the upper part of the new skipway has aided in the production which is sufficient to pay for all these construction expenses as they occur and still carry a good balance. On the west side of the shaft where for some time there

has been no copper of commercial values, rich grades have been passed through for the past week, with every promise of continuing, and the eastern drift is still in excellent showing. There is ahead large areas of good stoping ground and when the new hoisting engine is ready the daily tonnage will steadily increase.

Houghton Copper, up to the 2nd, had a stretch of 20 ft. of good grades in the vein encountered 120 ft. west of the Superior lode on the 12th level, and which at first did not resemble the West vein of the Superior mine, but as soon as the copper appeared the color and general character of the rock changed rapidly, and disclosed the well-known characteristics of that vein so prominently as to dispel doubt. The north drift on the bottom of the winze, the 12th level, has now a length of 70 ft., and is continuing in good grades, which, together with the good reaches met with in the winze, augurs well for the future of the Superior lode at this mine.

Lake Milling, Smelting & Refining Co. has, at its No. 2 mill, formerly the Tamarack No. 2 or "little Tamarack," the steel up for the northern addition, and the foundations laid for the southern. Each of the additions will be equipped with a Nordberg stamp and the most up-to-date system of "wash," thus doubling the present capacity of the mill. The additions will be ready some time in the spring and will be able to stamp the rock of the Allouez that now goes to the Centennial-Allouez at Point Mills, about 7 miles distant, thereby effecting quite a saving in transportation. One of the two stamps now in operation here mills the Centennial rock and the other stamps about 600 tons daily of the Allouez.

Osceola's tonnage for July will be about 105,000 as compared with 114,000 for June. This decrease is due mostly to the scarcity of trammers.

Franklin is on all of its southern drifts continuing to run into very rich stretches, and the week ending July 29 on the 28th level, was unable to make more than 15 ft., as compared with the usual 24, owing to the great amount of copper that made the drilling very difficult. These stretches have been quite numerous from a point about 400 ft. south of the shaft, and this 400 ft. was richer than the average of the northern ground; they are gradually raising the yield of refined copper. There is still a little good rock coming from the Pewabic or Quincy amygdaloid.

Cass is down about 900 ft. with its drill on the Malden property near the Norwich, and is finding mostly trap and sandstones. It was expected that a conglomerate, that has a good outcrop some distance away, would be found in the first 200 ft., but evidently it was missed by a few feet. The strike of the Forrest lode on which is located the Victoria mine, has not yet been sought. In a short time there will be another drill in commission and the ground will be thoroughly explored before the winter sets in.

Indiana has been delayed in getting new men and has not yet begun the new shaft on the Butler lode, but will have them soon and start to break the ground.

Ahmeek has received the "bull" jigs for the eighth stamp, but has not yet been sent the smaller ones. Nothing is being lost, however, as there is not now enough rock coming to keep the seventh stamp busy all the time. The company has bought 20 and the Calumet & Hecla 2 of the Dreadnought type of drills from the Denver Rock Drill Co. The purchase was the result of thorough tests that had been made at the Ahmeek.

IRON.

Ishpeming.

At the North Lake mines, owned and operated by the Cleveland-Cliffs Co., ore is being taken from the new open pit with steam shovels under contract with House & Person. The overburden was also removed by them and averaged be taken out next year by this method. The company is 30 ft. deep. The depth of the ore body has not been tested, but its surface dimensions are 400 ft. by 100 ft. The ore remaining in the pit after the end of a steam shovel work will be trammed through a drift to the Lloyd shaft, and hoisted. The distance between the open pit property and the Lloyd mine is 2000 ft. Open pit mining can be continued throughout this season, and it is possible that some ore can

employing a larger force than at any previous time. There has been no shortage of labor and all men who can be employed are on the pay roll. All houses recently constructed are now occupied. When navigation opened the stock piles at the underground mines were exceptionally large. It is not anticipated that all of the ore can be shipped this season, due to limited transportation. The company is going further than to simply open a mine. Edwin Cotter, in charge of landscape work for the company, is at the North Lake with Warren Manning, Boston, Mass., landscape artist. Much is intended to be done towards beautifying the location with shrubbery, etc.

Ironwood.

At the East Norrie mine the old "B" shaft will be abandoned in the middle part of 1917. About 700 ft. from it the new "C" shaft is going down and will replace "B" when completed. It is 11 ft. 4 in. by 20 ft. 8 in., is steel timbered, 8-in. H sections being used. The shaft is being concreted with concrete slabs manufactured at the shaft. The slabs are 6 and 8 ins. wide and 3 ins. thick, each set is numbered and two men make from 86 to 90 per day. Concrete rests in molds for 24 hours and is then piled to dry. Sets have 5-ft. centers including the steel. The shaft is now down about 1350 ft. and is on an incline of 64°. It will be electrically equipped throughout. A raise of 450 ft. has holed into the shaft and has been trimmed down to shaft size. The new shaft will permit the mining of a pillar of ore, containing about 1,500,000 tons, that has been supporting the old opening. The old "C" is located on the North Norrie property 1100 ft. north of the new "C," is in the hanging wall and to a depth, vertically of 1270 ft. All the original shafts in this section were in the hanging wall and held up ore as hanging wall openings do.

MISSOURI-KANSAS.

Joplin, Mo.

The Culbert Lead & Zinc Co. has purchased the mine and lease of the Henderson Lead & Zinc Co. at Four Corners, northwest of Joplin. On the lease purchased there is a 150-ton concentrator recently completed. The ground is just now being opened up, a number of prospect drill holes having been sunk for tests. This is the second property to be taken over by this company, which opened up an ore deposit on the land of the Missouri Lead & Zinc Co. southeast of Joplin, where a new mill is being erected. Those interested in the company are A. E. Culbert and E. J. Carter of Freemont, O., and W. S. Pate of Joplin.

In the Chitwood camp the St. Regis Mining Co. is completing a 300-ton mill on virgin territory. The ground has been opened at the 180 level, at which point the formation of disseminated sheet ground has been encountered. This will be a modern steam plant and designed to handle 300 tons per shift of 10 hours. E. R. McClelland is the owner.

Taylor-Marr & Co. are opening up a good prospect on the Chas. W. Edwards land north of Joplin. The ore extends from the 90 level to 120. The ground has been well drilled out, and the production now being made has verified the early prospecting. This is the second property to be opened on this tract in the past year.

The A. W. C. Mines west of Joplin has been compelled to close down their four properties because of lack of water for milling purposes. The ground in this part of the district is very dry. Not nearly enough ground water is supplied to keep the mills running and it is necessary to impound water in ponds during the rainy season. The drought extending over a period of the last 7 weeks has caused a dearth of water in this part of the field. If it continues many more mines in the same field will be compelled to shut down.

J. C. Vaughn of Joplin, has opened what he considers one of the richest strikes southwest of Joplin that has been made for a number of years. On a lease on which three shafts have been put down, very rich ore has been found at comparatively shallow levels. The ore being hoisted is said to run from 10 to 25% zinc, and for the present is being cleaned on hand jigs. The company is contemplating

the erection of a small mill. The strike was made on the land of the Empire Zinc Co., where a number of years ago some very rich strikes were made. Associated with Vaughn are W. H. Beal of Ft. Scott, Kan., Edwin Perkins and W. R. Baker of Joplin.

Chas. W. Edwards & Co. have taken over the Fighting Wolf mine at Bellville. Within another two weeks it is expected the production will be back to its old level. The mine is located on the land of the Royal Mining Co., whose local representative is Fleming S. L'Engle.

Webb City, Mo.

Wampler & Co., operating on a lease of the Hackett land south of Duenweg, have started the third shaft in an effort to get down to ore deposits which have been thoroughly developed by drilling. The company had already lost two shafts owing to the running character of the ground. The first shaft was 25 ft. deep and the second 80. The new shaft has been started on a portion of the lease in which it is believed nothing but hard ground will be encountered.

On the same tract Ihseng & Co. are sinking a new shaft in an effort to open up a run of ore at the same level as that developed on the Wampler. The shaft is now down 35 ft. and the company is installing steam equipment to complete the sinking of the shaft. The drilling of this lease is considered nearly as good as that of the Wampler tract.

J. W. Winter and associates are starting a drilling campaign on adjoining ground and will endeavor to trace the run of ore opened up on the above leases to adjacent ground.

In the same vicinity the Greenhorn Mining Co. has opened up a good strike of ore according to the reports of the drill men.

At Wentworth east of Webb City, a company of Granby and Pierce City men are erecting a new plant on the old Mollic Gibson lease east of that city. The company has developed the ore in four different shafts and will have a large tonnage ready for the mill. The new plant will be able to handle from 250 to 300 tons per day.

Galena, Kas.

George McCullagh has started in on a drilling campaign on the old New York Zinc Co. tract at Galena, and in the first hole put down encountered 15 ft. of ore at the 250 level, from which assays show 30% zinc. The strike is so rich as to encourage the further development of the ore at these levels and a number of other holes will be put down. The ore discovered is underneath the old workings, which many years ago was considered one of the richest in the district. The extension of the ore to deeper levels was anticipated and hence the deeper drilling.

MONTANA.

Butte.

The zinc plant at Great Falls is very nearly completed and will be ready to start operations in 2 weeks. The zinc concentrator in Anaconda will be ready then to furnish product for the electrolytic plant to treat. These plants were started in September and have been completed before the time promised by the engineers in charge of their construction.

The Montana Power Co. is pushing work on the development at the Holter dam and will also add several units to the Rainbow development this year. The capacity of the plants will be increased to utilize the flow, which is now augmented by the reservoirs, which have been constructed by the company during the past few years.

During the month Butte will entertain several prominent eastern citizens. They will accompany a party piloted by John D. Ryan. Among them will be W. E. Corey, formerly president of the U. S. Steel Corporation and a director of the International Smelting & Refining Co.; R. L. Agassiz, vice-president of the Calumet & Hecla and prominent in several other large copper companies, and Charles H. Sabin, a director of the International Smelting & Refining Co. and connected with the leading copper companies. They left New York last week and are now in Northern Michigan,

where they are making a trip of inspection. From there they will go west and expect to remain in Montana until the new zinc electrolytic refinery at Great Falls is ready to start, about Sept. 1. They will also visit the different plants of the Montana Power Co. and spend a short time hunting and fishing in the upper Madison district. In addition to this party, another visit is expected either in August or September from D. C. Jackling, general manager and managing director of the Butte & Superior and Utah Copper companies, together with a number of men prominent in the Jackling properties.

Work has been resumed on the Butte & Bacorn property after a shut down of about 10 years. The buildings are being repaired and put into good condition, the bunkhouse and boarding house remodeled and made up to date in every particular and the shaft put into shape for operation. There will be some repairing to be done at the collar and a new headframe 70 ft. high, with 18 by 18 timbers, will be installed at the Calumet shaft. In order to avoid delay in running electric power to the mine, a steam equipment will be installed. This has already been ordered and it is expected to have the surface working all in shape so that the unwatering of the shaft can begin within 6 weeks. Conditions at the property are very favorable for rapid work. As soon as the Calumet shaft is unwatered the work of sinking from the 1000 level, the present depth of the Calumet, will begin and be carried on down to the 1500. The showing made in this development work will be the most important of its kind in that section, as it will be the deepest shaft north of the Butte & Superior. The company, under the reorganized form, will be known as the Great Butte Copper Mining Co. Some \$264,000 was raised and all the indebtedness of the Butte & Bacorn was paid off. There is about \$180,000 available for carrying on the new development work, and the plans are to make a thorough exploration at depth of the 278 acres of ground owned by the company through the two shafts already down. All the necessary transfers have been made by which 400,000 shares of Butte & Bacorn stock were exchanged for a like amount of Great Butte stock. A number of prominent Pittsburgh and New York mining men are interested in the enterprise and ample capital is assured to carry forward the proposed development of the property. Surface indications point to some splendid possibilities and the management expects that when crosscutting is carried on in the lower levels a mining property with as fine bodies of ore as ever were opened in Butte will be shown.

President D. K. McDonald of Brooklyn mine has decided to enlarge the mill by adding one Wellman-Seaver-Morgan chilian mill, giving a tonnage of 550 daily. The development of the mine is going ahead steadily; 240 ft. of drifting has been done opening up one drift showing 6 ft. of high-grade ore; a drift off the main tunnel of 40 ft. shows 7 ft. of ore; from a winze sunk in main tunnel has opened up a fine showing of ore. Late assays show silver, 26.34 ozs.; zinc, 3.4%; copper, 9.8%. Another assay shows silver, 33.44 ozs.; zinc, 1.8%; copper, 2.6%.

NEVADA.

Luning.

Luning Idaho Mining Co., R. B. Todd, president, and J. C. Skuse, consulting engineer, is developing a copper property in Idaho canyon, 5 miles northeast of Luning, where there is a contact vein between monzonite and silicious sedimentary rock and lime. The ore consists of copper oxides in lime, with some copper sulphides disseminated through monzonite and quartz, all running 4 to 4½% copper. The contact vein is 60 to 70 ft. wide, the ore body within it of varying width. It has been opened by shafts and tunnel levels. The contact is being opened at greater depth by driving a crosscut from the face of a 390-ft. tunnel. A good wagon road has been built from Luning to the mine, a hoist and air compressor are to be put in, and the company will soon be shipping ore. It will cost \$2 per ton to deliver the ore to cars at Luning.

Property of R. B. Todd Mining Co. adjoins that of Luning Idaho. A crosscut has been driven, cutting a diabase

dike within limestone, the dike containing iron oxides, carrying paying gold values with some silver. Some free gold is found, but most of it is associated with the iron. The group has been developed by a shaft and several hundred feet of lateral work. Some shipments have been made and they have one ready to ship. This work is under direction of J. C. Skuse.

New York canyon, southeast of Luning, is a busy part of the district, nine properties being under development and most of them making shipments, as follows: Turk & Wall Street, being operated by Wall Street Copper Co., is hauling to Luning and shipping 40 tons per day running 7 to 10% copper. The Newcastle, operated by Watson & Bachman, is shipping about 5 tons per day. The Mayflower, owned by L. L. Patrick, Goldfield, and operated under lease to Walsh & Rackliff, is shipping 25 tons per day. New York mine, leased to H. B. Lind, Goldfield, is making small shipments. Silver Guardian, owned by Frank M. Smith, Oakland, is leased to H. R. Wagner, Luning, who is shipping ore. The Vacation, owned by Dr. Plymir, is under lease and is a small shipper, as is also the Copper Reef, owned by A. C. Bachman and E. W. Watson, who have a set of leasers at work. All mining in New York canyon is by lateral development, there being no hoisting and little timbering. Most of the ore being shipped runs 6 to 10% copper.

Nevada Champion Copper Co., operating the Nevada Champion and Anderson mine, 4 miles east of Luning, is shipping 20 tons of ore per day, running 4 to 6½% copper. A. C. Bachman has direct charge, J. C. Skuse being consulting engineer.

Copper Wedge Mining Co., with H. O. Howard in charge, has put in position a gasoline operated compressor, and is developing on a monzonite-limestone contact, having opened a body of mixed copper sulphide and oxide ore, running 8 to 12% copper. The ore broken in connection with development work is being shipped.

Old Giroux mine, 7 miles east of Luning, is being operated by Calavada Copper Co., under a lease and bond, the shipments running 10 tons a day of 12 to 15% copper. This is an old mine and is the deepest in this district, the ore being taken from 700 and 1000 levels. Manager Geisendorfer is in charge.

Copper Queen, owned by estate of Fermina Sarrias, is under control of J. H. Miller, administrator, who has 12 sets of leasers at work, whose aggregate shipments amount to 10 tons per day of an average grade of 12%. Small lots have sampled 40 to 45% copper.

All properties above mentioned are situated in the several canyons east of Luning, 4 to 7 miles from town. Thus far no water is found in those canyons, all water for camp use being hauled in barrels from a 200-ft. well in Luning, the price of water at the well being 25 cts. per barrel to regular customers, and 50 cts. per barrel to transients. Ore shipments from all east side mines amount to 150 tons per day, most of which is handled by Western Ore Purchasing Co., Reno, which has a sampler at Hazen.

West of Luning are the Hartwick, Houghton and Alameda, all small shippers of copper and silver ore. The Lottie mine, an old silver property in that locality, is owned by Delmonte Mining & Milling Co., and is being worked by leasers. The ore contains chloride and sulphide of silver and lead carbonate. Development on company account is being carried on by direction of Jos. Morris of Reno.

J. C. Skuse, E. M., formerly at Wallace, Ida., owns the Kelly's Wells group, 26 miles northeast of Luning. He has a 100-ft. shaft and a 200-ft. crosscut opening disseminated copper in porphyry. The ore is oxidized to a depth of 100 ft. The property, situated 2 miles from Kelly's wells, is under bond to prospective purchasers.

Rochester.

Rochester Merger Mines Co., controlled by men identified with Reno National Bank, is pushing development from the 1360-ft. point in Friedman tunnel, and from the 970-ft. point in Pitt tunnel. The Rochester Mines Co. and Rochester Merger Co. are joint owners of Friedman tunnel, which crosscuts 1567 ft. through Merger ground. It is maintained jointly by the two companies on a 50-50 basis. Pitt tunnel

cuts 971 ft. to their veins, on which there is 950 ft. of drifting. The Sampson shoot, in one vein, yielded ore averaging 1.17 ozs. gold, 25 ozs. silver, and 15% lead; the Pitt shoot of ore, on same vein, gave a general average of 0.08 oz. gold, 15 ozs. silver, and 4% lead. This property is equipped with a new Chicago Pneumatic Tool Co. air compressor, 462-cu. ft. capacity, operated by an electric motor. Three drills are used in drifting, and one in raises. B. R. Binns, superintendent, states that one year's development has been planned. Frank Silva, a graduate of Nevada School of Mines, is doing the assaying and surveying.

Lincoln Hill mine and 2-stamp mill produced gold bullion of value of \$8000 for the first 6 months of 1916. The mine has four parallel veins, which were opened to good depth by adit levels. Most of the production is incidental to development, and it is claimed a recovery of 96 to 97% is made by amalgamation. The mine is equipped with a plant for operating air drills. Clifford Dalorme, manager, states that the ore milled ran \$150 to \$200 per ton.

Rochester Mines Co. operations are conducted mainly through a 400-ft. crosscut intersecting the Foreman, West and East veins at 600 to 680 ft. below their apexes. This is known as the transportation level. The ground above this level is well developed by raises and drifts on the veins and by crosscuts. Drifts extend both ways on these veins from the transportation level, and also from winzes which have been sunk; one winze reaches a depth of 350 ft. on the dip of the vein. These veins are fissures in rhyolite, and range in width from 2 to 30 ft. The entire property is being opened and developed at greater depth by the Friedman tunnel, 1500 ft. long, which crosscuts the formation at a vertical depth of 450 ft. below the transportation level. A number of veins have been cut by this tunnel, and raises are being made to identify them, if possible, as being the same veins as those opened above. One raise has reached a height of 290 ft., and if calculations are correct a connection may be made with a 350-ft. winze sunk on the East vein by extending the raise 270 ft. higher. The mine is producing 118 tons of ore per day, all of which is taken out through the transportation level. A surface cable tramway, 1040 ft. in length, extends from that level to loading bins, the tracks being built on a 35° incline. The ore is hauled in self-dumping skips, the loaded skip down and the empty up running in counter-balance. The ore is hauled from these bins to the cyanide plant over a narrow-gage railroad, nearly 2 miles in length. The grade of the ore is \$9 to \$12 per ton, the gold and silver existing in the ratio of about 0.04 oz. gold to 15 ozs. silver, and by pulverizing to 150 and 200 mesh, and making use of the continuous, counter-current decantation system of cyanidation, an extraction of over 92% is made. The ore contains some antimonial sulphides. The ore, after passing through a jaw crusher, is reduced to about 4 mesh in two 5-stamp batteries of 1550-lbs. stamps. This is followed by pulverizing in two 5 by 16-ft. tube mills. In order to raise the capacity of the plant from 120 to 160 tons per day, an additional tube mill and more tanks are to be put in use. The company buys power from the Nevada Valleys Power Co., paying \$8 per horsepower-month. The milling costs run \$2.25 per ton; mining, \$3; transportation, 50 cts. With the proposed increase of mill capacity, these cost figures are likely to be reduced. It is estimated that one year's supply of ore for the mill is broken and in the stopes. The grade of ore varies much from low to high, but the run of the mine gives a good average. The mine is equipped with three air compressors—1 Sullivan, 1 Fairbanks-Morse, and 1 Rix, giving the capacity of 20 drills. The Waugh stopers, and Sullivan and Ingersoll-Rand mounted Jackhammers are used. The average force employed is 70 men at mine and mill. L. A. Friedman, president of the company, is general manager; C. W. Poole is in active charge as general superintendent; mill superintendent is J. Rasmussen; assayer and chemist is G. Emminger.

Tonopah.

A strike of considerable importance is reported from the West End mine. It was made in the extreme southern portion of the mine at a depth of 600 ft., and in territory entirely virgin. At present the ore body has been opened for a width of 8 ft. with neither wall exposed. Stephanite

and ruby silver is present in considerable amounts, with large streaks of the ore assaying \$50. Developments are proceeding steadily and all indications favor the opening of a large tonnage of excellent ore.

The vein recently uncovered on the 1000 level of the Monarch-Pittsburgh is showing improvement as the drift advances and indications are favorable for development of profitable ore. The vein has been penetrated for 30 ft. and is uniformly strong. Driving of the west drift is proceeding and it should reach the ore body soon. Ventilation has been materially improved and work is proceeding.

Conditions in the Midway are improving. The west drift is beginning to cut stringers of rich quartz and appears to be approaching a good vein. The east drift is following a wide face of low-grade quartz. The crosscut on the 1100 level is showing stringers of low-grade quartz in breccia.

Sinking of the new main winze at the Rescue Eula is progressing, and as soon as the 1050-ft. point is gained, crosscuts will be extended to the Rescue Eula vein and drifts driven both ways in ore. Ore is now coming from five raises above the 950 level, and 205 tons are sent weekly to the West End mill. Arrangements have been made to thoroughly explore the Maggie May claim from the 1100 level of the main shaft. A compressor has been ordered to facilitate rapid work.

Cherry Creek.

Downey Bros., Goldfield, are installing a small oil flotation plant to treat a mill tailings dump of 10,000 tons at Nevada Star mine. These tailings contain silver, lead, zinc, gold and silver. Their equipment comprises gasoline engines, a Hardinge mill, a Callow 1-cell flotation machine and tables.

Yerington.

Empire Nevada Copper Mining & Smelting Co., under the management of J. E. Gelder, is mining and shipping 600 tons of ore per month, being a carbonate and highly silicious. The higher grade ore runs 7% copper, and other grades run $2\frac{1}{2}$ to $3\frac{1}{2}$ %.

NEW MEXICO.

Red River.

The El Oro Mining & Milling Co. has been formed by Albuquerque interests. Walter Conklin is one of the leading men and he has recently gone to Denver, Colo., where tests were made on the company's ores. Three milling processes were tried. The company expects to make arrangements for financing a mill with a capacity of 25 tons, and have it operating this fall. About 10 tons of ore a day are now being handled. The men are drifting along a vein and timbering as they go. The holding is said to run about \$35 a ton in gold and silver, and is quite accessible.

Silver City.

The Santa Rita Development Co., with an authorized capital of \$100,000, with \$2500 paid in, has recently been formed and will have its main offices here. It will operate in the Santa Rita district. H. W. Loomis, an incorporator, has been named statutory agent. Others are Elmer S. Morton, San Francisco, and W. W. Lawhon, D. A. Richardson and D. C. Bradford, Douglas, Ariz.

C. W. Henderson, U. S. G. S., reporting on this state for the first half of 1916, shows a considerable increase in the production of lead, copper and zinc. In the Mogollon district, Socorro county, which in 1915 produced 40% of the gold and 63% of the silver output of the state, the Fanny and the Last Chance cyanidation mills were operated continuously, and the Cleveland-Weatherhead mill, idle in 1915, was placed in operation in April. Gold bullion and concentrates continued to be shipped from the Elizabethtown district, Colfax county, and gold bullion from the Whiteoaks district, Lincoln county. The output of silver was affected considerably by the idleness of the Cossack cyanidation mill, in the Cochiti (Bland) district, Sandoval county. Gold-copper are continued to be shipped from Orogrande district, Otero county. The purchase by the Phelps-Dodge Co. of a large area in the Organ mountain

district, Donna Ana county, promises a future production of all five metals. Siliceous and copper ores carrying gold were shipped from the Lordsburg district in quantities that indicate an output nearly double that of 1915. The Santa Fe Gold & Copper Co.'s matting plant at San Pedro was operated continuously. The Burro Mountain Copper Co.'s flotation mill in the Burro mountain district was placed in operation in April, 1916. The Chino Copper Co.'s mill, which in 1915 produced concentrates containing 68,293,893 lbs. of copper, yielded during the first quarter in 1916 a total of 16,267,450 lbs., the total quantity of ore treated for the three months being 714,000 tons, an average of 7850 tons a day, the highest average tonnage treated by the mill since it began operations. Shipments of copper from the Magdalena district increased. Lead ore was shipped from Cooks Peak and Tres Hermanas district, Luna county; from the Central and San Simon districts, Grant county, and from the Magdalena district, Socorro county. Increased shipments of zinc carbonate and zinc sulphide concentrates were made from Magdalena, Hanover, Cooks Peak, Florida, Tres Hermanas, and Pinos Altos districts. A mill was erected in the revived Steeplerock district, Grant county, and some shipments were made.

Pinos Altos.

Plans are now being developed to consolidate all the mining interests on this side of Pinos Altos mountain, of which the Savanna holdings, the C. & O. Mining & Milling Co., and the Silver Hill properties are the important ones. These properties are contiguous and contain the class of ore which has been treated successfully during the past year in the Wright & Stauber mill.

Mogollon.

The new working shaft in Last Chance mine, operated by Mogollon Mines Co., has reached a point 100 ft. below 700 level. Good progress has been made considering character of ground. But a small quantity of water has been encountered thus far. The mill is running steadily, treating about 900 tons of ore per week. The company has inaugurated a change in its system of freight delivery from Silver City. A transfer station, including oil storage tanks, has been erected at Glenwood, some 12 miles from Mogollon, and fuel oil and other supplies are delivered there by truck, from whence they are hauled over the heavy mountain grades to Mogollon by teams. The other operators are still depending on teams or trucks for the entire trip of 80-odd miles.

Most of lumber has been delivered for terminals of aerial wire rope tramway from Pacific mine to plant of Socorro Mining & Milling Co. The ore bins and all other construction are being rushed as much as possible. Cables, buckets, etc., are all on the ground and towers practically completed. The tramway will be about a mile in length.

The Oaks Co., developing the Clifton mine, has encountered good grade of milling ore in a winze being sunk from adit tunnel level. At the Eberle mine, operated by same company, developments are also yielding mill ore. The product of both properties is shipped to custom works of Socorro Mining & Milling Co.

M. L. Nanquin, operating the oil and freight trucks between Silver City and Mogollon, reports a loaded truck-mile cost of \$0.141 based on a total of 5236 truck-miles and an average load of 6500 lbs. It is divided as follows: Repairs, \$0.008; gas and lubricating oil, \$0.033; tires, \$0.038; labor, \$0.062. Average mileage per set of tires, 1396. The grades exceed 20% for short distances in a number of places.

The proposed road from Clifton, Arizona to Mogollon is again receiving consideration. It is understood the Arizona factors will construct a first-class highway to the state line and the Mogollon interests are now running a survey from the Silver City road at Cactus Flats to determine the feasibility of the route. It is said the distance to railroad would thus be shortened by 20 miles with a reduction of \$5 per ton in freight charges. As the in and out freight for this district amounts to many thousand tons a year, the saving would be appreciable.

Delivery of machinery for the hydro-electric power plant of Socorro Power & Lumber Co. has been promised early in January, and it is now believed the plant will be in commission by April. It is designed to generate 250 hp.

OREGON.

Grant Pass.

The Layton placer mine has been sold to Austin Wilson, Boston, Mass., and is now being operated under Superintendent Lester Layton, with a full crew of men. The mine is located on Williams creek. It has been a producer for more than 40 years. There are 38 miles of ditches with the mine, and the water rights are rated as being valuable. The streams from which the water is taken are of such magnitude as to make it possible to carry on active mining operations all the year round. The water is delivered to the hydraulic giants under a head of 300 ft. The property consists of 600 acres of land. The mine will be owned and operated by the Pacific Placer Co., of which Wilson is general manager. It is Wilson's idea to consolidate the Layton mine with a tract of 400 acres adjoining and owned by the Pacific Placer Co., and operate the two properties under the same management, thus making the entire tract to include 1000 acres of land. The property is situated in the Applegate-Williams district, and is easily reached by an auto drive of an hour from this city.

Selina.

On Eight Dollar mountain E. D. Hagen took some samples of what he thought was chrome-iron. These were proved to be tungsten containing the mineral wolframite and some scheelite. Now in company with J. F. Sanders of Roseling steps are being taken to develop the property. The ledge is said to be 20-ft wide and 10-ft. test pits have been put down.

Sumpter.

The Buck Gulch mine has completed its surface work and of the 30 men formerly on the pay roll only a few are left now and these are doing underground development work.

R. W. Derby has brought suit against Thomas and Clair Bessler to attain the rights to dredging ground. Formerly Besslers were plaintiffs in a suit against Derby, but did not gain their ground. For that reason they have hindered Derby's operations on the ground in question and Derby is endeavoring to restrain Besslers from such action.

SOUTH DAKOTA.

Custer.

Norman, Tembath, Holstein and Rule have secured a lease on the American Express group. The ore bodies that will be worked follow on the quartzite over into Blacktail gulch and are on the same level as those in the Wells Fargo group, on which they also hold a lease. The American Express will be worked from the Sheeptail side, and the lessees will work the Wells Fargo from that side also. It is their intention to soon resume work in the Imperial shaft on Blacktail, unwater it and also do some work in the Wells Fargo from that shaft. The work of taking the water from the Imperial shaft was abandoned early in the spring, because there was at that time so much water coming into the workings from surface. They have ordered a new pump, but delay followed its delivery, and it may be a couple of weeks before it can be placed in position. When the work of draining the workings which are controlled from the Imperial shaft on Blacktail starts, it will be rushed until the job has been completed, and will make a very large number of ore bodies in that district available at depth.

Central City.

Shaft sinking at the Hidden Treasure Mining Co. is progressing under Supt. Fish. A depth of 285 ft. has been reached. It is the intention to continue to the 500 level a system of crosscutting and drifting, for development will be pursued. The hoisting and air-compressing equipment, gas-line driven, is working satisfactorily. On the 200 level crosscuts were run east and west for 107 ft. The east crosscut was in ore throughout, but in the west the ore came and

went, indicating that the work was being prosecuted along the apex of the ledge. For this reason it was determined to go deeper, where the solid body of the ledge may be prospected. The fact that the gold values were higher in the east than in the west crosscut led to the conclusion that better grade ore would be encountered at depth, as values are found to be higher where the ore body is more solid and unbroken.

UTAH.

Tintic.

In sinking the shaft of the Eagle & Blue Bell from the 1700 to the 1850 level, it encountered high-grade ore at a depth of 1832 ft. This is declared to be high grade lead-silver, and at present the entire shaft is in the ore. After sinking the main shaft to the 1700 a winze was sent down 80 ft., being in ore the entire distance, and the bottom of the winze was in ore when the work stopped. This is fully 200 ft. away from the shaft. The ore in the shaft runs about \$35, carrying 28% lead and 12 ozs. silver. It is believed that the water level is fully 225 ft. below where the present work is being carried on.

Orders have been issued by the smelter to allow the Iron Blossom to increase its output of copper ore. The winze from the 600 level at the property which encountered copper ore the first of the year has again encountered some high-grade ore at a depth of 1170 ft. This ore is running around 10% copper and will add considerable to the tonnage of the property.

C. F. Sherwood, metallurgical engineer, has been making a number of tests on Tintic ores with the flotation process. He finds that most of the ore yields readily.

On the 2200 level of the Grand Central mine some good-grade copper ore has been encountered and the greater part of the shipments are coming from there. This ore runs 6 to 7% copper and there is quite a large body.

At the Gold Chain some good ore is being mined from the drift of the 1500 level of the Lower Mammoth shaft. A winze has been sunk 150 ft. and it is understood that work will be started shortly from the 1800 level of the Gold Chain to get under this ore. This could be done with about 300 ft. of work.

James B. Allen and M. J. McGill have secured a bond and lease on the Deprezin group of claims adjoining the Centennial Eureka and work will shortly be started on this property.

In order to solve the ventilation question quickly the Tintic Standard will install a large blower fan in the old shaft. The new shaft is now down 75 ft. A new compressor is being installed at the new shaft and three shifts will shortly be put to work. A carload of ore a week is being shipped. The drift on the 1600 level has already cut the ore for 60 ft. and another drift for 18 ft.

North Star.

H. B. Cole, who has just returned from a visit to the Paloma says that the vein on the 500 level is now 7 ft. wide and at least 4 ft. is of good ore. A station is being cut and the ore drifted on. It is also the intention to sink the shaft to the 600 level.

The Cedar-Talisman management intends installing a dry process for the treatment of the low-grade zinc ore. Officials of the company are now in Los Angeles looking into the tests being made. It is declared that the company now has 50,000 tons of low grade ready for treatment.

Lincoln.

Over 50 cars of ore have been shipped from the Creole property since it was leased to Dern & Griggs. A new hoist recently arrived on the ground and is being installed.

The ore body has been struck on the 155 level at the Croff property. This is 100 ft. below where it was encountered in the 55 level and from 2½ ft., which the fissure was there, it has widened out to 9 ft. The fissure carries a large amount of galena and lime spar. Machine drills are now opening up the ore and in 16 ft. along the strike of the ore,

the average samples, which are sulphides, carried 30% zinc, 21% lead, 1.5 ozs. silver, and 40 cts. gold.

American Fork.

At a recent meeting of the directors of the Mineral Flat Mining Co., controlled by Jesse Knight, it was decided that work be resumed at once on the property, which is at the head of American Fork canyon. To carry out the work the 146,976 shares in the treasury are to be sold to the stockholders at 4 cts. a share, 17 shares going to each 100 shares held. The offer stands to Aug. 10. Mineral Flat is the best equipped property in the district having ample accommodations for 50 men, the property is electric lighted from its own power plant and a large amount of work has been done.

The Silver Flat property has started operations. The tunnel shows some molybdenum.

The American Fork Development & Mining Co. has started operations in the tunnel on its ground which shows a large deposit of hematite iron.

C. W. Earl, who has a lease and bond on the Austin patented claim between the Earl-Eagle and the Globe Con. has two shifts at work cleaning out the old tunnel.

Another car of silver-copper ore has just been marketed by the Fissures Exploration Co., which has a 10-year lease on the Pacific property. The shipment contained 51 tons which averaged 0.035 oz. gold, 124 ozs. silver, 3.91% copper, 24.6% iron and 27.4% sulphur. The stope at the end of the north drift is now up 40 ft., and is still in good ore. New bins have been put in at the mine and a large amount of milling ore is being added to the dump.

All the tables for the new 60-ton mill at the Dutchman mine on Dutchman Flat are now at the property, and the shafting and other machinery which was purchased from the New England Co. at Bingham is now in the shop, being overhauled ready to install. The tunnel has been cleaned out and retimbered for 800 ft.

It is understood that the Fissures Exploration Co. will start suit against Peter Miller and Bert Durrant, locators of the Copper Glance property adjoining the Pacific property on the north. Miller and Durrant were in charge of the development of the Pacific at the time they located the ground.

Big Cottonwood.

At the South Cardiff property trenching is being carried on to find the intersection of the Cardiff and Howell fissures. It is believed that the intersection will be found either on the Peak or Beauty claims.

At the Reeds Peak two shifts are moving ahead at the rate of 8 ft. a day. The tunnel is in about 900 ft. and it is estimated that the Birthday fissure will be encountered at 936 ft.

Ore from the Cardiff is being hauled by teams to the big ore bins recently erected by the Cardiff at the mouth of South Fork, and from there to the smelter at Murray the ore is being taken down by tractors. Three trains consisting of a tractor and seven trailers for the first two trains, and a tractor and four trailers for the third train. The last train was loaded with timbers and made the trip in 6 hours. The trailers hold 5 to 6 tons, and from 250 to 300 tons of ore a day are to be hauled. The tractors are also being used for hauling ore from the Maxfield mine.

Alta.

The Triangle lease on the Michigan Utah property is sending out from 1 to 3 cars of ore a day, or an average of about 80 tons. In the old workings some high-grade copper ore running from 3½ to 4% is being opened up. From leasing operations alone the company is receiving from \$2000 to \$3000 a month. At the same time there is considerable work being done on company account.

The East Hecla Mines Co. has started operations in the 100-ft. shaft. Supt. David J. Cook is grading for a permanent tunnel site and buildings. The company owns 150 acres in Alta.

General Manager R. O. Dobbs of the Cottonwood Atlantis believes that before long ore will be encountered in the Contact tunnel. This tunnel was driven about 125 ft. by former operators, and where a turn was encountered in the contact it was lost, and about 25 ft. was driven in the quartz-

ite. The new management started working where the quartzite was first encountered, since which time the tunnel has been directed along the contact. The ground is now softer and the mineralization has been increasing.

In the Sells ground the company is driving a raise on Wedge fissure up from 1200 level. This fissure has yielded the rich ore in the South Hecla and the lime formation is declared to be identical in the Sells.

The Alta Con. is breaking down a car of ore a week and is also doing a large amount of development work.

There is considerable talk of the South Hecla taking over the property of the Albion Mining Co. George H. Watson is general manager. The South Hecla has 250,000 shares in its treasury with which to take over the property.

Bingham.

The Utah Apex mine is earning close to \$500,000 a quarter at present. The last quarterly report for the quarter ending May 31, 1916, showed net earnings of \$417,948 and since then it is declared there has been an improvement.

Shipments from the Lark side of the Bingham Amalgamated are now at the rate of 150 tons of ore a week. The ore is running around 5 to 6% copper, 50 cts. to \$1.50 in gold and 1.5 to 3 ozs. in silver.

The Yosemite Mines Co., a subsidiary of the Bingham Mines Co., is shipping ore regularly and is opening up some good ore bodies it is declared.

The Congor mine at Bingham, which has been idle for many years, is now shipping a car of ore a day from an old incline at a depth of about 200 ft. This will average 6% lead with values in gold and silver. Since work started the company has shipped 2000 tons of ore.

It is understood that an apex suit will probably be filed by the Utah Metal & Tunnel Co. against the New England Gold & Copper Mining Co. of Massachusetts. The suit was prepared several years ago and never filed.

Park City.

Supt. John Forsman of the American Flag mine says that the ore in the Easter raise has widened out to 8 ins. The property is now operated under a lease and bond to the Park City Mines Co. A shipment will be made in a few days.

In a letter to the stockholders of the Big Four Exploration Co., President M. P. Kirk says that the engineers figure the tailings deposit at the Atkinson mill owned by the Big Four, will return net profits of approximately \$180,000 a year or 45% on the par value of the stock.

Mining operations have been resumed on the Revelator property in the Samke Creek end of the district.

Gold Strike.

Miners at the Gold Strike Bonanza ground in the gold camp of Gold Strike are preparing to develop a 2½-in. streak of ore that pans unusually high. This is at a depth of 50 ft. The shaft is down 84 ft. and the bottom is in a good quartz that is also showing values. Work has been resumed on the Hassaampai and several other properties in the district.

WASHINGTON.

Spokane.

Bitter opposition to the selection of Seattle as the location for the federal mining experiment station for the northwest is being aroused among the general business interests of the intermountain territory, and protests have been sent from different parts of eastern Washington and practically all of Idaho and Montana to Franklin K. Lane, Secretary of the Interior, and the congressional delegations from the three states. Commercial organizations and mining associations in the different districts have joined in the protests, and the result has been that Secretary Lane has announced that Director Manning of the federal Bureau of Mines will soon visit Spokane to personally investigate the situation. The protests are based on the contention that Seattle is not a logical site for the station, in that it is remote from all the

producing metal mining regions of the northwest, and that if the plant is located there it will defeat the government's purpose in establishing it. Different points in the intermountain region have been suggested as a site for the experimental plant, but there is a tendency to unite on any place in the mineral region that will be satisfactory to the majority, and the fight at present is being confined to convincing Secretary Lane that Seattle would not be considered in any event. Spokane is being advanced as a candidate for the station, the leaders in the movement basing their claims on the fact that the city is a recognized financial, mining and transportation center, and that many of the companies operating in the different camps in Washington, Idaho, Montana and Oregon have their head offices here. It is further pointed out that much of the ore in these districts is refractory and hard to treat, and that for this reason it is imperative that the station be located at a point convenient to the mines, else it will not be possible for the owners of the properties to avail themselves of the facilities of the station.

The Conconully and Ruby mining districts are in the north-central part of Washington, about 40 miles south of the Canadian border. The ore deposits were discovered as long ago as 1886, but the production has been small, owing to lack of transportation facilities, difficulty in treating complex ores, and the decline in the price of silver. The most valuable ore deposits in these districts consist of quartz veins which occur in schists near the areas of granite or at the contact of schist and granite. The ore minerals, pyrite, zinc blende, chalcopyrite, and gray copper, carry silver and a little gold. A report on these districts, by Edward L. Jones, Jr., just published by the Geological Survey as Bulletin 640-B, contains a study of the geology and mineralogy of the region and detailed descriptions of the individual mines and prospects.

WISCONSIN-ILLINOIS.

Platteville.

Ore shipments from mines to separating plants and smelters direct for July were:

District.	Zinc, lbs.	Lead, lbs.	Pyrites, lbs.
Benton	21,148,000	162,230	.....
Cuba	5,168,000	.....	3,104,400
Dodgeville .....	.....	80,100	.....
Galena	6,102,000	286,900	.....
Hazel Green	4,922,000	50,000	.....
Highland	1,090,000	.....	.....
Linden	4,044,000	80,000	240,000
Miffin	5,538,000	.....	86,000
Mineral Point	202,000	.....	1,103,100
Montfort	88,000	.....	.....
Platteville	3,512,000	.....	.....
Potosi	474,000	30,000	.....
Shullsburg	2,000,000	.....	.....
Totals	54,288,000	689,230	4,533,500

The net deliveries out of the field to smelter from ore refineries and mine run stuff, all high grade, aggregated 25,260,000 lbs. The Mineral Point Zinc Co. delivered 83 cars refinery ore to DePue, 6,220,000 lbs.

Stockholders of the Wisconsin Zinc Co. received dividend checks the 31st, 2%, or \$20,000. This is the second quarterly dividend on a basis of 8% per annum.

Shipments from local operators for week of Aug. 5th were light, and much concentrates, both high grade and raw ore, was carried over.

Benton.

The Frontier Mining Co. paid its regular monthly dividend of 2%, Aug. 1. A 10% additional dividend is also paid, as the surplus in the treasury justifies. The company is one of the most active of all the large operating companies in this field at present. The Calvert mine is making 3 cars of concentrates weekly from range on south side of lease, and is now opening up a new synclinal basin on the west side of the Calvert lease. Drills checking on the range show tremendous deposits of zinc ore. The Bull Moose mine, a Frontier development, is making 200 tons of 42% weekly. A new 2-compartment shaft is now in ore on the south side of the lease, and plans for a new power, mining and milling plant are being made. The Hird mine, the most recent of Frontier

developments, is still having trouble with water, forcing the management to make an upraise into the top flat now being mined and making 32% ore. The lower level is in bad ground, making operations there hazardous. New drill holes to the south on the Hird lease reveal immense deposits of zinc ores.

Seven drilling machines are employed for the Frontier at this writing on the Hird, Calvert, Treganza, Robson and Carey leases. On the last named uniform richness of strikes on the range insure another good zinc ore producer. Drills for the company on the Drill-Hole prospect meet with small runs of ore in the oil rock strata, but no basin formations have as yet been encountered. The work of exploration will continue indefinitely. On the Burr-Treganza mine production is being maintained at the rate of 175 to 200 tons of 45% weekly. Dividends are paid on a capitalization of \$30,000, at the rate of 25% monthly.

Shipments of zinc concentrates from mines of this district for week of July 29th totaled 61 cars, all current production, 5,220,000 lbs.; for week of Aug. 5th, 48 cars, 3,890,000 lbs. Much ore was carried over through a scarcity of cars. New shipping companies are the Wilkinson Mining Co. and Sally Mining Co. Others holding ore and ready to make initial deliveries are the Acker Mining Co. and Hoffman Mining Co., both with new equipment. Drilling operations continue in this district for several new companies, and nearly all the regular producers. Shafts are down in ore for the Greater Mining Co., Domestic Mining Co. and Buchan Mining Co. On the last named a 100-ton mining and power plant is being planned. Longhenry-Mining Co., operating the Spenseley lease, has several cars ready for shipment and ground well opened up. A larger power and milling plant is immediately necessary.

Highland.

Shipment of carbonate zinc ore was made last week by the New Jersey Zinc Co. from company mines to Mineral Point, 2 cars, 60 tons. A new milling plant was set in operation at the Saxe-Lampe mine. Another goes into commission soon on the Kennedy mine.

Linden.

Linden Zinc Ore Separating Co. reported no sales last week. Milwaukee-Linden, Ross Bros. and Saxe-Pollard each shipped to Mineral Point and Hinkle mine, 1 care to Cuba. Spring-Hill Mining Co. started up with a new plant the first of this week. Another new plant is building for the Mineral Point Development Co.

Miffin.

Shipments last week came from the Peacock mine to American Metals Co., 38 tons; Lucky Six to LaSalle, 2 cars, 82 tons; Biddick mine to Benton, 2 cars, 81 tons; Coker mines to Mineral Point, 7 cars, 281 tons; Rundell mine to Cuha, 2 cars, 82 tons. Goodsell Billings Co. made their initial shipment last week, 1 car high grade to LaSalle, 25 tons. M. & A. Mining Co. has a new plant in commission on the Big Tom mine. Another new plant is nearing completion for the Vinegar Hill Co. on extensions of the Rundell ranges mined successfully the past 8 years.

Mineral Point.

Shipments of zinc ore for week of Aug. 5th totaled 119 cars from mines, 4662 tons. Lead ore from the Fields mine, 80,000 lbs.; Nels Snow Linden, 77,970; Champion, 40,000 lbs.; Winskill, 30,000 lbs.; Blackstone, 80,000 lbs.; Fox, 86,000 lbs.; Utt-Thorne, 60,000 lbs.; all to Federal Lead Co. Shipments of pyrites were light, 478,900 lbs. The gross recovery mine run for the week aggregated 7,748,000 lbs.; net refined ores to smelters, 4,040,000 lbs. The Mineral Point Zinc Co. shipped 16 cars high-grade refinery product to smelter at DePue, 600 tons. Both top and high-grade ores slumped \$5 during the week, 60% ore going at \$60 basis. Second and medium ores, \$52 for grades as low as 50% zinc. Low-grade ores were in better demand. Receipts of raw ore and refineries of the New Jersey Zinc Co. for the week, 31 cars, 1164 tons. Heavy importations of carbonate, silicate and low-grade calcined blende ores from far western states and Mexico continue. Locals delivered 41 tons to furnaces.

Cuba.

Receipts of raw ore ran exceptionally high at the National Ore Separators, 27 cars, 1073 tons; 6 cars came from low-grade independent operators. Shipments of high-grade

out to Illinois Zinc Co., 4 cars, 148 tons; Granby Con., 6 cars, 219 tons; Utt-Thorne Mining Co. to Benton Roasters, 2 cars, 80 tons.

Montfort.

The O. P. David, reported shut down, resumed shipping this week sending 1 car to Cuba for separation, 44 tons. Work in the mine has been resumed.

Hazel Green.

The Kennedy mine continues shipping, last week clearing 4 cars, 130 tons; Monmouth Zinc Co. to Mineral Point, 39 tons. Cleveland mine, reported exhausted, recovered with 3 cars, 123 tons, to Galena. Lawrence to Galena, 6 cars, 245 tons.

Galena.

Black-Jack mine, going steadily once more, shipped 3 cars last week to Mineral Point, 112 tons; Galena Refinery Co. to LaSalle, 30 tons; to Lanyon Zinc Co., 40 tons; Edgar Zinc Co., 3 cars, 130 tons. The Graham mine of the Vinegar Hill, with its initial shipment to Cuba, 2 cars, 83 tons; North Unity to Cuba, 3 cars, 122 tons; Wisconsin Zinc Roasters to LaSalle, 3 cars, 108 tons. Great Western Lead Mfg. Co., after years of successful production of zinc ore and the payment of nearly \$400,000 in profits, has become involved in litigation. The Great Western mine, it is claimed, is exhausted. New leaseholds are being prospected. James Billingsley is engaged with drills on the Hess farm on the crest of Pilot Knob.

WYOMING.

The Mondell bill for the leasing of oil and gas lands on Indian reservations in Wyoming has been approved by Secretary Lane and the Public Lands committee, Washington, D. C., and has been introduced in Congress. The bill provides that the Secretary of the Interior is empowered to lease for the production of oil and gas, lands within the ceded portion of the Shoshone or Wind River Indian reservation, under such terms and conditions as shall be by him prescribed; and the proceeds or royalties arising from such leases shall be first applied to the extinguishment of any indebtedness of the Shoshone Indian tribe, and thereafter shall be applied to the use and benefit of said tribe in the same manner as though secured from the sale of said lands, as provided by the Congress, March 3, 1905. The leases granted under this act shall be conditioned upon the payment by the lessee of such royalty as may be fixed in the lease, which shall not be less than 10% in amount or value of the production and the payment in advance of a rental of not less than \$1 per acre per annum during the continuance of the lease. The rental paid for any one year is credited against the royalties as they accrue for that year. Leases shall be for a period of 20 years, with the privilege for the lessee to renew the same for successive periods of 10 years each upon such terms as may be prescribed by the Secretary of the Interior, unless otherwise provided by law at the time of expiration of any such period. Leases shall be irrevocable except at the end of the terms. They may be forfeited by an appropriate proceeding in the United States district court for Wyoming whenever the lessee fails to comply with the terms and conditions.

CANADA.

BRITISH COLUMBIA.

Nelson.

Dr. W. H. Willson, Barney Crilley, H. Y. Anderson and Thomas Gough, lessees of the Granite-Poorman mine, have completed their cleanup at the mill, and the property is now ready to be taken over, mill and mine, by the Spokane and Butte capitalists who recently bonded it and who have already paid \$10,000 down. The bondholders of the mine are John McGinnis of Butte, W. E. Cullen and R. A. Carnochan of Spokane. The purchasers have men at work on the surface preparing for development which is to be undertaken in the Poorman and Hardscrabble workings.

ONTARIO.

Cobalt.

Eight mines in this district shipped 490.37 tons during the week ended July 9, and this is noted as the largest production for some time past. McKinley-Darragh led and shipped 4 cars, containing an aggregate of 317,400 lbs., and Nipissing, 4 cars, containing 263,000 lbs. Casey Cobalt was on the list with 1 car, consigned to Deloro. All 4 cars from Nipissing went to Welland, and of those from McKinley-Darragh, 3 went to Perth Amboy and 1 to Marmora. The shipment from O'Brien went to Marmora also. Both Beaver and Temiskaming shipped to Thorold. Nipissing was the only bullion shipper during the week, sending out 96 bars containing 112,210.80 ozs., valued at \$72,357.97.

At the King Edward mill the old concentrating machinery is being taken out and will be replaced by the Callow flotation machines. It is the intention to dredge the tail's of the old plant from the lake and retreat them, as extraction by the old plant was very low. It is possible that, providing results are as good as anticipated, some of the dump rock will be crushed and treated. The King Edward property proper is being explored by the National Mines, Ltd., which has a lease on the King Edward, but it is understood that one of the local customs concentrating companies has made arrangements with the former company regarding the tailings and dump.

In a letter sent to stockholders of Temiskaming the following is given: "The main shaft has reached depth of 1180 ft., a working station having been cut at the 1150 level. We shall continue sinking until the lower contact between diabase and keewatin is reached, which we have proven exists at a depth of 1600 ft. Then we shall commence the development of this lower contact. On the upper levels of the mine work is progressing favorably and we are recovering some high grade. Some surface work in the way of trenching is being done on the Gans lot, as well as on the McDonald claim at North Cobalt. No work is being done at the present time on the North Dome property in Porcupine. We recently leased our Red Jacket claim to a syndicate who are dewatering the shaft in anticipation of development." The statement shows that the company is in a good financial position, with \$170,210.02 cash on hand, bullion in storage of 311,922.84 ozs., ore in smelters, 90,276.14 ozs., making a total of 502,287.98 ozs., which, valued at present prices of silver, is worth over \$300,000. From this the present dividend of \$75,000 must be deducted.

Kirkland Lake.

A 7-drill Ingersoll-Rand compressor has been ordered for the Lake Shore mine. The new compressor will be power and belt driven. As soon as installed it can be run by steam and when the Northern Ontario Light & Power Co.'s transmission line is completed electricity will be used. According to latest estimates made the ore reserves now blocked out are in the neighborhood of \$300,000 and as yet only about 10% of the known fractured area has been prospected. The extent of the large ore body struck in drifting on the 100 and 300 levels is not known, but the management is confident that it persists to greater depth. Sinking to lower levels will be resumed on the completion of the installation of new machinery, including the compressor, a new headframe, hoist and cage. The property was closed down a month ago to allow for the installation, which will, it is expected, be completed in September. When work was stopped the face of the West drift on the 300 level was in \$53 ore and that on the 100 level was in good milling ore. As to the building of a mill, the management proposes to wait for a few months of further development before definite action is taken, but an efficient 60-ton mill has been arranged for.

Matheson.

In the mining districts about Cobalt and Porcupine brush fires have started again and the death toll has been noted at various figures, from 134 to 450. The Croesus mine, 10 miles from here, has had its surface plant swept clean and reports state variously between 5 and 10 of the company staff are unaccounted for.

World's Index of Current Literature

A Weekly Classified Index to Current Periodical and other Literature, Appearing the World Over Relative to Mining, Mining Engineering, Metallurgy and Related Industries, in Four Parts.

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Part 2. *Ores and Metals*—(a) Metals and Metal Ores; (b) Non-Metals.

Part 3. *Technology*—(a) Mines and Mining; (b) Mill and Milling; (c) Chemistry and Assaying; (d) Metallurgy; (e) Power and Machinery.

Part 4. *General Miscellany* (including Testing, Metallography, Waste, Law, Legislation, Taxation, Conservation, Government Ownership, History, Mining Schools and Societies, Financial, etc.

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- (6) Number of pages. Illustrated articles are indicated by an asterisk (*).
- (7) The price.

I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Draper, David.—*De Launay on Rand Gold*. [A discussion of De Launay's theory on the origin of gold in the conglomerates of the Rand district, South Africa].—Mg. Mag. July 1916; p 26; pp 5; 50c.

Fath, A. E.—*An Anticlinal Fold Near Billings, Noble County, Oklahoma*. [The geology and formation of the anticline is described relative to the possibilities of oil and gas which is found 20 miles from the anticline].—U. S. G. S. Bull. 641-E; pp 18*.

Mellor, E. T.—*The East Rand South Africa*. [A description of the formation of the country].—S. Afr. Engg. June 1916; p 102; pp 2½*; 35c.

Parodi, Lorenzo.—*Notizie Sulla Metallurgia del Nickel Importanza del Nickel nell'odierna Metallurgia*. [Notes on the metallurgy of nickel today. Deals with the situation and methods employed in the principal producing countries].—Metallurgia Ital. May 31 1916; p 365; pp 14; No. 1.

Purinton, C. W.—*Precious Stones in the Urals, Russia*. [A description of the deposits and their location].—Mg. Mag. July 1916; p 24; pp 2*; 50c.

Toso, Pietro.—*Sul Modo di Formazione dei Giacimenti Petroliferi e Soliferi*. [On the method of formation of petroliferous and sulphurous materials].—Ind. Chim. Min. & Met. June 10 1916; p 177; pp. 5; June 25; p 193; pp 3¾*; 70c.

Wade, Arthur.—*Petroleum Prospects on Brundy Island, Tasmania*. [Deals with the geology and possibilities there].—Tasmania Parliament Report No. 60; pp 6*; 50c.

Way, Herbert, W. L.—*The Minerals of Sze-Chuan, China*. [Brief description of the deposits, their possibilities and operation. Salts have been mined, petroleum is plentiful and gold, silver and copper give promise].—Mg. Mag. July 1916; p 20; pp 4*; 50c.

II. ORES AND METALS

(I) METALS AND ORES

Alloys

Broniewski, M. Witold.—*Sur la Structure des Alliages Cuivre-Zinc et Cuivre-Etain*. [A metallographic study on copper-zinc and copper-tin alloys].—Metallurgie French Nov. 1915; p. 951; pp 29*; 50c.

Carnell, W. C.—*Acid Resisting Alloys*. [A paper read before the American Inst. of Chem. Eng. Deals with the properties of duriron, tantiron and the like].—Iron Age July 27 1916; p 182; pp 1¼; 30c.

—*Utilization of Zinc*. [Abst. from an article in the bulletin of the Imperial Inst. The uses of spelter, zinc dust, zinc alloys and pigments are taken up separately].—Canadian Mg. Jnl. July 15 1916; p 342; pp 2; 35c.

Chromium

Richards, J. W.—*The Metallurgy of the Rarer Metals*. [Abst. from a paper read before the American Inst. of Chem. Eng. Discussing the importance of the future of magnesium, chromium and other metals].—Mg. World July 15 1916; p 93; pp 1¼; 10c.

—*Rhodesia Report of the Executive Committee of the Chamber of Mines and Production of Gold and Other Minerals in May 1915*. [The production of operating gold companies is given individually].—Rhodesia Chamber of Mines Report May 1916; pp 6.

Copper

Broniewski, M. Witold.—*Sur la Structure des Alliages Cuivre-Zinc et Cuivre-Etain*. [A metallographic study on copper-zinc and copper-tin alloys].—Metallurgie French Nov. 1915; p 961; pp 29*; 50c.

Hurja, E. E.—*The Ketchikan District, Alaska*. [Reviews the progress and operations of the principal mines].—M. & S. P. July 29 1916; p 163; pp 3*; 20c.

Way, Herbert, W. L.—*The Minerals of Sze-Chuan, China*. [Brief descriptions of the deposits, their possibilities and operation. Salts have been mined,

petroleum is plentiful and gold, silver and copper give promise].—Mg. Mag. July 1916; p 20; pp 4*; 50c.

Parodi, Lorenzo.—*Notizie Sulla Metallurgia del Nickel Importanza del Nickel nell'odierna Metallurgia*. [Notes on the metallurgy of nickel today. Deals with the situation and methods employed in the principal producing countries].—Metallurgia Ital. May 31 1916; p 355; pp 14; \$1.

Willis, Charles F.—*Mining in Arizona*. [A review of operations mostly at the copper mines of the district].—M. & S. P. July 29 1916; p. 157; pp 3*; 20c.

—*Rhodesia Report of the Executive Committee of the Chamber of Mines and Production of Gold and Other Minerals in May 1916*. [The production of operating gold companies is given individually].—Rhodesia Chamber of Mines Report May 1916; pp 6.

Gold Fields and Mining

Draper, David.—*De Launay on Rand Gold*. [A discussion of De Launay's theory on the origin of gold in the conglomerates of the Rand district, South Africa].—Mg. Mag. July 1916; p 26; pp 5; 50c.

Gudgeon, C. W.—*The Scheelite Gold Mines of Otago, New Zealand*. [Several properties are described. In each the ore body, milling process and milling and mining costs are dealt with].—Proc. Aus. Inst. M. E. No. 21 1916; p 37; pp 14*; 65c.

Hurja, E. E.—*The Ketchikan District, Alaska*. [Reviews the progress and operations of the principal mines].—M. & S. P. July 29 1916; p. 163; pp 3*; 20c.

Miller, Benjamin Leroy; Singewald, J. T.—*The Gold Mines of Brazil*. [The two most noted mines are described. The power question, mining and refining of the ore are dealt with].—E. & M. J. July 29 1916; p 207; pp 5*; 25c.

Scott, W. A.—*Commonwealth Mine and Mill, Pearce, Arizona*. [Gives details on operations and description of methods used].—Mg. World July 29 1916; p 187; pp 1½*; 10c.

Way, Herbert, W. L.—*The Minerals of Sze-Chuan, China*. [Brief description of the deposits, their possibilities and

operation. Salts have been mined, petroleum is plentiful and gold, silver and copper give promise].—*Mg. Mag.* July 1916; p. 20; pp 4*; 50c.

— *Gold Dredge at Hammon, California.* [Reported as the largest ladder dredging bucket constructed].—*Engg. Rec.* June 24 1916; 20c.

— *Rhodesia Report of the Executive Committee of the Chamber of Mines and Production of Gold and other Minerals in May 1916.* [The production of operating gold companies are given individually].—*Rhodesia Chamber of Mines Report* May 1916; pp 6.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron and Steel

Carnell, W. C.—*Acid Resisting Alloys.* [A paper read before the American Inst. of Chem. Eng. Deals with the properties of duriron, tantiron and the like].—*Iron Age* July 27 1916; p 182; pp 1¼; 30c.

Harbord, F. W.; Hall, J. W.—*Metalurgy of Steel.* [An up-to-date review of practice in steel metallurgy].—*Lippincott Co.*; book; pp 933; \$12.50.

Sauveur, Albert.—*Detecting Alumina Inclusions in Steel.* [A microscopic investigation as to the occurrence and appearance of alumina particles].—*Iron Age* July 27 1916; p 180; pp 2*; 30c; *I. Tr. Rev.* July 27; p 179; pp 2*; 25c.

— *German Steel Syndicate and Cartells.* [The syndicate, its formation, operation and effects on the industry].—*I. & C. Tr. Rev.* July 7 1916; p 1; pp 4; 35c.

— *Pacific Coast Steel Co.'s Plans.* [The plants described are located at both Seattle, Wash., and San Francisco, Cal.].—*Iron Age* July 27 1916; p 175; pp 4½*; 30c.

Iron and Steel: Foundry and Furnace Practice

Harbord, F. W.; Hall, J. W.—*Metalurgy of Steel.* [An up-to-date review of practices in steel metallurgy].—*Lippincott Co.*; book; pp 933; \$12.50.

Johnson, J. E., Jr.—*Blast Furnace Irregularities and Their Treatment.* [Treats on the troubles of the water supply to the water jackets].—*Met. & Chem. Engg.* Aug. 1 1916; p 127; pp 3½; 35c.

— *Pacific Coast Steel Co.'s Plants.* [The plants described are located at both Seattle, Wash., and San Francisco, Cal.].—*Iron Age* July 27 1916; p 175; pp 4½*; 30c.

Lead

Hodgkinson, H. H.—*Mining Ore from Pillars.* [A method used by the New Jersey Zinc Co. It is a combination where top-slicing is begun at the bottom of the body and raised from level to level by shrinkage stoping].—*E. & M. J.* July 29 1916; p 217; pp 2½*; 25c.

Parodi, Lorenzo.—*Ricordi e Note Sulla Metallurgia Italiana.* [A record of the metallurgical production of metals in Italy during 1914 and 1915].—*Metallurgia Ital.* April 30 1916; p 260; pp 15; \$1.

Verne, C. E.—*Zinc's Record Breaking Year.* [A review of the first part of 1916 in the Joplin district].—*Zinc & Lead Jnl.* June 1916; p 3; pp 2*; 20c.

Whitaker, W. A.; Belchic, George; Neal, Roy; Van Velzer, H. L.—*Flotation Experiments on a Joplin Tailing.* [The results from using a number of different

oils are tabulated and discussed. Testing was done with 400-gm. samples].—*Met. & Chem. Engg.* Aug. 1 1916; p 131; pp 7; 35c.

— *United States Metals Refining Co.'s Plant, Grasselli, Indiana.* [A description of the steam and electric power plants at the electrolytic lead refinery].—*Pract. Eng.* Aug. 1 1916; p 641; pp 4½*; 20c.

Nickel

Guess, G. A.; Lathe, F. E.—*An Investigation Into the Flowing Temperatures of Copper Mattes and of Copper-Nickel Mattes.* [A number of tests and investigations to determine the temperature at which the two mattes will flow].—*Bull. A. I. M. E.* June 1916; p 1067; pp 6*; 35c.

Parodi, Lorenzo.—*Notizie Sulla Metallurgia del Nickel Importanza del Nickel nell'odierna Metallurgia.* [Notes on the metallurgy of nickel today. Deals with the situation and methods employed in the principal producing countries].—*Metallurgia Ital.* May 31 1916; p 355; pp 14; \$1.

Parodi, Lorenzo.—*Ricordi e Note Sulla Metallurgia Italiana.* [A record of the metallurgical production of metals in Italy during 1914 and 1915].—*Metallurgia Ital.* April 30 1916; p 260; pp 15; \$1.

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Scott, W. A.—*Commonwealth Mine and Mill, Pearce, Arizona.* [Gives details on operations and description of methods used].—*Mg. World* July 29 1916; p 187; pp 1½*; 10c.

Way, Herbert, W. L.—*The Minerals of Sze-Chuan, China.* [Brief description of the deposits, their possibilities and operation. Salts have been mined, petroleum is plentiful and gold, silver and copper give promise].—*Mg. Mag.* July 1916; p 20; pp 4*; 50c.

— *Rhodesia Report of the Executive Committee of the Chamber of Mines and Production of Gold and Other Minerals in May, 1916.* [The production of operating gold companies are given individually].—*Rhodesia Chamber of Mines Report* May 1916; pp 6.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Broniewski, M. Witold.—*Zur la Structure des Alliages Cuivre-Zinc at Cuivre-Etain.* [A metallographic study on copper-zinc and copper-tin alloys].—*Metalurgie French* Nov. 1915; p 961; pp 29*; 50c.

Matheson, A. M.—*Notes on the Chemical Assay of Tin Ores.* [Discussion of the chemical and fire assay of pyritic tin ores show that mill losses cannot be estimated by vanning and the fire method].—*Proc. Aus. Inst. M. E.* No. 21 1916; p 1; pp 7; 65c.

Stannard, O. J.—*Chemical Methods of Extraction.* [Deals with the chemistry and brief description of thermic, electro and hydro metallurgical processes. A discussion of costs is also given].—*Mg. Mag.* July 1916; p 15; pp 5; 50c.

Zinc

Broniewski, M. Witold.—*Sur la Structure des Alliages Cuivre-Zinc at Cuivre-*

Etain. [A metallographic study on copper-zinc and copper-tin alloys].—*Metalurgie French* Nov. 1915; p 961; pp 29*; 50c.

Engle, Robert H.—*The Engle Furnace for Redistilling Spelter.* [The operation and construction of the furnace is described].—*E. & M. J.* July 29 1916; p 213; pp 1¼*; 25c.

Gilbert, J.—*Costs and Profits of an Up-to-Date Spelter Works.* [A practical consideration of the subject and operations connected therewith].—*Mg. Jnl.* July 15 1916; p 496; pp 1¼; 35c.

Hand, J. H.—*Arkansas Mining Industry Grows.*—*Zinc & Lead Jnl.* June 1916; p 7; pp 2; 20c.

Hodgkinson, H. H.—*Mining Ore from Pillars.* [A method used by the New Jersey Zinc Co. It is a combination where top-slicing is begun at the bottom of the body and raised from level to level by shrinkage stoping].—*E. & M. J.* July 29 1916; p 217; pp 2½*; 25c.

Muth, E. G.—*Great Increase in Spelter Production.* [A review of production for the first half of 1916].—*Zinc & Lead Jnl.* June 1916; p 5; pp 2½; 20c.

Orr, Charles T.—*Progress in Our Zinc Mines.* [Deals with progress in the mines of the Missouri-Kansas-Oklahoma district].—*Zinc & Lead Jnl.* June 1916; p 16; pp 2*; 20c.

Parodi, Lorenzo.—*Ricordi e Note Sulla Metallurgia Italiana.* [A record of the metallurgical production of metals in Italy during 1914 and 1915].—*Metallurgia Ital.* April 30 1916; p 260; pp 15; \$1.

Shiras, Thomas.—*Great Activity in the Northern Arkansas Zinc Fields.* [A review of activities during the first half of 1916].—*Mg. World* July 29 1916; p 179; pp 30*; 10c.

Verne, C. E.—*Zinc's Record Breaking Year.* [A review of the first part of 1916 in the Joplin district].—*Zinc & Lead Jnl.* June 1916; p 3; pp 2*; 20c.

Whitaker, W. A.; Belchic, George; Neal, Roy; Van Velzer, H. L.—*Flotation Experiments on a Joplin Tailing.* [The results from using a number of different oils are tabulated and discussed. Testing was done with 400-gm. samples].—*Met. & Chem. Engg.* Aug. 1 1916; p 131; pp 7; 35c.

(I) NON-METALS

(A) FUELS

Coal Fields and Mining

Parodi, Lorenzo.—*Ricordi e Note Sulla Metallurgia Italiana.* [A record of the metallurgical production of metals in Italy during 1914 and 1915].—*Metallurgia Ital.* April 30 1916; p 260; pp 15; \$1.

— *American Coal Mine Haulage.* [Describes the practice in detail].—*Colly Guard.* July 14 1916; p 61; pp 2½*; 35c.

— *Rhodesia Report of the Executive Committee of the Chamber of Mines and Production of Gold and Other Minerals in May, 1916.* [The production of operating gold companies is given individually].—*Rhodesia Chamber of Mines Report* May 1916; pp 6.

Petroleum

Fath, A. E.—*An Anticline Fold Near Billings, Noble County, Oklahoma.* [The geology and formation of the anticline is described relative to the possibilities of oil and gas, which is found 20 miles from the anticline].—*U. S. G. S. Bull.* 641-E; pp 18*.

Toso, Pietro.—*Sul Modi di Formazione*

dei Giacimenti Petroliferi e Solfiferi. [On the method of formation of petroliferous and sulphurous materials].—Ind. Chim. Min. & Met. June 10 1916; p 177; pp 5; June 25; p 193; pp 3½*; 70c.

Wade, Arthur.—*Petroleum Prospects on Bruny Island, Tasmania.* [Deals with the geology and possibilities there].—Tasmania Parliament Report No. 60; pp 6*; 50c.

Way, Herbert, W. L.—*The Minerals of Sze-Chuan, China.* [Brief descriptions of the deposits; their possibilities and operation. Salts have been mined, petroleum is plentiful and gold, silver and copper give promise].—Mg. Mag. July 1916; p 20; pp 4*; 50c.

Fuels Miscellaneous

Cooper, Stanley G.—*The Production and Use of Power and Its Relation to Fuel Economy.* [Curves and detailed information].—I. & C. Tr. Rev. July 14 1916; p 44; pp 1*; 35c.

Oil Fuel. [On methods of pumping and piping the oil to the burners].—Pract. Eng. Aug. 1 1916; p 648; pp 1½*; 20c.

Smokeless Fuel, Gas, Oil and Ammonia Production. [A description of equipment used and some details on the methods of operation].—I. & C. Tr. Rev. July 7 1916; p 10; pp 2*; 35c.

(B) STRUCTURALS AND CERAMICS

Clays, Ceramics

Arbogust, C. O.; Sheridan, L. J.—*The Open Door to Results in Burning.* [On the use of pyrometry in brick and clay furnace work].—B. & C. Rec. Aug. 1 1916; p 216; pp 5; 35c.

Middleton, Jefferson.—*Pottery in 1915.* [Treats on the production of materials used in the manufacture of pottery and the amount of pottery manufactured. The production of states is tabulated].—Min. Res. of U. S. II; pp 11.

(C) OTHER NON-METALS

Acids

Carnell, W. C.—*Acid Resisting Alloys.* [A paper read before the American Inst. of Chem. Eng. Deals with the properties of duriron, tantiron and the like].—Iron Age July 27 1916; p 182; pp 1½; 30c.

Gilbert, J.—*Costs and Profits of an Up-to-Date Spelter Works.* [A practical consideration of the subject and operations connected therewith].—Mg. Jnl. July 15 1916; p 496; pp 1½; 35c.

Gems

Mellor, E. T.—*The East Rand, South Africa.* [A description of the formation of the country].—S. Afr. Engg. June 1916; p 102; pp 2½*; 35c.

Purington, C. W.—*Precious Stones in the Urals, Russia.* [A description of the deposits and their location].—Mg. Mag. July 1916; p 24; pp 2*; 50c.

Magnesite

Eddy, L. H.—*Sonoma Magnesite Mines, California.* [Describes the development, transportation and calcining of the ores for shipment].—E. & M. J. July 29 1916; p 225; pp 2*; 25c.

Richards, J. W.—*The Metallurgy of the Rarer Metals.* [Abst. from a paper read before the American Inst. of Chem. Eng. Discussing the importance of the future of magnesium, chromium and other metals].—Mg. World July 15 1916; p 93; pp 1½; 10c.

III. TECHNOLOGY

MINES AND MINING

Surveying and Drafting

Marshall, R. B.—*Spirit Leveling in Arkansas, 1896 to 1915.* [Data and a description of the location of bench marks in the state].—U. S. G. S. Bull. 636; pp 56*; 15c.

Marshall, R. B.—*Spirit Leveling in Maine, 1899 to 1915.* [Data and descriptions of the location of all U. S. G. S. bench marks in the state are given].—U. S. G. S. Bull. 633; pp 64*; 15c.

Ingenious Special Devices for Tunnel Surveys. [Abst. from Eng. News. Instruments and devices for marking are described].—E. & M. J. July 22 1916; p 180; pp 1½*; 25c.

Shafts and Shaft Sinking

Buffum, F. D.—*Compressed Air for Sinking a Shaft.* [Abst. from Coal Age. Deals with methods of piping and handling the compressed air which was used entirely for power. Remedies for difficulties encountered are given].—Comp. Air July 1916; p 8048; pp 3*; 20c.

Miller, Benjamin Leroy; Singewald, J. T.—*The Gold Mines of Brazil.* [The two most noted mines are described. The power question, mining and refining of the ore are dealt with].—E. & M. J. July 29 1916; p 207; pp 5*; 25c.

Schmidt, Frederick.—*Shaft Sinking by the Freezing Process.* [A paper read before the Manchester Mining & Geol. Soc., England].—I. & C. Tr. Rev. June 23 1916; p 720; pp 1; 35c. Coll'y Guard. June 23; p 1189; pp 4*; 35c.

Ventilation

Buffum, F. D.—*Compressed Air for Sinking a Shaft.* [Abst. from Coal Age. Deals with methods of piping and handling the compressed air which was used entirely for power. Remedies for difficulties encountered are given].—Comp. Air July 1916; p 8048; pp 3*; 20c.

Miller, Benjamin Leroy; Singewald, J. T.—*The Gold Mines of Brazil.* [The two most noted mines are described. The power question, mining and refining of the ore are dealt with].—E. & M. J. July 29 1916; p 207; pp 5*; 25c.

Transport

Eddy, L. H.—*Sonoma Magnesite Mines, California.* [Describes the development, transportation and calcining of the ores for shipment].—E. & M. J. July 29 1916; p 225; pp 2*; 25c.

Robertson, A.; Johnston, A. M.—*Belt Conveyors.* [On the life and proper loading of belts].—S. Afr. Engg. June 1916; p 107; pp 2½*; 35c.

Haulage and Conveying

Scott, W. A.—*Commonwealth Mine and Mill, Pearce, Arizona.* [Gives details on operations and description of methods used].—Mg. World July 29 1916; p 187; 10c.

Warren, H. M.—*Electrical Distribution and Application in Mines.* [Speaks of the use of electricity for pumps, hoists, locomotives, drilling and air compression].—Coal Age July 22 1916; p 138; pp 4*; 20c. pp 1½*; 10c.

American Coal Mine Haulage. [Describes the practice in detail].—Coll'y Guard. July 14 1916; p 61; pp 2½*; 35c.

Production

Hewett, D. F.—*Manganese and Man-*

ganiferous Ores in 1915. [Primary ores, both domestic and foreign, are spoken of, as also are the production and values of ores].—Min. Res. of U. S. I:4; pp 15.

Katz, Frank J.—*Silica in 1915.* [Takes up the uses of silica, its production in general and by states, with briefs on other important siliceous materials].—Min. Res. of U. S. II:8; pp 6.

Middleton, Jefferson.—*Pottery in 1915.* [Treats on the production of materials used in the manufacture of pottery and the amount of pottery manufactured. The production of states is tabulated].—Min. Res. of U. S. II; pp 11.

Muth, E. G.—*Great Increase in Spelter Production.* [A review of production for the first half of 1916].—Zinc & Lead Jnl. June 1916; p 5; pp 2½; 20c.

Orr, Charles T.—*Progress in Our Zinc Mines.* [Deals with progress in the mines of the Missouri-Kansas-Oklahoma district].—Zinc & Lead Jnl. June 1916; p 16; pp 2*; 20c.

Parodi, Lorenzo.—*Ricordi e Note Sulla Metallurgia Italiana.* [A record of the metallurgical production of metals in Italy during 1914 and 1915].—Metallurgia Ital. April 30 1916; p 260; pp 15; \$1.

Verne, C. E.—*Zinc's Record Breaking Year.* [A review of the first part of 1916 in the Joplin district].—Zinc & Lead Jnl. June 1916; p 3; pp 2*; 20c.

Rhodesia Report of the Executive Committee of the Chamber of Mines and Production of Gold and Other Minerals in May, 1916. [The production of operating gold companies is given individually].—Rhodesia Chamber of Mines Report May 1916; pp 6.

MILL AND MILLING

Flotation

Hilderbrand, Joel H.—*Principles Underlying Flotation.* [Abst. of an illustrated lecture before the American Chem. Soc. and A. I. M. E.].—M. & S. P. July 29 1916; p 168; pp 3*; 20c.

Lewis, R. S.; Ralston, O. C.—*Patents Relating to Oil-Flotation Processes.* [Short descriptions of patents dating from 1879 on are given].—Utah Engg. Experiment Sta. Bull. No. 8; pp 56.

Whitaker, W. A.; Belchic, George; Neal, Roy; Van Velzer, H. L.—*Flotation Experiments on a Joplin Tailing.* [The results from using a number of different oils are tabulated and discussed. Testing was done with 400-gm. samples].—Met. & Chem. Engg. Aug. 1 1916; p 131; pp 7; 35c.

Concentration: Sorting, Sizing, Washing

Gudgeon, C. W.—*The Scheelitz Gold Mines of Otago, New Zealand.* [Several properties are described. In each the ore body, milling process and milling and mining costs are dealt with].—Proc. Aus. Inst. M. E. No. 21 1916; p 37; pp 14*; 65c.

Miller, Benjamin Leroy; Singewald, J. T.—*The Gold Mines of Brazil.* [The two most noted mines are described. The power question, mining and refining of the ore are dealt with].—E. & M. J. July 29 1916; p 207; pp 5*; 25c.

Scott, W. A.—*Commonwealth Mine and Mill, Pearce, Arizona.* [Gives details on operations and description of methods used].—Mg. World July 29 1916; p 187; pp 1½*; 10c.

Cyaniding

Miller, Benjamin Leroy; Singewald, J.

T.—*The Gold Mines of Brazil*. [The two most noted mines are described. The power question, mining and refining of the ore are dealt with].—E. & M. J. July 29 1916; p 207; pp 5*; 25c.

Scott, W. A.—*Commonwealth Mine and Mill, Pearce, Arizona*. [Gives details on operations and descriptions of methods used].—Mg. World July 29 1916; p 187; pp 1½*; 10c.

Mill and Smelter Costs

Gilbert, J.—*Costs and Profits of an Up-to-Date Spelter Works*. [A practical consideration of the subject and operations connected therewith].—Mg. Jnl. July 15 1916; p 496; pp 1¼; 35c.

Gudgeon, C. W.—*The Scheelite Gold Mines of Otago, New Zealand*. [Several properties are described. In each the ore body, milling process and milling and mining costs are dealt with].—Proc. Aus. Inst. M. E. No. 21 1916; p 37; pp 14*; 65c.

Stannard, O. J.—*Chemical Methods of Extraction*. [Deals with the chemistry and brief description of thermic, electro and hydro metallurgical processes. A discussion of costs is also given].—Mg. Mag. July 1916; p 15; pp 5; 50c.

CHEMISTRY AND ASSAYING

Chemistry

Hesse, Bernhard, C.—*Revision of Our Chemical Statistics*. [Lists of chemicals produced are given and it is stated that U. S. needs to give information about a greater number of these products].—Met. & Chem. Engg. Aug. 1 1916; p 143; pp 6; 35c.

Matheson, A. M.—*Notes on the Chemical Assay of Tin Ores*. [Discussion of the chemical and fire assay of pyritic tin ores show that mill losses can not be estimated by vanning and the fire method].—Proc. Aus. Inst. M. E. No. 21 1916; p 1; pp 7; 65c.

Stannard, O. J.—*Chemical Methods of Extraction*. [Deals with the chemistry and brief description of thermic, electro and hydro metallurgical processes. A discussion of costs is also given].—Mg. Mag. July 1916; p 15; pp 5; 50c.

Assaying

Gudgeon, C. W.—*The Scheelite Gold Mines of Otago, New Zealand*. [Several properties are described. In each the ore body, milling process and milling and mining costs are dealt with].—Proc. Aus. Inst. M. E. No. 21 1916; p 37; pp 14*; 65c.

Matheson, A. M.—*Notes on the Chemical Assay of Tin Ores*. [Discussion of the chemical and fire assay of pyritic tin ores show that mill losses can not be estimated by vanning and the fire method].—Proc. Aus. Inst. M. E. No. 21 1916; p 1; pp 7; 65c.

METALLURGY

Electrometallurgy

Lomas, Garcia.—*Recuperacion de Humos por Precipitacion Electrica*. [The recovering of fumes for electrical precipitation].—Revista Minera July 1 1916; p 317; pp 1¼; 35c.

Parodi, Lorenzo.—*Notizie Sulla Metallurgia del Nickel Importanza del Nickel nell'odierna Metallurgia*. [Notes on the metallurgy of nickel today. Deals with the situation and methods employed in the principal producing countries].—Metallurgia Ital. May 31 1916; p 355; pp 14; 31c.

United States Metals Refining Co.'s Plant, Grasselli, Indiana. [A description of the steam and electric power plants at the electrolytic lead refinery].—Pract. Eng. Aug. 1 1916; p 641; pp 4½*; 20c.

Thermic Metallurgy

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Electricity

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IV. MISCELLANEOUS

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Sauveur, Albert.—*Detecting Alumina Inclusions in Steel*. [A microscopic investigation as to the occurrence and appearance of alumina particles].—Iron Age July 27 1916; p 180; pp 2*; 30c. I. Tr. Rev. July 27; p 179; pp 2*; 25c.

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Searls, R. M.—*An Extra-Lateral Problem*. [Points out a peculiar position controlled by this law].—M. & S. P. July 29 1916; p 160; pp 1½*; 20c.

History

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Societies

Howe, Charles S.—*Engineering Education in the United States*.—M. & S. P. July 22 1916; p 126; pp 3; 20c.

General Miscellany

Raymond, Miner.—*Relation Between Price and Volume in the Purchase of Mine Equipment*. [Deals with the fact that men buy when the manufacturer is busy and prices high].—Mg. World July 29 1916; p 191; pp 1¼; 10c.

Ingalls, W. R.—*The Business of Mining*. [An address to the School of Mines, Missouri, reviewing things and ideas in the practical or business field of the industry].—Missouri School of Mines Bull. June 1916; pp 20.

Ore and Metal Markets; Prices-Current

New York, Aug. 9, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Aug. 9 were as follows:

	New York. Cents.	London. Pence.
Aug. 3.....	64½	30¾
4.....	64½	30 15/16
5.....	66½	31½
7.....	65½	31 7/16
.....	66½	31 7/16
.....	66½	31 7/16

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London	
	High.	Low.	Avg.	Standard Oz.	1915.
January	57½	55½	56.775	48.890	26.875
February	57	56½	56.755	48.477	27.000
March	69½	56½	57.935	49.326	27.080
April	73½	60½	64.415	50.034	31.375
May	77½	68½	74.27	49.915	34.182
June	68½	62½	65.02	49.072	31.038
July	65	60	62.94	47.519	29.870
August .....	.....	.....	.....	47.178	.....
September .....	.....	.....	.....	48.68	.....
October .....	.....	.....	.....	49.385	.....
November .....	.....	.....	.....	51.713	.....
December .....	.....	.....	.....	55.038	.....
Year .....	.....	.....	.....	49.690	.....

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Improvement in the demand for copper has continued since our last report. Business has emanated principally from foreign consumers. Large producing companies report that sales consummated since the first of the month aggregate fully 30,000,000 lbs. While business has been of a nature that would under ordinary circumstances be productive of a general revival in copper demand, trade factors assert that domestic business may be withheld for another month, as home consumers are generally well covered for the third quarter. Orders have come mainly from France and Italy and involve the shipment of electrolytic over the remainder of the year. While producers have not announced the prices at which the foreign business has been taken, it is understood that the sales were made at prices ranging from 24½ to 25 cts. free alongside ship. The advent of copper buying on a large scale brings to a close the protracted period of inactivity which had its inception late in May. For over two months the market has been dull, but withal prices have been maintained, although the current values are several cents under the high points reached in the last buying movement.

The position of the red metal is all that can be desired. Domestic manufacturers who overbought last spring have liquidated their excess holdings and the market is shaping for a general revival in activity which, however, may not fully materialize until the fourth quarter. As has been pointed out in these reports, the future of copper depends greatly on the continuance of the war. Now that it is certain that hostilities will prevail over the coming winter, the pessimistic talk is not so strongly in evidence.

Producers are well sold up to Oct. 1 and have large orders running into the first quarter of next year. Electrolytic for August and September is scarce and commands a slight premium, resellers asking 26½@27 cts. For October producers are offering at 26@26¼ cts., with November quoted at 25½ cts and December at 25½ cts. There appears to be no disposition to offer copper for the first quarter of 1917, but it is stated that with the next buying movement a considerable business will be done for delivery next year.

That the copper market has finally reached a firm basis at around 26 cts. for the fourth quarter is generally admitted. Some large wire drawers and brass makers have intimated that they would be buyers at 24 cts., but it is not likely that they will receive this low price, in view of the advent of foreign demand, which adequately fills the gap occasioned by

the slow domestic business. Spot casting copper is held at 25 cts., with forward deliveries quoted at 23½@24½ cts.

The London market has been devoid of any feature in the interim. Electrolytic has declined £1 to £124 in the past few days, while standard copper, after breaking £1, has recovered 10s. It is reported that the English government has been selling to users at £121, which would be about equivalent to the current market here.

Quotations for copper per pound at New York for the week ended Aug. 9 were as follows:

(For Third Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
Aug. 3.....	24¾ @ 25¼	24¾ @ 25¼	24¾ @ 25¼
4.....	25 @ 25½	25 @ 25½	24¾ @ 25¼
5.....	25 @ 25½	25 @ 25½	24¾ @ 25¼
7.....	25½ @ 26	25½ @ 26	24¾ @ 25¼
8.....	25¾ @ 26¼	25¾ @ 26¼	25 @ 25½
9.....	25¾ @ 26¼	25¾ @ 26¼	25 @ 25½

Quotations for copper per ton at London for the week ended Aug. 9 were as follows:

	Spot.	Standard	Futures.	Electrolytic.
Aug. 3.....	£107 0 0	.....	£104 0 0	£125 0 0
4.....	106 0 0	.....	103 0 0	125 0 0
5.....	106 0 0	.....	103 0 0	125 0 0
7.....	106 10 0	.....	103 10 0	124 0 0
8.....	107 0 0	.....	105 0 0	124 0 0
9.....	109 0 0	.....	106 10 0	114 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August .....	.....	.....	.....	17.472
September .....	.....	.....	.....	17.758
October .....	.....	.....	.....	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August .....	.....	.....	.....	17.222
September .....	.....	.....	.....	17.705
October .....	.....	.....	.....	17.859
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August .....	.....	.....	.....	.....	67.350
September .....	.....	.....	.....	.....	68.560
October .....	.....	.....	.....	.....	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—Business in tin has been almost wholly absent. Prices have receded slightly on nearby positions, but sellers are disposed to hold forward deliveries firmly. The situation

in the metal has undergone no startling change in the past few weeks. Consumers as a rule are well covered over August and September by supplies already in hand, while the large users have large contracts against fourth quarter needs. The statistics for July showed the total visible supply on July 31 to be 18,404 tons, a decline of 959 tons from the visible supply on June 30. The deliveries in July totaled 4432 tons, while the stocks in landing amounted to 5028 tons. The detailed statistics showed Straits shipments of 5410 tons, of which 2530 tons are for the United States. The arrival of the steamer *Radja* with 1100 tons Banka tin unsettled the market, as this steamer was not expected until late in August. Spot Straits tin is offered at 37½ cts., with spot Banka held at 36½ cts. Straits for late August delivery is quoted at 37½ cts. and September at 37½ cts. For October arrival sellers ask 37½ cts., with November held at 37½ cts. and December at 37 cts.

Foreign markets were inclined to be easier on the absence of orders from this side. English sellers, however, are inclined to be optimistic in view of the extensive reduction in stocks of Bolivian ores held in the Kingdom and also on the greater consumption in this country, which offsets the smaller absorption abroad. Price changes were of a minor character and without special influence.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Aug. 9 were as follows:

	New York		London.	Singapore.
	Spot.	August.	Straits, spot.	
Aug. 3.....	38c	37½c	£168 15 0	£170 5 0
4.....	38c	37½c	168 10 0	171 0 0
5.....	38c	37½c	168 10 0	171 0 0
7.....	37½c	37½c	168 0 0	170 0 0
8.....	37½c	37½c	167 15 0	171 10 0
9.....	38c	37½c	168 15 0	170 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August .....	.....	.....	.....	34.586
September .....	.....	.....	.....	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Late last week the American Smelting & Refining Co. announced a reduction of \$10 a ton in its official price for lead. The change had been anticipated and was immediately met by independents. The market following the cut was weak and very dull and there is little prospect of an early revival in demand. Foreign buyers who were in evidence during July have covered their needs, while domestic consumers, especially munition makers, showed no interest in the metal.

Sellers in the outside market were offering up to November delivery at 5.70 cts. St. Louis, with spot held at 5.95 cts. New York and 5.825 cts. St. Louis. The new quotations of the American Smelting & Refining Co. are 6 cts. New York and 5.925 cts. St. Louis. The average price during July of the leading interest was 6.50 cts. in New York and 6.425 cts. at St. Louis. It is stated that some business for October was done at 5.85 cts. St. Louis before the reduction in the official price, but sellers now report that consumers are looking for still lower quotations.

The London market, after holding unchanged for a number of days, has begun to advance, but the upward movement is small. Spot and futures gained 5s on Monday.

Quotations for lead per pound at New York and per ton at London for the week ended Aug. 9 were as follows:

	New York		London	
	A. S. & R. Co.	Indpts.	Spot.	Futures.
Aug. 3.....	6.00c	5.95c	£28 0 0	£27 15 0
4.....	6.00c	5.95c	28 10 0	28 0 0
5.....	6.00c	5.95c	28 10 0	28 0 0
7.....	6.00c	5.95c	28 15 0	28 5 0
8.....	6.00c	5.95c	28 15 0	28 5 0
9.....	6.00c	5.95c	28 10 0	29 15 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	6.20	5.50	5.926	31.92	18.637
February	6.55	6.10	6.271	33.108	19.804
March	8.00	6.50	7.47	34.410	22.010
April	8.00	7.37½	7.70½	33.70	21.100
May	7.50	7.22½	7.34	33.209	20.120
June	7.20	6.75	6.88	29.760	25.750
July	6.85	6.25	6.37	28.035	25.611
August .....	.....	.....	.....	.....	22.160
September .....	.....	.....	.....	.....	22.953
October .....	.....	.....	.....	.....	23.932
November .....	.....	.....	.....	.....	26.240
December .....	.....	.....	.....	.....	28.884
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—During the week ended Aug. 5 no hopes for a better ore market was noted in the Missouri-Kansas-Oklahoma district and the price was again down \$5 and \$65 was the prevailing price paid for ores, though some few lots went as high as \$67. Production was also off a little and there were produced 1,594,330 lbs. of concentrates in the district during the week. This brought the total for the year to 64,370,542 lbs. The production for the week was valued at \$52,728 and that for the year at \$2,792,199.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9375	59.00
August .....	.....	.....	.....	47.50
September .....	.....	.....	.....	48.25
October .....	.....	.....	.....	61.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—In the Missouri-Kansas-Oklahoma district it is said that many of the furnaces which have no advance orders are closing down because they can not produce at a profit under prevailing prices. Ore in the district again dropped \$5 and the top price for the week ended Aug. 5 was \$70, this price ranging down to \$50. During the week there were produced in the district 7,474,110 lbs. of concentrates and during the year to that date 40,279,354 lbs. The values for these amounts were given at \$224,155 and \$18,863,423 respectively.

Calamine.—As with the other ores calamine was down \$5 and sold from \$35 to \$45. There were produced 243,100 lbs. of concentrates, making the production for the year 19,403,520 lbs., and these amounts were valued at \$4913 and \$712,665.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	63.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.60	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August .....	.....	.....	.....	60.25
September .....	.....	.....	.....	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.96

Spelter.—The market has been almost featureless. Sellers state business has been lacking and that consumers have not been interested in offers. The government statistics covering production over the first half of the year, and announced this week, were considered bullish, and some factors believe they may be the basis for an improved demand. It is reported that the supply in the first half totaled 330,922 tons, while the apparent consumption was 228,718 tons. Sellers offered for November and December at 7¼ cts., while for spot 8½ cts. New York and 8¼ cts. St. Louis were quoted.

Galvanizers who were disposed to buy at the recent upturn have latterly displayed no interest, although the asking price of sellers has been only 2 cts. above what is con-

sidered normal. At London the market opened the week with a sharp decline, carrying spot down £3 to £44 and futures £2 to £40.

Quotations for spelter per pound at New York and per ton at London for the week ended Aug. 9 were as follows:

	New York.		London.	
	Spot.		Spot.	Futures.
Aug. 3.....	8.62½c		£47 0 0	£42 0 0
4.....	8.50c		47 0 0	42 0 0
5.....	8.50c		47 0 0	42 0 0
7.....	8.50c		44 0 0	40 0 0
8.....	8.50c		44 0 0	40 0 0
9.....	8.50c		47 0 0	40 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1915		1916	1915	
January	19.42½	17.30	18.801	6.519	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July	10.75	8.75	9.80	20.803	53.00	98.150
August				16.110		68.250
September				14.493		64.400
October				14.196		64.196
November				16.875		88.240
December				16.675		89.153
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—On a general absence of demand prices have again declined, with quotations of several of the large sellers varying to the extent of \$2 a flask. On Monday of this week one of the important sellers lowered its price to \$75 per flask, but others still asked \$77 per flask. There are some powder interests in the market for about 6 cars for late August delivery, and it is understood that these buyers have offered \$73 per flask. The market, while quiet and declining, cannot be considered weak. Prices have reached buyers' views, and with the balance restored it is likely that some very active business may soon be done.

Antimony.—Dealers in Asiatic metal continue to compete actively for business, with the result that price concessions are visible. Thus while 11 cts. is quoted for spot in store it is known that consumers have been quietly offered at 10 cts. For the fourth quarter offers of Chinese antimony at 9 cts. duty paid are reported to have been made. The situation in this metal reflects the after effect of overproduction stimulated by high prices. Some of the new producers are having a hard time to cover expenses. Whether antimony will ever return above 20 cts. is problematical.

Aluminum.—Second hands have been offering spot ingots at concessions, with the demand very dull. Resellers have asked 55 cts. for spot virgin ingots, while first hands are quoting 57@59 cts. per pound in ton lots. No. 1 remelted is held at 56@58 cts. and No. 12 alloy at 46@48 cts. Automobile makers have not been buyers recently. Sheet aluminum has been quite active, with dealers reporting a scarcity of supplies. Small lots have been sold at \$80 to \$100 per 100 lbs., while special material is held at \$90 to \$100.

Finished Copper, Brass and Other Products.—There has been a revision of prices on copper and lead sheets, makers reducing quotations. Demand for copper products has been fair, but lead and zinc sheets are dull. Brass products hold fairly steady, but are inclined to be quiet. The following prices are all f. o. b. mill:

Sheet zinc	\$15.00@
Sheet aluminum, 1917 contract	40.00@
Sheet aluminum, outside market, prompt shipment	80.00@95.00
Copper wire	29.00@32.00
Sheet copper, hot rolled	35.50@
Sheet copper, cold rolled	36.50@
High brass sheet, wire and rods	38.00@39.50
Low brass sheet, wire and rods	39.50@42.00
Bronze sheet and wire	40.00@42.00
Bronze rods	40.00@42.00
Brazed brass tubing	45.00@46.50
Brazed bronze tubing	46.00@47.00
Seamless copper tubing	43.00@44.00
Seamless brass tubing	42.00@43.00
Seamless bronze tubing	43.00@44.00
Full lead sheets	8.25@
Cut lead sheets	8.50@

Pig Iron.—While domestic demand continues to be the minor factor in the pig iron market, much interest was displayed in an inquiry put out by the International Steam Pump Co. for 6000 tons foundry grades for delivery in the first half of next year. It is expected that when domestic users do resume buying that a considerable tonnage will be booked for delivery next year. Foreign demand continues quite large, inquiries now in the market amounting to about 20,000 tons. Prices on steel making and foundry grades show no change.

PRICES-CURRENT.

Acids —Muriatic, 18 deg.	2.00	to	3.00
Muriatic, 20 deg.	2.25	to	3.25
Nitric, 36 deg.	.07½	to	.08½
Nitric, 40 deg.	.09	to	.09½
Alcohol —U. S. P., gal. grain	2.70	to	2.72
Denatured, 183 proof, gal.	2.68	to	2.70
Wood, 97 p. c.	.70	to	.71
Alum —Powdered, lb.	.05½	to	.07
Lump, lb.	.05½	to	.06½
Ground, lbs.	.041	to	.07½
Ammonia —			
Muriate, white grain, lb.	.08½	to	.08½
Muriate, lump	.17	to	.18
Arsenic —White, lb.	.06½	to	.06½
Red, lb.	.55	to	.60
Barium Chloride —Ton	110.00	to	115.00
Nitrate, kegs, lb.	.14	to	.15
Bismuth —Metallic, lb.	3.15	to	3.25
Subnitrate	3.10	to	3.15
Bleaching Powder —			
Drums, 100 lbs.	4.50	to	5.65
Borax —100 lbs., car lots	7.75	to	8.00
Coke —Connellsville furnace	2.50	to	2.75
Foundry	3.00	to	3.50
Copperas —Spot, lb.	1.50	to	2.00
Ferromanganese —Spot	175.00	to	.....
Last half	175.00	to	.....
Ferrosilicon , 50%			85.00
Ferrotitanium , per lb.	.08	to	.12½
Fuller's Earth , 100 lbs.	.80	to	1.05
Glauber's Salts , bags	.50	to	.75
Calcined			2.50
Iron Ore —			
Bessemer, old range, ton			4.45
Bessemer, Mesabi			4.20
Non-Bessemer, old range			3.70
Non-Bessemer, Mesabi			3.65
White crystals	.15½	to	.15½
Broken, cakes	.14½	to	.15
Powdered	.17	to	.17½
Lead —Granulated, lb.	.17	to	.17½
Brown sugar	.13½	to	.14
Litharge , American, lb.	.09	to	.09½
Mineral Lubricants —			
Black summer	.13½	to	.14
20 gr., 15 c. t.	.14	to	.15
Cylinder, light, filtered, gal.	.21	to	.26
Neutral, filtered, lemon, 20 gr.	.37½	to	.38
Wood grade, 30 gr.	.19½	to	.20
Paraffin —High viscosity	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto	.32½	to	.33½
Benzine, 59 to 62°, gal.	.29	to	.29½
Nickel Salt , double	.07½	to	.08½
Single	.10½	to	.11
Petroleum —			
Crude (jobbing), gal.	.15	to	.18
Refined, bbl.			.12
Platinum —Oz. ref.	80.00	to	84.00
Potash Fertilizer Salts —			
Kainit, min. 16% actual potash			32.00
Muriate, 80 to 85%, basis 80% ton	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%	400.00	to	450.00
Hard salt, man., 12.4% actual potash	Nominal		32.00
Potassalum —			
Bichromate	.38	to	.40
Carbonate, cal. 96 to 98%	1.30	to	1.35
Cyanide, bulk, per 100%	.75	to	1.00
Chlorate	.45	to	.50
Prussiate, yellow	.85	to	.90
Prussiate, red	2.40	to	2.50
Saltpeter —Crude, lb.	.12	to	.14
Refined	.25½	to	.26
Soda —Ash, 58% (43% basis), bbl.	1.25	to	1.50
Strontia Nitrate , casks, lb.	.47	to	.48
Sulphur —			
Crude, ton	28.00	to	29.00
Flowers, 100 lbs.	2.10	to	2.50
Roll, 100 lbs.	1.95	to	2.25
Tin —Bichloride, 50°, 100 lbs.	.13½	to	.14
Crystals, bbls., lb.	.29½	to	.30
Oxide, lb.	.44	to	.46
Zinc Chloride	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest						Paid in 1916	Total to date	Latest	
						Date	Am't.							Date	Am't.
Acacia, g.	Colo.	1,438,989	\$1	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,915	\$1	\$98,916	Sept. '01	\$0.01		
Adams, s. l. c.	Colo.	80,000	10	778,000	Dec. 16, '09	.04	Golden Star, g.	Ariz.	400,000	5	120,000	Mar. '10	.05		
Adventure, c.	Mich.	100,000	25	60,000	July 20, '18	.50	Gold' Com. Fra. g.	Nev.	922,000	1	92,111	Oct. 15, '09	.10		
Alhambra, c.	Mich.	200,000	25	1,200,000	July 10, '16	3.00	Goldfield Con. g.	Nev.	3,559,148	10	28,999,831	Oct. 31, '15	.10		
Alaska Goldfields.	Alaska	250,000	5	403,250	Jan. 10, '15	.15	Good Hope, g. s.	Colo.	600	100	941,250	Jan. '03	.25		
Alaska Mexican, g.	Alaska	190,000	6	3,507,351	Nov. 25, '15	.10	Good Sp. Anchor, z. s.	Nev.	650,000	1	119,765	June 15, '08	.01		
Alaska Mines Sec.	U. S.	600,000	5	90,000	Nov. 1, '06	.02	Grand Central, g.	Utah	600,000	1	1,545,200	Dec. 23, '15	.02		
Alaska Treadwell, g.	Alaska	200,000	25	15,790,000	May 29, '16	.50	Grand Gulch, c. s.	Nev.	233,845	2.50	11,992	June 1, '16	.03		
Alaska United, g.	Alaska	180,000	6	54,600	Feb. 28, '16	.30	Granite, g.	Alaska	430,000	1	17,200	May 10, '16	.02		
Allouez, g.	Mich.	100,000	25	450,000	July 15, '16	2.00	Gwin, g.	Cal.	100,000	10	481,500	Feb. '06	.25		
Amalgamated, c.	Mont.	1,638,829	100	103,444,883	Aug. 30, '15	3.77	Hazel, g.	Cal.	900,000	1	1,114,000	Jan. 5, '15	.01		
Am. Sm. & R. com.	U. S.	600,000	100	1,600,000	June 1, '16	1.60	Hecles, s. l.	Idaho	1,000,000	0.25	800,000	July 3, '16	.15		
Am. Sm. & R. pf.	U. S.	500,000	100	1,750,000	June 1, '16	1.75	Hercules, s.	Idaho	1,000,000	1	4,555,000	Sept. 15, '16	.20		
Am. Sm. Sec. A. pf.	U. S.	170,000	100	765,000	July 1, '16	1.50	Hidden Treasure, g.	Cal.	30,000	10	457,452	Sept. '00	.10		
Am. Sm. Sec. B. pf.	U. S.	300,000	100	1,125,000	July 3, '16	1.25	Holy Terror, g.	S. D.	600,000	1	172,000	Jan. '00	.01		
Am. Zinc, L. & Sm.	Mo.	193,120	25	2,414,000	June 10, '16	12.50	Homestake, g.	S. D.	251,160	100	36,848,488	July 25, '15	.65		
Anacosta, c.	Mont.	2,331,250	50	6,993,750	May 20, '16	1.50	Hope Dev.	Cal.	500,000	1	6,000	Dec. 31, '15	.01		
Annie Laurie, g.	Utah	25,000	100	439,561	Apr. 22, '05	.50	Horn Silver, L. s. z.	Utah	400,000	1	6,182,000	June 30, '16	.05		
Argonaut, g.	Cal.	200,000	6	1,680,000	June 27, '16	.10	Imperial, c.	Ariz.	600,000	10	300,000	June 24, '07	.20		
Arizona, c.	Ariz.	100,000	25	20,212,164	Apr. 1, '18	.02	Independ'ce Con. g.	Ariz.	2,500,000	1	251,375	Apr. '01	.04		
Atlantic, c.	Mich.	100,000	25	990,000	Feb. 21, '05	.50	Inspiration Con. g.	Colo.	920,687	20	3,091,233	July 31, '16	2.00		
Bagdad-Chase, g. pf.	Cal.	84,819	6	202,394	Jan. 1, '09	.10	Inter'l Nickel, com.	U. S.	1,673,384	25	5,438,498	June 1, '16	2.00		
Bald Butte, g. s.	Mont.	250,000	1	1,354,415	Nov. 1, '07	.04	Inter'l Nickel, pf.	U. S.	89,128	100	297,378	May 1, '16	2.00		
Baltic, c.	Mont.	100,000	25	7,950,000	Dec. 31, '13	2.00	Inter'l Sm. & Ref.	U. S.	100,000	100	4,100,000	May 2, '14	2.00		
Barnes-King, g.	Mont.	40,000	5	60,000	June 1, '16	.07	Interstate-California	Idaho	484,990	10	3,952,415	June 30, '16	1.60		
Beck Tunnel Con.	Utah	1,000,000	0.10	940,000	Nov. 15, '07	.02	Iowa, g. s. l.	Colo.	1,666,667	1	270,167	Dec. 31, '15	.00		
Big Four Expl.	Utah	400,000	1	70,000	July 15, '16	.05	Iowa Tiger, g. s. l.	Colo.	3,000	1	25,179	Jan. 15, '16	.60		
Biingham-N. Haven	Utah	228,689	6	960,493	Dec. 20, '15	.20	Iron Blossom, L. s. g.	Utah	1,000,000	1	2,760,000	July 20, '16	.10		
Board of Trade, z.	Wis.	120,000	1	78,000	Jan. 15, '11	.05	Iron Cap pf. c.	Ariz.	33,481	10	6,422	July 1, '16	.35		
Bonanza Dev.	Colo.	300,000	1	1,425,000	Oct. 29, '11	.20	Iron Clad, g.	Colo.	1,000,000	1	50,000	Nov. '06	.06		
Booth (Reorganized)	Nev.	499,376	5	349,949	June 26, '16	.05	Iron Silver, s.	Colo.	600,000	20	5,050,000	Dec. 31, '15	.10		
Boss, F.	Nev.	98,500	10	40,850	Dec. 10, '14	.10	Isabella, g.	Colo.	2,250,000	1	742,500	Mar. '01	.01		
Boston & Colo. Sm.	Colo.	15,000	25	402,350	Oct. '02	.75	Isle Royale, c.	Mich.	150,000	25	150,000	July 31, '16	1.00		
Bot. & Mont. Con.	Mont.	200,000	25	63,225,000	May 15, '11	4.00	Jamison, g.	Cal.	390,000	10	373,300	Jan. '11	.02		
Breece, L. s.	Colo.	300,000	1	220,000	Dec. 15, '13	.10	Jerry Johnson, g.	Colo.	2,600,000	10	187,500	Nov. 5, '14	.00		
Brunswick Con. g.	Utah	100,000	10	203,315	Sept. 16, '15	.06	Jim Butler, g.	Nev.	171,802	1	343,500	June 1, '16	.04		
Bullion-B. & Champ	Mont.	450,000	1	2,768,400	July 11, '08	.10	Joplin Ore & Spelter	Mo.	400,000	5	62,000	July 22, '16	.04		
Bullwhacker, c.	Cal.	200,000	1	10,000	July 1, '07	.01	Jumbo Ext. g.	Nev.	1,550,000	1	194,000	June 30, '16	.06		
Bunker Hill Con. g.	Idaho	327,000	10	885,000	July 4, '16	.02	Kendall, g.	Mont.	600,000	5	60,000	Apr. 3, '16	.10		
Bunker Hill & Sull.	Idaho	75,000	10	17,750,000	July 4, '16	.40	Kenebeck Zinc.	Mo.	200,000	....	60,000	June 30, '16	.10	
Butte Alex. Scott.	Idaho	327,000	10	1,054,119	Apr. 10, '16	10.50	Kennecott.	Alas.	250,000	10	12,000,000	June 30, '16	1.50		
Butte-Ballaklava, c.	Mont.	250,000	10	125,000	Aug. 1, '10	.50	Kennedy, g.	Cal.	100,000	100	1,901,001	June '00	.05		
Butte Coalition, c.	Mont.	1,000,000	15	4,700,000	Dec. 1, '11	.25	King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. 2, '09	.12		
Butte & Superior, z.	Mont.	272,697	10	11,383,017	June 30, '16	10.75	Klar Piquet, z.	Wis.	20,000	1	157,500	Dec. 16, '12	.25		
Caledonia, L. s. c.	Idaho	2,005,000	10	1,429,751	July 15, '16	.03	Knob Hill, g.	Wash.	1,000,000	1	70,000	Aug. 1, '13	.00		
Calumet & Ariz. c.	Ariz.	641,923	10	2,595,676	June 20, '16	2.00	La Fortuna, g.	Ariz.	250,000	1	1,200,500	Oct. '02	.01		
Calumet & Hecles, c.	Mich.	100,000	25	132,250,000	June 23, '16	15.00	Lake View, g.	Utah	500,000	.05	114,500	June 12, '16	.01		
Camp Bird, g.	Utah	1,750,000	25	113,554	Jan. 1, '16	.17	Last Dollar, g.	Colo.	1,500,000	1	1,000,000	Feb. 23, '03	.02		
Cardiff, L. s.	Utah	600,000	1	250,000	June 1, '16	.25	Liberty Bell, g.	Colo.	133,551	6	1,752,795	Jan. 31, '16	.06		
Cardinal, g. s.	Utah	600,000	1	60,000	Dec. '06	.01	Lightner, g.	Cal.	102,255	1	331,179	June 30, '16	3.00		
Centennial Eureka	Utah	100,000	25	4,000,000	Apr. 25, '16	1.00	Linden, z.	Wis.	1,020	10	11,200	Dec. 31, '16	.06		
Central Crook, L. z.	Mo.	100,000	10	595,000	July 1, '16	.15	Little Bell, s. l.	Utah	300,000	1	75,000	Apr. 22, '16	.06		
Central Eureka, g.	Cal.	100,000	1	799,159	Mar. 6, '06	.05	Little Florence.	Nev.	1,000,000	1	430,000	Jan. '08	.03		
Century, g. s. l.	Utah	1,000,000	1	392,087	Feb. 15, '16	.06	Lost Packer.	Idaho	150,000	1	37,600	Oct. 23, '13	.25		
Champion, c.	Mich.	100,000	25	4,390,000	July 7, '16	6.40	Lower Mammoth.	Utah	1,000,000	1	67,000	Dec. 15, '01	.01		
Chile Con.	Utah	882,960	1	88,175	May 15, '16	.60	MacNamara, g. s.	Nev.	734,576	1	46,800	Apr. 23, '06	12.00		
Chino Copper C.	N. M.	869,990	5	9,742,925	June 30, '16	2.25	Magma, c.	Ariz.	240,000	6.00	240,000	June 30, '16	.50		
C. K. & N. g.	Colo.	1,431,990	1	171,825	Nov. '04	.01	Mammoth, g. s. c.	Utah	400,000	10	2,390,000	June 30, '16	.06		
Cliff, g.	Alaska	100,000	10	115,000	Feb. 5, '16	.05	Manhattan-Big 4, g.	Nev.	762,400	1	30,248	Aug. 16, '11	.02		
Cliff, s. l.	Utah	300,000	10	80,000	Jan. 1, '13	.10	Mary McKinney, g.	Cal.	1,309,282	1	1,169,306	July 28, '14	.02		
Clinton, g. s.	Colo.	200,000	10	80,000	Dec. '03	.03	May Day, g.	Utah	40,000	0.25	28,400	May 26, '12	.07		
Colo. O. Dredging.	Utah	1,000,000	0.20	425,000	Feb. 23, '16	1.00	Mary Murphy, g. s. l.	Colo.	370,000	5	85,106	May 1, '16	.07		
Colorado, s. l.	Utah	1,000,000	0.20	2,600,000	Mar. 15, '13	.03	Mexican, g. s.	Nev.	201,600	3	171,350	June 4, '14	.75		
Columbus Con. L. s. c.	Utah	263,540	5	212,623	Oct. 14, '07	.20	Miami, c.	Ariz.	747,114	5	7,454,442	May 15, '16	1.50		
Combination, g.	Nev.	320,000	1	873,000	Dec. '06	.15	Mine La Motte, L.	Mo.	300,000	10	300,000	Jan. 23, '04	.20		
Comstock-Phoenix.	Nev.	785,000	1	50,000	Nov. 11, '11	.65	Modoc, g. s.	Colo.	600,000	1	275,000	Oct. 20, '11	.01		
Con. Mercur, g.	Utah	1,000,000	1	1,265,000	June 25, '13	.65	Mogollon, g. s.	N. M.	355,682	1	130,000	Oct. 1, '15	.10		
Consolidated, g.	Colo.	2,500,000	1	380,000	Mar. '02	.01	Mohawk, c.	Mich.	100,000	25	4,675,000	Feb. 1, '16	7.00		
Con. St. Gothard, g.	Cal.	100,000	10	11,430	Oct. 14, '08	.05	Moh'k Com. Lease.	Nev.	600,000	1	116,000	July 22, '08	.08		
Continental, z.	Mont.	22,000	25	581,000	July 1, '16	1.00	Moh'k (Goldfield).	Nev.	710,000	1	688,000	Nov. 26, '07	.		

Dividends of Mines and Works—Continued

NAME OF COMPANY	Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY	Number Shares Issued	Par Val	Dividends on Issued Capitalization				
			Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest		
					Date	Amt.							Date	Amt.	Date	Amt.
Petro, g. s.	Utah	600,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04	Success	Ida.	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03	
Pharmacist, g.	Colo.	1,600,000	1	91,500	Feb. 1, '10	.00%	Superior & Pitts, c.	Ariz.	1,499,792	10	10,318,568	Dec. 21, '15	.36		
Phelps, Dodge & Co	U. S.	450,000	100	53,771,527	June 30, '16	6.00	Swansea, s. l.	Utah	100,000	6	334,500	Apr. 29, '07	.06		
Pioneer, g.	Alaska	5,000,000	1	2,041,526	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	9,420,000	July 23, '07	4.00		
Pittsburg, l. z.	Mo.	1,000,000	1	20,000	July 15, '07	.02	Tamarack-Custer	Idaho	2,000,000	1	80,000	June 1, '16	.02		
Pittsburg-Idaho, l.	Ida.	1,000,000	1	249,104	July 15, '13	.04	Tennessee, c.	Tenn.	300,000	24	300,000	Apr. 15, '16	.75		
Pitts Silver Peak	Nev.	2,790,000	1	840,600	Dec. 1, '14	.02	Tightner	Cal.	100,100	100	160,000	Jan. 3, '14	.24		
Platteville, l. z.	Wis.	600	60	179,500	June 15, '07	10.00	Tomboy, g. s.	Colo.	310,000	5	74,400	3,861,555	June 30, '16	.01	
Plumas Eureka, g.	Cal.	150,625	10	2,531,294	Apr. 9, '01	.06	Tom Reed, g.	Ariz.	909,555	1	2,555,934	Sept. 1, '15	.01		
Plymouth Con.	Cal.	240,000	5	231,050	Apr. 10, '16	.24	Ton-Belmont, g.	Nev.	1,600,000	1	562,500	8,205,627	July 1, '18	.12%	
Portland, g.	Colo.	3,000,000	1	10,447,080	July 20, '16	.03	Ton. Extension, g. s.	Nev.	1,272,301	1	413,660	1,400,856	July 1, '16	.15	
Prince Con, a. l.	Nev.	1,000,000	2	125,000	July 1, '16	.05	Tonopah, g. s.	Nev.	1,000,000	1	450,000	13,450,000	July 21, '16	.15	
Quartzette, g. s.	Nev.	100,000	10	375,000	July 31, '07	.20	Tonopah Midway, g.	Nev.	1,000,000	1	250,000	250,000	Jan. 1, '07	.05%	
Quicksilver, pf.	Cal.	45,000	100	1,931,411	Apr. 8, '03	.50	Tremis	Cal.	200,000	2.50	234,000	Apr. 28, '15	.02		
Quip, c.	Wash.	1,600,000	1	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	1,100,000	Oct. 30, '12	3.00		
Quincy, c.	Mich.	110,000	25	22,547,500	June 30, '16	4.00	Tuolumne, c.	Mont.	800,000	1	495,525	Apr. 13, '13	.10		
Ray Con, c.	Ariz.	1,571,273	10	6,144,406	June 30, '16	.50	Uncle Sam Con, s.	Utah	500,000	1	470,000	Sept. 20, '11	.05		
Red Bird, g. s. c. l.	Mont.	300,000	5	72,000	Oct. 9, '04	.01	Union, g.	Colo.	1,250,000	1	444,244	Jan. 27, '03	.02		
Red Metal, c.	Mont.	100,000	10	1,200,000	Apr. 1, '07	.10	Union Basin, z.	Ariz.	835,350	1	167,070	Nov. 16, '15	.10		
Red Top, g.	Nev.	1,000,000	1	128,176	Nov. 25, '07	.10	United, c. pf.	Mont.	80,000	100	1,500,000	Apr. 15, '07	3.00		
Republic, g. s. l.	Wash.	1,000,000	1	85,000	Dec. 23, '10	.01%	United, c. com.	Mont.	450,000	100	6,125,000	Aug. 6, '07	1.75		
Richmond, g. s. l.	Nev.	54,000	1	4,453,787	Dec. 23, '09	.02	United, z. l. pf.	Mo.	19,556	25	211,527	Oct. 15, '07	.60		
Rocco Home, l. s.	Nev.	300,000	1	152,500	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01		
Rochester Ld. & L.	Mo.	4,900	100	190,846	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1	440,435	Jan. 1, '10	.04		
Round Mountain, g.	Nev.	889,018	1	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	759,000	3,335,000	June 30, '16	15.00	
Sacramento, g.	Utah	1,000,000	5	308,000	Oct. 22, '05	.00%	United Metals Sell.	U. S.	50,000	100	11,000,000	Sept. 23, '10	6.00		
St. Joseph, l.	Mo.	1,464,798	10	10,972,631	June 20, '16	.25	United Verde, c.	Ariz.	300,000	10	1,620,000	38,047,000	July 9, '16	.75	
St. Mary's M. L.	Mich.	160,000	25	7,660,000	July 28, '16	2.00	U. S. Red & R. com.	Colo.	59,188	100	414,078	Oct. 9, '03	1.00		
Schoenh'r-Wal'n, z. l.	Mo.	10,000	10	90,000	Sept. 20, '11	.20	U. S. Red & R. pf.	Colo.	39,458	100	1,775,936	Oct. 1, '07	1.50		
Scratch Gravel	Cal.	1,000,000	1	20,000	Feb. 1, '16	.02	U. S. S. R. & M. com.	USMx	351,115	50	965,566	7,590,745	July 15, '16	1.00	
Seven Tro. Con, g. s.	Nev.	1,443,077	1	252,532	Apr. 1, '15	.02%	U. S. S. R. & M. pf.	USMx	486,350	60	18,094,366	July 15, '16	.87%		
Shannon, c.	Ariz.	300,000	10	750,000	Jan. 30, '13	.50	Utah, c.	Utah	1,624,490	10	5,934,696	41,656,692	June 30, '16	3.00	
Shattuck, Ariz., c.	Ariz.	350,000	10	4,200,000	July 20, '16	1.25	Utah, s. l. (Fish Sps)	Utah	83,000	10	253,720	Oct. 21, '10	.02%		
Silver Hill, g. s.	Nev.	108,000	1	88,200	June 24, '07	.10	Utah-Apex, s. l.	Utah	628,100	6	254,100	330,125	July 1, '16	.25	
*Silver King Coal'n	Utah	1,250,000	5	14,147,455	July 1, '16	.15	Utah Con, c.	Utah	300,000	6	450,000	9,600,000	June 28, '16	.75	
Silver King Con	Utah	637,582	1	942,373	July 22, '16	.10	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 23, '16	1.00	
Silver Mines Expl.	N. Y.	10,000	100	250,000	June 16, '10	2.00	Victoria, g. s. l.	Utah	250,000	1	207,500	207,500	Apr. 23, '10	.04	
Sinox Cons., l. s. c.	Utah	745,389	1	872,105	June 20, '11	.04	Vindicator Con, g.	Colo.	1,500,000	1	135,000	3,397,500	July 25, '16	.03	
Skidoo, g.	Cal.	1,000,000	5	365,000	Oct. 2, '14	.01	Wasp No. 2, g.	S. D.	600,000	1	100,000	619,466	May 15, '16	.02%	
Smuggler, s. l. z.	Colo.	1,000,000	1	2,235,000	Nov. 22, '06	.03	Wellington, l. z.	Colo.	10,000,000	1	400,000	1,050,000	July 1, '16	.02	
Snowstorm, c.	Idaho	1,600,000	1	1,169,610	Oct. 10, '13	.01%	West End Con.	Nev.	1,788,486	1	536,545	Jan. 15, '16	.06		
Socorro, c.	N. M.	377,342	6	177,205	June 1, '16	.05	West Hill	Wis.	20,000	1	40,000	40,000	June 29, '16	.20	
South Eureka, g.	Cal.	299,381	1	1,388,764	July 15, '16	.07	White Knob, g. pf.	Cal.	200,000	10	170,000	170,000	May 29, '16	.10	
So. Swansea, g. s. l.	Utah	300,000	1	287,500	Apr. 3, '04	.01%	Wilbert	Ida.	1,000,000	1	30,000	30,000	May 1, '16	.01	
Spearfish, c.	S. D.	1,500,000	1	165,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	360,000	8,760,000	Apr. 1, '16	6.00	
Standard Con, g. s.	Cal.	173,394	10	5,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,674	16	53,403	53,403	Nov. 15, '15	.25	
Standard, c.	Mex.	425,000	1	69,600	Sept. 8, '05	.50%	Work, g.	Colo.	1,600,000	1	1,697,688	Apr. 31, '12	.02		
Stewart, l. z.	Idaho	1,238,362	1	2,043,297	Dec. 3, '15	.05	Yak, c.	Colo.	1,000,000	1	2,127,685	June 30, '16	.07		
Stratton's Crisp, Ck.	Colo.	2,000,000	1	300,000	Sept. 6, '08	.02%	Yank Con, g. s. l.	Utah	1,000,000	1	167,500	167,500	Feb. 1, '13	.01	
Stratton's Ind.	Colo.	1,000,000	5	5,028,568	Dec. 23, '06	0.12	Yellow Aster, g.	Cal.	100,000	10	15,000	1,187,789	July 6, '16	.02	
Str'n's Ind. (new) g.	Cal.	1,000,000	.30	691,250	Jan. 31, '16	.16	Yellow Pine	Cal.	1,000,000	1	650,000	1,513,008	July 25, '16	.15	
Strong, g.	Colo.	1,000,000	1	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	102,583	July 15, '14	.10		

Corrected to August 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675.00

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest		
						Date	Amt.								Date	Amt.	
Ajuchitlan	Mex...	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrilas	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00		
Amistad y Concordia g.s	Mex...	9,600	50		429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25		1,527,320	Dec. 15, '15	\$0.24		
Amparo, s. g.	Mex...	2,000,000	1	200,000	2,132,176	May 10, '16	.06	Lucky Tiger	Mex...	715,337	10	284,675	3,528,066	July 20, '16	.08		
Barlo de Medina Mill	Mex...	2,000	25		103,691	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Gnt...	2,247,692	1	202,293	4,810,061	July 1, '16	.03		
Batopilas, s.	Mex...	446,268	20		55,870	Dec. 31, '07	.12%	Mexican, l. pf.	Mex...	12,500	100		1,018,750	May 1, '12	3.50		
Beaver Con. s.	Ont...	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex...	240,000	10		660,000	Mar. 10, '08	.25		
Bolao, g.	Mex...	120,000	20		721,371	May 8, '11	6.00	Mexico Mines of El Oro	Mex...	180,000	6		4,478,500	June 26, '14	.96		
British Columbia, c.	B. C.	691,709	5		615,399	Jan. 5, '13	.15	Minas Pedrazzini	Mex...	1,000,000	1		4,958,600	July 25, '13	.06		
Buena Tierra	Mex...	330,000	5		160,350	Jan. 30, '15	.24	Mines Co. of Am.	Mex...	900,000	10		4,958,600	July 25, '13	.12%		
Buffalo, Ont.	Ont...	1,000,000	1		2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can...	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%		
Canadian Goldfields	Can...	600,000	0.10		237,099	July 15, '14	.01%	Monteruma, l. pf.	Mex...	6,000	100		402,600	Nov. 16, '12	3.50		
Cananea Central, c.	Mex...	600,000	10		360,000	Mar. 1, '12	.60	Monteruma M. & Sm.	Mex...	500,000	1		100,000	July 20, '09	.04		
Cariboo-Cobalt	Ont...	1,000,000	1		295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,600	Jan. 3, '16	.11		
Cariboo-McKinney, g.	B. C.	1,250,000	1		56,250	Dec. 1, '09	.00%	Naica, s. l.	Mex...	100	300		3,190,000	Oct. 11, '09	\$233		
City of Cobalt	Ont...	500,000	1		138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	220,000	3,970,000	July 23, '16	.50		
Cobalt Central, s.	Ont...	4,761,500	1		192,845	Aug. 24, '09	.01	Nipissing, g.	Ont...	1,200,000	5	900,000	14,340,000	July 20, '16	.25		
Cobalt Lake, s.	Ont...	3,000,000	1		465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1		633,000	Feb. 1, '10	.02		
Cobalt Silver Queen	Gnt...	1,500,000	1		316,000	Dec. 1, '08	.03	Paloma, g.	Mex...	3,000	...		99,600	Dec. 1, '12	5.00		
Cobalt Township, s.	Gnt...	199,282	5		1,042,359	Aug. 20, '14	.24	Panuco	Mex...	10,000	...		7,465,000	Nov. 4, '09	5.00		
Coniagas, s.	Ont...	800,000	5	200,000	8,040,000	Feb. 5, '11	.25	Penoles, s. g.	Mex...	120,000	20		6,481,687	Sept. 30, '13	1.25		
Con. Mx. & Sm. g. s. c.	B. C.	58,050	100	420,517	2,740,654	July 1, '16	2.50	Perezgrina, pf.	Mex...	10,000	100		328,656	Sept. 1, '10	.03		
Crown Reserve, s.	Ont...	1,999,957	1		6,102,408	July 15, '16	.03	Peterson Lake	Ont...	2,401,820	1	84,064	340,287	July 1, '16	.01%		
Dolores	Mex...	400,000	5		1,374,865	July 24, '11	.22%	Pinguilo, pf.	Mex...	20,000	100		790,000	Apr. 15, '13	3.00		
Dome Mines, s.	Ont...	400,000	10	400,000	800,000	June 1, '16	.50	Porcupine Crown	Ont...	2,000,000	1	180,000	600,000	July 2, '16	.03		
Das Estrellas, (El Oro)	Mex...	300,000	0.50		15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex...	6,000	15		363,500	Jan. 1, '06	1.02		
El Favor	Mex...	3,600,000	1		210,000	Apr. 30, '14	.01	Ramblor-Cariboo	B. O.	17,500	100	52,600	47,500	June 2, '16	.03		
El Oro, g. s.	Mex...	1,147,500	6		9,136,842	July 11, '13	.24	Rea Mines, Leasing	Ont...	200,000	1		12,750	Feb. 20, '15	.06%		
El Rayo, g. s.	Mex...	260,020	2		140,410	Apr. 24, '11	.16	Right of Way	Ont...	1,685,500	1	16,855	560,614	June 15, '06	.00%		
El Triunfo, c.	Mex...	2,000,000	1		20,000	Aug. 28, '11	.01	Rio Plata	Mex...	374,518	5		346,744	Feb. 1, '13	.06		
Esperanza, s. g.	Mex...	450,000	5		12,521,250	Dec. 31, '16	.10	San Francisco Mill	Mex...	6,000	25		445,086	Oct. 15, '08	1.00		
Granby Con. c. g. s.	B. C.	149,985	100	449,966	6,050,341	May 1, '16	1.50	San Rafael	Mex...	2,400	25		6,798,260	Jan. 11, '12	2.00		
Greene-Cananea, g.	Mex...	1,000,000	10		5,094,382	May 29, '16	2.00	San Toy, s. l.	Mex...	6,000,000	1.00		540,000	July 24, '13	.01		
Greene Con. c.	Mex...	1,000,000	10	2,600,000	12,934,000	July 25, '16	1.00	Santa Gertrudis, Edgo.	Mex...	1,500,000	6	364,500	2,619,772	June 16, '16	.24		
Greene Gold-Silver, pf.	Mex...	300,000	10		194,871	Mar. 28, '07	.07	Sta. Gerty's Guadalupe, g. s.	Mex...	60,000			3,360,000	Mar. 27, '16	.00		
Guanaquato Con.	Mex...	540,000	6		600,000	Oct. 8, '06	.07%	Sta. Maria del Paz	Mex...	9,600	12 1/2		6,606,000	Jan. 2, '13	2.50		
Guanaul 1/20 Dev. pf.	Mex...	10,000	100		274,356	Jan. 1, '11	.30	Seneca-Superior	Ont...	473,834	1	473,834	1,400,096	July 15, '16	.30		
Guzgenhelm Explor.	Mex...	833,732	25	10,713,456	34,082,780	Apr. 3, '16	11.86	Soledad, s. l.	Mex...	960	20		4,439,340	Oct. 17, '11	6.00		
Hallebury, s.	Ont...	60,000	1		50,000	Apr. 6, '11	.50	Sorpresa, g. s.	Mex...	19,200	20		3,979,240	Jan. 6, '11	\$1.3400		
Hedley	B. C.	120,000	10	120,000	1,943,520	June 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	350,000	2,150,000	July 10, '16	.02%		
Hinds Con. g. s. l.	Mex...	5,000	1		85,000	Feb. 27, '08	.02	Temiscamg. & Hud. Bay	Ont...	7,761	1		1,940,250	Nov. 10, '14	3.00		
Hollinger	Ont...	600,000	1	920,000	5,130,000	July 14, '16	.20	Temiskaming, s.	Ont...	2,500,000	1	75,000	1,634,156	July 22, '08	.08		
Jimlico, c.	Mex...	10,000	100		975,000	Feb. 27, '11	.01	Terzaghi, c.	Mex...	1,000,000	100		1,935,000	Mar. 27, '16	1.80		
Kerr Lake, s.	Gnt...	600,000	6	300,000	6,420,000	June 1, '16	.25	Tor-gh-Gake	Ont...	531,500	6	199,311	265,750	July 1, '16	.12%		
La Blanca	Mex...	140,000	20		2,776,700	Mar. 31, '13	.90	Tretheway, s.	Ont...	1,000,000	1		1,061,988	July 15, '14	.05		
La Republica, s.	Mex...	400,000	5		110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.	Gnt...	1,416,590	1		666,386	Oct. 20, '13	.05		
La Rose Con. s.	Ont...	1,498,627	5	224,793	6,611,913	July 20, '16	.05	Yukon, g.	Y. T.	3,500,000	6	625,000	8,108,110	June 30, '16	.07%		

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The Function of Oil and Acid in Flotation

By H. J. STANDER.*

If one wishes to closely observe the behavior of particles of oil, air and sulphides, while they are in an agitated quantity of water, it is highly essential to carry out the experiment in a machine which has one of its sides constructed out of glass. The experiments described in this article were carried out in a testing machine, built on the style of the Minerals Separation machine, having glass fronts to both the agitating chamber and the spitzkasten box.

When the two boxes are filled with water, and the agitator run at a speed of about 1800 rpm., one can see, by looking through the glass front, a certain number of air bubbles. These bubbles have been beaten into the water in the agitating chamber, and are now passing into the spitzkasten, having enough momentum to travel downwards along the baffle plate until they are released at the end of the plate. The baffle plate in this machine points downwards. As soon as the air bubbles get around the lower end of the baffle plate, they, of course, rise to the surface of the water in the spitzkasten.

Even when the agitator is run at full speed, which is 2400 rpm., the number of air particles coming from the agitating chamber is not sufficient to cause any noticeable change in the appearance of the water in the spitzkasten box. One can detect a limited quantity of these bubbles as they come round the baffle plate and rise to the surface of the water in the collecting chamber.

On the addition of one drop of oil, such as creosote, eucalyptus or pine oil, to the water in the agitating chamber, the number of air bubbles is increased to such an extent that the water in the spitzkasten becomes perfectly white. It is of course not the water that changes in color, but this white appearance is due to the fact that we now have an infinitesimal amount of exceedingly small particles of air intermingled with the water in the collecting chamber. In other words, we may say that an emulsion has been formed; and the change in the appearance and quantity of air bub-

bles, due to the addition of about 0.02% of oil, is indeed a very remarkable one. It is possible to get an estimate of what an oil will do in flotation by noting to what extent it increases the number of air bubbles in the machine, or, to use a colloquial expression, by seeing to what degree it "whitens up" the water in the spitzkasten.

Although the process of concentrating ores by the flotation method is usually spoken of as "oil flotation," we know that an oil is not the only substance that will form a froth with sulphide particles. On the addition of certain organic substances, I have obtained an exceedingly high percentage of extraction of sulphide particles. Experiments were made without oil, using such organic substances as froth makers. Not only did they produce a very good effect on the air bubbles, by increasing the number of bubbles when added to the agitated water, but they also formed excellent froths with ores carrying sulphides. The following is a table of the results of some of the more common of the substances:

Volume of solution used.	Emulsifying agent.	Pct. of emul. agent in sol.	Pct. of sulphide extracted.
4500 cc.	Amyl. Acetate	0.02	60
4500 cc.	Pyridin	0.04	45
4500 cc.	Toludin	0.05	35
4500 cc.	Carbon tetra-chloride	0.1	30
4500 cc.	Ether	0.1	30

Experiments were also carried out with acetone, toluol, chloroform, formaldehyde, oil anilin, cymol, geraniol, etc.

From the above it seems as if any substance which is an emulsifying agent, i. e., will cause the air bubbles in the water (produced either by pneumatic or mechanical agitation) to increase in number and decrease in size, is capable of forming a froth with the metallic particles.

A very interesting experiment is to take a small scoop, place some finely ground galena in it, and allow a small quantity of water to flow slowly on to it. Keeping the scoop in a tilted position for some time, and then lowering the front end so that the water can run off, it will be found that as the water runs back off the galena, its surface is covered with dry sul-

*Flotation Engineer.

phide particles, while the galena that is left behind in the scoop will be perfectly dry. The water finds great difficulty to wet the galena, because as soon as it comes in contact with the top layer of the sulphides, the surface of the water becomes completely covered with very fine sulphide particles. Furthermore, as the water is allowed to flow over the galena, it gets an envelope of sulphides all around itself, and these sulphides lie so closely together on the surface of the water that when looked at under a microscope they seem to form a complete film without any breaks. The angle of contact of the sulphide particle and the water surface is such that the particle does not pierce the water surface, but rather floats on or adheres to it. Also it appears as if the sulphide particles are totally non-porous, absorbing apparently no water.

If this experiment is done with silica instead of galena, one will see that the water is at once absorbed into the silica particle, and the water fills up all the pores in the particle, during which action the surface of the water is naturally pierced, with the result that the silica sinks into the water. If a paste of finely ground galena and water is formed, and water is allowed to flow slowly over the surface of this paste, one notices that, even under these conditions, when the galena is practically "wet," the water surface becomes coated with a fine, but consistent layer of galena particles. This experiment can be done in a beaker; and although one shakes the beaker quite violently, the water will always carry a layer of metallic particles.

But what is even more interesting in the above experiment, is that as the beaker, with its contents of galena and water, is shaken up, the bubbles of air, which are shaken into the water, come to the surface of the water with a slight covering of a very fine film of galena particles. This, however, applies only to the smallest of the air bubbles. The air bubble, as it is shaken into the water, is surrounded by water, with the result that we have again a water surface bounded by an air surface, producing an interfacial tension of water and air; and the surface which now separates the two phases is a foam interface. The fine sulphide particles tend to stay in such a water-air interface. Blowing very small air bubbles through a glass tube, which has been drawn out to a small aperture, into the water in the beaker, the above-stated action of the galena particles can be seen to an even greater advantage. If the bubbles blown in are too big they will carry very little or no sulphides, because the exposed bubble surface is very small as compared with that when a very large number of fine bubbles are blown into the water. The smaller the air bubble, as it passes through the water containing the sulphide particles in suspension, (as a result of the agitation) the better chance the sulphides have to form a complete film on the water surface, which surrounds this bubble; or, in other words, in the spherical water-air interface. This explains in part why the air, in the case of pneumatic agitation, should be passed through a fairly thick canvas screen.

It will then appear that when air bubbles are either beaten or forced into a quantity of water, and a small amount of some particular foreign substance be added to the water, the bubbles seem to decrease in size and increase in number to an almost unlimited extent. For instance, such is the case when a drop of eucalyptus oil or ether is added to the water. The interfacial tension between the water and air phases is decreased on the introduction of an emulsifying agent. Such an emulsifying agent must have the property of tending to enter the water-air interface. Wilder D. Bancroft has written a series of articles on "The Theory of Emulsification," published in the *Journal of Physical Chemistry*, out of which very useful data with regard to the characteristics of an emulsifying agent, can be obtained. His article in the April number, 1915, is of special interest, inasmuch as quite a number of very useful experiments are cited. He says: "For a substance to be an emulsifying agent, it must tend to pass into the surface separating the two liquids and form a coherent film there. If the emulsifying agent does not form a coherent film the emulsion will crack."

When two liquids, which are practically immiscible, come together we have a surface that separates these two liquid phases, and this surface is called a *dineric*² interface. In order to fully understand the water-air interface, it may be of value to study a case where we have a *dineric* interface. The following extract from Wilson's³ account of an experiment which he carried out as early as 1848, will serve the purpose as well as any:

"When chloroform is placed in a test-tube, or other vessel of glass, standing on a horizontal surface, it exhibits, like other substances which wet that solid, a curved surface with the concavity upwards. If water, or an aqueous solution of nitric, sulphuric, or muriatic acid, be poured upon the stratum of chloroform, the surface of the latter immediately changes the direction of its curve, and becomes convex upwards, the convexity induced being much greater, however, than the previous concavity. If, on the other hand, an aqueous solution of potash, soda, or ammonia be placed above the chloroform, the latter ceases at its upper limit to present a sensible curvature upwards or downwards, and shows a surface which, to an unassisted eye, appears to be flat. It is the property of an acid to round, and of an alkali to flatten the surface of various liquids, of which chloroform is one, that I seek specially to direct attention.

"The phenomena referred to cannot seem remarkable when merely described; but they have appeared strikingly, and, I may say, startling to most of those that have witnessed them. They are best observed by dropping into a perfectly clear, flat-bottomed glass vessel containing pure water, a quantity of chloroform too small in amount to touch the walls of the vessel on every side. The heavier liquid then shows itself

¹Bancroft: *Jour. Phys. Chem.*, 19, 275 (1915).

²De I.: *Jour. Phys. Chem.*, 9, 531 (1905).

³*Jour. Chem. Soc.*, 1, 174 (1848).

as a brilliant highly-mobile globule. If alkali be now added, the globule in a moment collapses, sinks as if exposed to a crushing force, and flattens out on the bottom of the glass. On slightly supersaturating the alkali with acid, the flattened chloroform starts into its previous globular shape, with a momentum and rapidity, such as might be exhibited by a highly-elastic substance, like a ball of caoutchouc suddenly relieved from enormous pressure. When the acid in its turn is supersaturated with alkali, and the flattening again occurs, and by alternating the addition of these reagents, the same globule may be successfully flattened and rounded for any number of times.

"Change in configuration, however, is not the only alteration which the globule of chloroform undergoes. Some of the other physical properties are markedly altered by its contact with acids and alkalis. These changes are best seen when a deep, white saucer, or flat-bottomed porcelain basin, is made use of as the containing vessel. When acidulated water is placed in this, and chloroform let fall into it, the denser fluid is scarcely wetted, and although nearly half as heavy again as pure water, sinks reluctantly. If the drops indeed be small, they never reach the bottom, but on floating on the surface, evaporate away. Those which descend form globules very mobile, and readily obeying the solicitation of gravity. When separate globules melt, they rapidly flow together, and scarcely one is seen without a bubble of air attached to its upper surface and adhering tenaciously. When the water, on the other hand, is alkali, the chloroform is quickly wetted, and sinks swiftly. The drops, if small, become circular discs with rounded edges; if large, they are oval, or spread out into elongated, irregularly ovoidal, or flattened cylindrical forms. Their shape, however, is changed by the slightest impulse, or inclination of the containing vessel, in a way, which perhaps might best be illustrated by comparing it to the ever-varying elongation, contractions and irregular swellings, which alter the configuration of an active living leech in a glass of water. The flattened globule moreover, is much less mobile than the rounded one in acid. The former moves sluggishly, even down an inclination, clings to the vessel; and when compelled to move rapidly leaves a tail behind it, like foul mercury. No air bells attach themselves to it and its brilliancy is sensibly diminished, as if its refractive index had altered."

From this experiment we can very clearly see how the interface changes in shape when an acid or alkali is added to the system. The interfacial tension is markedly altered in both cases. In the flotation process, the emulsifying agent alters, in the same way, the interfacial tension existing between the surface of the water and the air bubble. The result is that the metallic sulphide particles find it even more difficult to pierce the water-air interface, then when there is no emulsifying agent to make a more coherent film. Thus the oil will make it possible for a larger number of sulphides to adhere to this, usually spherical, film.

As previously stated, the surface tension of the water decreases on the addition of small quantities of such substances as ether, chloroform or oil. This decrease in surface tension then brings about a decrease in the size of the air bubble. The air bubble will tend to leave the liquid when the surface tension of the liquid increases; in other words, the air will form in larger bubbles, and the opposite of course happens when the surface tension of the liquid decreases. The oil is responsible for such a decrease in the surface tension of the liquid, but it performs another duty apart from this.

The sulphide particles cannot be given an oil coating as the amount of oil added is too minute. In practice the amount of oil in the solution is usually only 0.05%. That a molecular oil-film is formed around the metallic particles, is possible, but as yet we are not capable of discussing this particular point.

To form an emulsion, we do not need enough of the emulsifying agent to form a real film of it between the liquid and gas phases; on the contrary, only so much of it is required as to bring about the desired change in the surface tension of the liquid, and to make the interfacial film more coherent. When one closely observes the change that takes place in the agitated water on the addition of about 0.01% of oil, such as eucalyptus, pine oil or creosote, it can clearly be seen that the added oil produces an emulsifying effect. This cannot be noticed in the mill, or when a large amount of ore is added to the agitated water before the oil is added. The emulsion under such conditions is partly broken down, yet we get the same results from the emulsifying effect of the oil. Difference in the emulsifying effect of different oils will make it possible to get a difference in the so-called selective action of the oil.

Various properties of a solution are changed by the addition of an alkali or acid. It is quite possible to conceive that the interfacial film changes in its properties, as the liquid is made alkaline or acidic. It is well known that a more selective action in flotation is brought about by the help of an acid. A more selective action really means that the ability of the air or gas bubbles to attach themselves to, or carry, the gangue particles, decreases to such an extent that the silica finds it totally impossible to rise to the surface of the liquid. Experiments show that although the concentrate carries less gangue, yet the recovery of sulphides is not so high as when without acid.

This is further proof that the air bubbles decrease in their carrying ability when the solution is made acidic; in other words, a change has been brought about in the water-air boundary. That this effect is confined to the interfacial tension, and the coherent property of this interface is not probable, especially when the electrical theory is given any consideration.

An emulsion is usually interpreted as drops of one liquid suspended in another liquid, these drops being kept in some way or other from coalescing. Whether

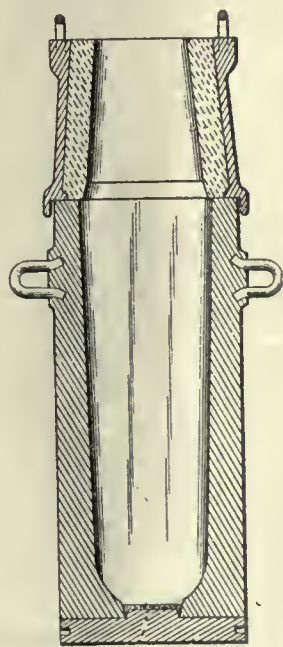
it is possible to have an emulsion of a liquid, a gas and a foreign liquid, is a matter worth our attention.

The term "emulsion" has been freely used in this article. I have failed to find any term other than emulsion to suitably describe the phenomenon which takes place when an infinite number of air particles are being released in a quantity of water containing, say, 0.01% pine oil.

When considering the change in size of the air bubbles brought about by the addition of those foreign substances, to which I referred as emulsifying agents, it is of importance to remember that the more convex the surface film, the greater will be its resistance to outside forces. As the air particle gets smaller, its spherical surface film naturally gets more and more convex, with the result that its resisting power to any force that may tend to pierce it, also increases. This gives us another reason why it is that the smaller the air bubble, the better collector of sulphides does it become. The large bubbles of air, which are very often seen on the top of a froth, should not be confused with these "collecting" air bubbles. The former are in the froth medium, and practically out of contact with the water; while in the case of the latter we have a water-air interface which is of prime importance in the raising of the metallic sulphide particles.

A Novel Ingot Mold.

In this class of molds, known as "big-end-up" molds, where the mold is solid or not made in sections as is sometimes done, the ingot is stripped from the mold by either being raised or pushed out of the mold,



SECTIONAL VIEW OF INGOT MOLD.

or the mold is reversed and the ingot dropped out. If the molten metal leaks from the bottom of the mold in such a manner as to form a lateral fin at the inner end of the ingot, the stripping of the ingot is prevented

or impeded, furthermore if the walls of the mold cavity are not properly formed what are known as "stickers" are formed on the ingot which prevent or impede the stripping operation. It is quite important that the mold cavity should be free from re-entrant angles which tend to impede the stripping operation.

In an ingot mold recently patented by Emil Gathmann, of Baltimore, Md., (No. 1,188,751), the bottom opening of the mold is preferably formed with walls which converge downwardly, and the walls of the lower portion of the mold cavity are formed with rounded or convex walls surrounding the inner end of the bottom opening and which merge into the concave walls of the lower portions of the mold. By this construction the presence or formation of re-entrant angles is prevented and the stripping of the ingot is facilitated.

Where the mold stool is provided with a projection which enters the bottom opening in the mold such projection is preferably tapered inwardly and sealing material of a refractory nature is spread upon the top of the stool and this material also enters the recess surrounding the inwardly projecting portion of the stool. In some cases the projection on the stool may be dispensed with and the refractory material is made to fill or partially fill the bottom opening of the mold.

The accompanying sectional view illustrates the points involved.

Insuluminum.

Insuluminum, the patented new metal with heat resisting qualities, will undoubtedly play an important part in the industrial development of the future. So satisfactory and indispensable has its use proved to the manufacturers of soot blowers and pyrometers that a demand has been created among the manufacturers of boilers, superheaters, economizers, stokers, annealing ovens, condensers, etc., for permission to use the material in those parts of their products that are exposed to continuous high temperatures, and arrangements are now being made by the licensees, the Diamond Power Specialty Co., whereby they may be supplied with the metal. Seldom has anything as revolutionary as insuluminum been accorded such a complete acceptance on its merits. Since its adoption the sales of Diamond Blowers have more than doubled in volume, and the company's estimate of sales for the year beginning Aug. 1, 1916, contemplates a further notable increase to a production to equip 1,000,000 hp. of boilers annually. Hundreds of successful applicants of Diamond Insuluminum soot blowers have been made in the hottest portions of the boilers in the past year.

The principal uses of benzol and its products are: As a motor fuel; to enrich illuminating gas; in the manufacture of aniline dyes; as a solvent for rubber and similar substances; in the manufacture of gunpowder.

2000-Ton Leaching Plant at Anaconda, Mont.

By FREDERICK LAIST* and HAROLD W. ALDRICH,†

After a series of experiments covering a period of about 3 years, a 2000-ton leaching plant for the treatment of the accumulated copper concentrator tailing was built and put into operation. During the experimental period, the first step was that of laboratory experiments or beaker leaches. The results on this small scale were so satisfactory that a small operating plant, capable of handling 5 tons of roasted tailings per day, was installed. Again, the results proved satisfactory and an 80-ton plant was built and operated continuously from August until February, 1913. In this plant, full-sized roasting and leaching units were used. The results obtained by the operation of the 80-ton plant proved that the roasting and leaching of delimed concentrator tailings could be profitably done, so in the early spring of 1914, the construction of a 2000-ton leaching plant was begun (Fig. 1). Opera-

tion of the plant began on May 13, 1915. A flow sheet of the plant is shown in Fig. 2.

Leaching Plant Feed.

The accumulated tailings in the New Works dump is estimated at about 20,000,000 tons. The dump consists of the concentrator tailings discharge over a period extending from February, 1902, to the present date. According to daily samples taken during that period, the copper content is about 0.64% and the silver 0.48 oz. per ton. The peak of the dump, or the point where the tailings are discharged, carries about 0.75% copper, while down toward the toe, and where present excavation is taking place, the copper content is only 0.57%. About 3 lbs. per ton of the copper is oxidized, the remainder being sulphide.

The dump is being excavated by a Bay City Industrial Works electric hoist, equipped with a 4-yd.

Conveying and Storage Equipment.

The loaded cars of tailings are spotted by a 25-ton electric locomotive operated by the third-rail system. The unloading pit is a steel bin capable of holding 350 tons and is of sufficient length to allow 3 cars to be unloaded at a time. On top of the pit is a 2-in. grizzly, through which all tailings must pass before going to the storage bins. Under the steel bin are 22 short-belt feeders, each feeding from its own gate and running at right angles to the length of the bin. These feeders discharge onto a 36-in. belt running lengthwise, which in turn delivers the sand to another 36-in.

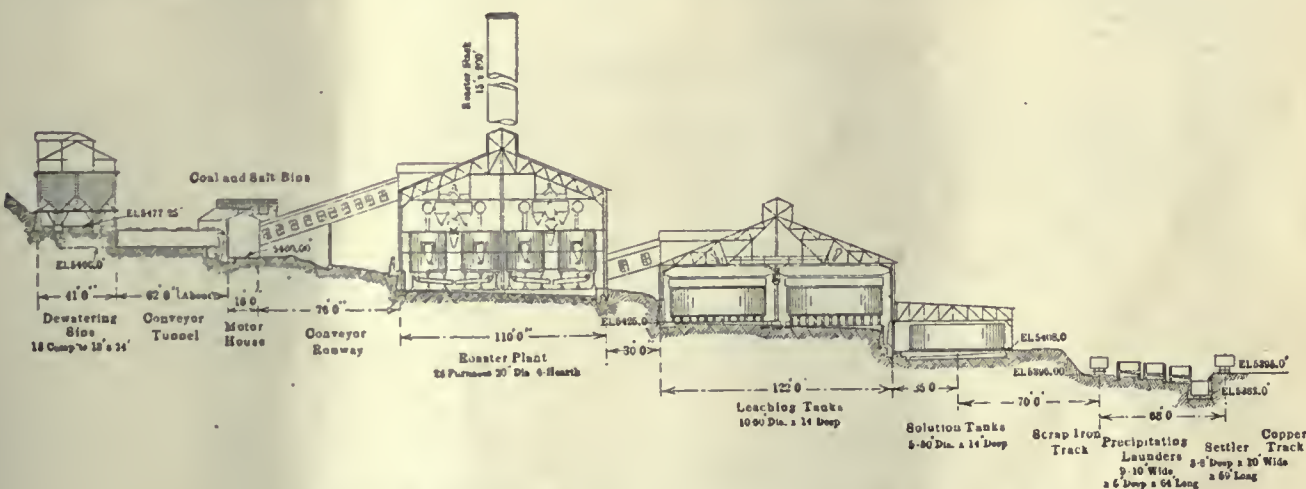


FIG. 1. GENERAL PROFILE OF 2000-TON LEACHING PLANT AT ANACONDA.

belt traveling on an 18° angle to the top of the storage bins. The system will handle over 3000 tons of tailings in 8 hours.

Storage Bins.

The storage bins will hold 6000 tons. This gives between 2 and 3 days' supply for the leaching plant. The bins are of substantial wood construction and are inclosed, the walls and roof of the building consisting of wood sheathing covered with corrugated iron. The bins are arranged in a double row and are hopper-bottomed. The tailings are distributed over the bins by means of a 36-in. belt and movable tripper.

Underneath are 36 gates, each with its hopper from which an 18-in. belt feeder delivers to a 24-in. belt running the full length of the building in the center. By means of other belts, traveling through a tunnel under the railroad tracks, and up an 18° incline, the feed is delivered to the top of the furnace building.

There are also small coal and salt storage bins from which a 22-in. belt system conveys coal and salt

*Metallurgical Manager, Anaconda Mining Co.
†Superintendent of Leaching Plant, Anaconda Mining Co.
‡Bull. American Institute of Mining Engineers.

a tripper, the calcine is dumped into a suitable distributor, which spreads it over the tank.

Each tank has three lead pipes 4 ins. in diameter and one 4-in. iron pipe entering at the top. The lead connections are for strong and dilute acid solutions and the iron pipe is for wash water. Above the level of the leaching tanks an iron storage tank is provided for holding the stock of concentrated acid. Its capacity is about 120 tons of 60° Bé. acid. All concentrated acid, used to raise the acid strength of any solution, is added to the solution as it goes on the charge in the leaching tanks.

There are seven 10-in. sluicing gates in the bottom of each leaching tank, one in the center and six spaced equidistant from each other in a circle about half way between the center and the circumference of the tank.

from the solution tanks, by means of vertical shaft, direct-connected, hard-lead, centrifugal pumps.

Precipitating Division.

The precipitation of the copper and silver is accomplished with scrap iron. The precipitating launders are of concrete, each about 250 ft. long and, having a section of 4 by 8 ft. available for containing iron. Each launder is partitioned off into four sections by concrete walls. Any of the 12 sections may be bypassed for the purpose of cleaning up. In the bottom of the launders is a heavy wood grating, upon which the iron rests, leaving a space about 6 ins. under it, for accumulation of any cement copper which may drop off the iron. In the side of each section, at the bottom, are four 6-in. holes, toward which the con-

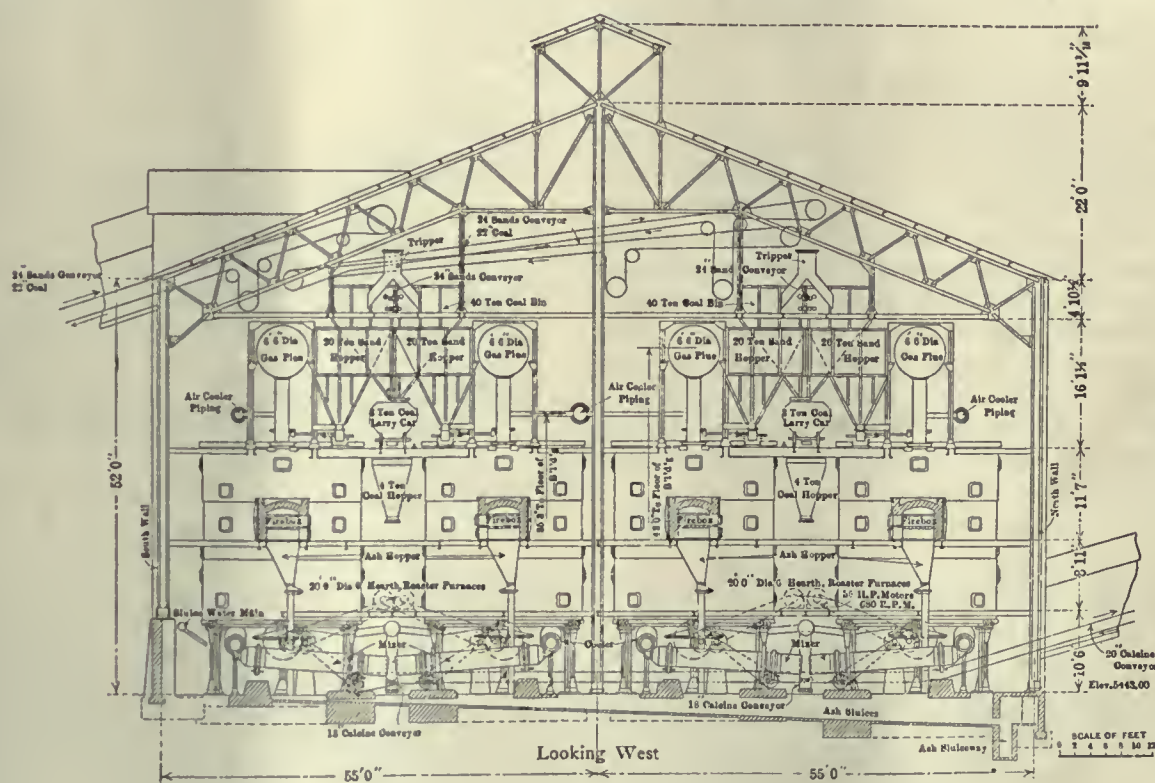


FIG. 3. CROSS SECTION THROUGH ANACONDA ROASTING PLANT.

These discharge into launders which connect with the main tailings launder.

"Acimet" valves and lead piping are used throughout for handling dilute and concentrated acid solutions.

The floors of both the leaching and solution buildings are of concrete, and are painted with an asphaltar mixture for acid proofing. These floors slope to a gutter which connects to a pump sump and in this way any overflow or leakage of solution is saved and returned to the system.

The solution tank building is a lean-to off the leaching building and contains five solution-storage tanks. These are 50 ft. in diameter and 14 ft. deep. Solutions drain from the leaching tanks to the storage tanks and are pumped to the top of the leaching tanks,

crete bottom slopes. These holes discharge into launders which carry the copper to a settling tank. There it is washed and stored and finally excavated with a clamshell bucket, loaded into standard railroad cars and, at present, shipped to the briquetting plant before blast-furnace treatment. An electrically operated Brown hoist, equipped with a lifting magnet, handles the scrap iron and loads the copper.

Details of Operation.

The tailings are subjected to a simple oxidizing roast, no particular care being taken to obtain a large amount of sulphate. The sulphur content of the feed is about 2.2% and that of the calcine about 0.6%. One-third of the total sulphur in the calcine is in the form of sulphate. When too hot a roast is attempted in order

to decrease the total sulphur content, a certain portion of the copper is rendered insoluble in all ordinary acids, with the exception of hydrofluoric.

A pyrometer is inserted over the fourth floor of every furnace, and by means of these, the firemen are able to keep constant control of the temperature. The best results are obtained by keeping the fourth floor at about 500° C. The hottest hearth in the furnace is the third or fired floor, and averages about 535° C.

The water for the calcine cooler systems enters at about 40° C., is discharged at 65° C., and is piped to the solution building, where it is used to heat the circulating solutions. It is then pumped back and used again in the coolers. The calcine after passing through the coolers, and after the addition of 1% moisture, while going through the mixers, has a temperature of about 45° C. During the conveying from the roasters to the leaching tanks, this temperature is lowered to 40° C.

Leaching.

The leaching is done by continuous downward percolation, no circulation or upward percolation being used. The percolation rate will vary from 3 ins. per hour with the first solution to as high as 10 ins. with the wash water. As nearly as possible all solutions and wash waters go on the charge at 40° to 50° C.

It requires about one-fourth of the weight of calcine, in weight of solution, to saturate a charge thoroughly.

There are five solution tanks: One for storage of No. 1 solution, one for No. 2 solution, one for copper solution, and two for wash-water.

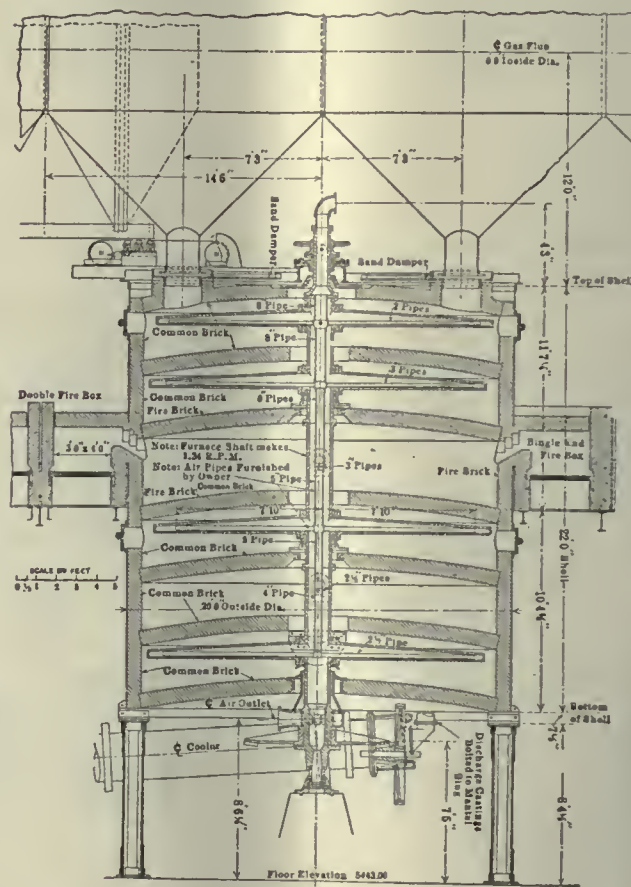
	Cu Pct.	H ₂ SO ₄ Pct.	NaCl Pct.
No. 1 solution tank	0.8	5.0	7.0
No. 2 solution tank	0.1	0.5	3.5
Copper-solution tank	1.9	1.0	7.0
Wash-water tanks	0.2	1.0	1.0

After a tank is charged with calcine and leveled, 250 tons of No. 1 solution is added as fast as the charge will absorb it. The drain valve is always open, so, as soon as the solution reaches the bottom of the tank, it commences to drain to the copper-solution storage tank as copper solution. From the copper-solution tank there is only one outlet, which is to the precipitation launders. After traveling through the launders, two-thirds of the solution is returned to the No. 2 solution tank and the balance wasted. This waste is necessary to keep impurities such as iron and aluminum sulphates from building up in the system.

When the No. 1 solution has all been added to the leaching tank, the solution is allowed to drain until none shows on top of the calcine, when 1% of the weight of the charge, of common salt (NaCl), is added 100 tons of solution from No. 2 solution tank but with additional strong acid to bring it to 20% H₂SO₄. Following the 20% acid solution, 150 tons of No. 2 solution is added, but without additional strong H₂SO₄. This scheme gives a zone 4 or 5 ft. in depth of very strong chloridizing solution, traveling down through the charge. There is about 8% of ferrous

and ferric iron in solution, which, with the salt, forms ferric chloride, in itself a very corrosive reagent, even dissolving a considerable amount of unroasted sulphide. This chloridizing action also gives the silver extraction, as without it very little silver is recovered. The 150 tons of No. 2 solution which follows the 20% acid is for the purpose of washing out silver chloride and dissolved copper which may have been held in the calcine. It carries very little copper or acid, but is fairly high in salt content, and therefore better than a clean water wash. Following the last acid solution, about 300 tons of hot, clean water is added.

The two portions of No. 2 solution, one at 20%



iron, and makes a soft spongy cement copper which is easily washed off with a hose, leaving the iron clean for more precipitation. It is never necessary to remove the iron for cleaning. The silver is recovered by precipitation on the precipitated copper.

Results.

The resulting cement copper carries about 70% copper. The following data are taken from the reports for the month of October, 1915. This is a representative month, but it is certain that the results will be improved upon, after longer operation.

Sand tailings treated, tons.....	70,401.00
Copper in feed, per cent.....	0.575
Silver in feed, ounces per ton.....	0.45
Copper in tailings, per cent.....	0.082
Silver in tailings ounces per ton.....	0.14
Sulphuric acid (60° Bé), pounds per ton of feed.....	64.90
Coal, per cent of feed.....	3.30
Salt, per cent of feed.....	1.52
Iron, pounds per pound of copper.....	2.00

The plant during this month made an extraction of about 80% of the copper and 60% of the silver. This is less than indicated by assays of heads and tailings owing to various plant losses of which the largest is dust from the roasting furnaces amounting to about 4.5% of the copper in the feed.

Analyses of Feed and Tailings.

	Cu, Pct.	Ag, Ozs.	SiO ₂ , Pct.	FeO, Pct.	S, Pct.	Al ₂ O ₃ , Pct.	CaO, Pct.
Feed	0.575	0.45	81.3	3.0	2.1	9.4	0.4
Tailings	0.082	0.14	84.7	2.4	0.4	8.7	0.4

A New Use for Motor Truck.

A very interesting and unusual use of the motor truck is illustrated by the accompanying photograph.

This 4-wheel drive truck is used in place of a loco-

600 linear feet of roadway are being laid daily. The track is 4 miles in length and 10 round trips are made each day. Each trailer carries 1½ yds. of gravel or crushed rock, making a total pay-load of 24 to 26 tons. The truck pulls this load while running in high gear, and travels at 12 to 15 miles per hour.

Fifty teams and wagons were unable to do the work which is now being done by this truck and string of trailers, according to the contractors, and an enormous saving in cost is effected. The average daily cost of operating the truck and trailers in this service is \$17.

The motor truck is built by the Four Wheel Drive Auto Co., Clintonville, Wis.

Another Manganese Ore Company.

The Manganese Products Co., 35 Wall street, New York, incorporated in Delaware April 1, 1916, has taken over the Kennedy manganese ore mines, located about 5 miles from Lipscomb, Augusta county, Virginia, formerly owned and operated by the Steel Ores Co. of Virginia. About 15 years ago a mill was erected to wash and crush the ores and since then about 20,000 tons, averaging 45% manganese, was taken out in intermittent operations. The new company is now operating the mine and mill. It controls about 10 miles of property along the Blue Ridge mountains, comprising about 5500 acres. With improvements in the mill about 50 tons of ore a day will be produced, beginning in May. A standard gauge railroad, 6 miles long, connecting with the Norfolk & Western, is owned by the company. One object of the new organization is stated to be to assist the small ore producers of that region to increase their output



A 4-WHEEL DRIVE TRUCK HAULING GRAVEL ON A NARROW GAUGE TRACK.

motive to draw a string of heavily loaded trailers on a narrow gauge track. The truck itself straddles the rails, and it is interesting to note that enough traction is secured to pull the train easily up a 5% grade, although no load whatever is carried on the body of the truck.

The crushed rock, gravel and cement hauled by this outfit are being used in the construction of a 16-ft. concrete highway in Iowa. The large amount of material hauled is indicated by the fact that from 500 to

and dispose of their ore as a nucleus for an independent furnace operation.

The Geological Survey now has available for distribution its annual statement on potash salts for 1915, which also includes some simple tests to determine the presence of potash. The amount of potash salts imported for consumption into the United States during the year is given at 170,555,450 lbs., valued at \$3,765,224.

An Improved Separating Magnet.

The Kidney improvement gives very important technical value to the universally used horseshoe magnet. The rapid, clean, automatic discharge of attracted particles, without labor or loss, affords practical means of estimation of percentages, the separ-

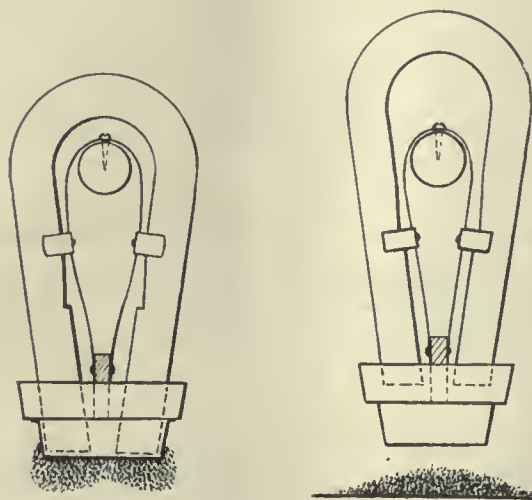


FIG. 1. CIRCUIT CLOSED WITH PARTICLES ADHERING. FIG. 2. CIRCUIT BROKEN. PARTICLES DISCHARGED.

ated fractions being available to test for associated values.

These separating magnets are fitted with improved cases in which the poles are always in forced contact with a fixed current keeper for preservation of magnetic integrity. These improvements should be of much interest, and more especially to those interested in mining.

Stoping Costs in the Calumet & Arizona Mines, Bisbee, Ariz.

In summing up the various methods of stoping ore in the Calumet & Arizona Mining Co.'s property, Philip D. Wilson is of the opinion that the cut-and-fill system is easily the cheapest and most satisfactory in every way where conditions will permit of its use. The item of timber, usually a large one (\$17.50 per thousand), is much reduced and the risk of fire is virtually eliminated. While any large horse of waste encountered in the ore may be kept separate and left in the gob, any attempt at close sorting is inadvisable. In the case of the Mitchell slicing system, if the ore is fairly clean the greatest ultimate economy will be gained by mining it all as it comes without attempting to sort. The consequent low-stoping cost obtained by mining large tonnages rapidly will more than counterbalance the increased cost of handling and treating a slightly lower grade material. In neither system can the grade of ore be controlled as closely as in the square-set or top-slice caving methods. Where the ore is very irregular or badly mixed with waste the square-set method is still found to be the most satis-

factory. If the stope is in good condition a considerable proportion of the timbers may be safely extracted as it is filed.

For a heavy uniform ore body the Mitchell inclined top-slice caving system is a good one. While it still retains some of the disadvantages of the old-fashioned top slice it is in many ways a great improvement over the older method. Its principal advantages are the substantial saving in labor and powder, and the greater rapidity with which the ore may be mined. Its unfavorable features are those of all top-slice caving methods, the almost inevitable sacrifice of some ore, narrow work, poor ventilation in the stopes and the fact that the ground above is so badly broken as to render the expense of future work on upper levels so great as to be in many cases prohibitive. The Mitchell slicing system finds its chief application to fairly regular bodies in not too heavy ground. Under favorable conditions lower costs are obtained with this method than by any of the others in use, with the exception of the cut-and-fill method. Its saving in labor and timber is a very appreciable one over square-set stoping and the cycle of preparing, mining, filling and abandoning a section is normally a very short one. This feature, in addition to permitting a large daily output, reduces considerably the repair cost incidental to keeping a section of the country open over a long period. In short, the introduction of these methods has effected a tremendous saving to the Calumet & Arizona Mining Co. during the past few years without the slightest sacrifice of the safety of the men or of the mines in which they have been used.

COMPARATIVE STOPING COSTS.¹

Method and conditions.	Labor.	Explosives.	Timber.	Candles or carbide.	Air.	Other supplies.	Total.
Square-set, oxide ore, ² heavy ground.....	\$0.73	\$0.06	\$0.34	\$0.01	\$0.12	\$0.04	\$1.30
Square-set, oxide ore, average ground....	0.60	0.05	0.25	0.01	0.10	0.04	1.05
Square-set, oxide ore, robbing timbers....	0.61	0.05	0.16	0.01	-0.10	0.04	0.97
Top-slice caving, old method, oxide ore, heavy ground.....	0.63	0.07	0.20	0.01	0.10	0.03	1.04
Mitchell top-slice caving, oxide ore, heavy ground.....	0.54	0.04	0.21	0.01	0.10	0.03	0.93
Mitchell slicing, oxide ore, average ground	0.51	0.05	0.20	0.01	0.06	0.02	0.85
Square-set, sulphide ore, ³ average ground	0.49	0.04	0.19	0.01	0.04	0.03	0.80
Mitchell slicing, sulphide ore, average ground	0.43	0.03	0.15	0.01	0.03	0.01	0.66
Cut-and-fill, Gilman method, sulphide ore, good ground..	0.34	0.04	0.07	0.01	0.04	0.01	0.51
Cut-and-fill, old method, sulphide ore, good ground.....	0.32	0.04	0.04	0.01	0.04	0.01	0.46

¹Figured on the basis of the wet tons mined. These costs obtain under normal conditions with a base wage of \$4 per day for miners and \$3.75 for muckers.

²Oxide ore in place will average from 12 to 16 cu. ft. to the ton.

³Sulphide ore will average from 9 to 11 cu. ft. to the ton.

*Associated Geologist. Abstract from Proc. A. I. M. E.

The American demand for Japanese zinc dust has expanded greatly since the war. About 600 tons is sent yearly to New York and San Francisco importers from the Nagasaki district.

Operations at Battle Mountain, Nevada

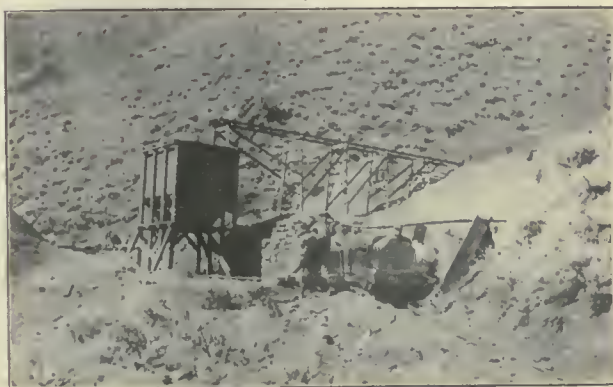
By W. A. SCOTT.

Battle Mountain Mines & Development Co. recently put in operation its new mill for concentrating silver sulphide ores by fine crushing and oil flotation. The property is in Lewis canyon, 16 miles south of Battle Mountain, Nev. It is owned by M. H. Whittier of Los Angeles and associates. The group is made up of a number of properties, operated separately, between 1870 and 1885, which were acquired and consolidated 5 years ago by this company. In early days two stamp mills were built at the mouth of the canyon to treat these ores by roasting and

appearing on the mountain side, and running nearly parallel to the canyon, is strong and conspicuous. All conditions are favorable to opening the vein by crosscuts from the main canyon, or by adit levels from secondary canyons. While the vein, as shown by the principal workings, is in limestone, the deepest workings show a porphyry foot wall and give some evidence of a contact at greater depth between lime and porphyry. The vein width varies, being from 8 ins. to 70 ft. The gangue material comprises white quartz, lime and decomposed matter, disseminated



BATTLE MOUNTAIN CO.'S MILL.



ORE-LOADING BIN AT CROSSCUT.



MILL BUILDINGS IN LEWIS CANYON.



GASOLINE LOCOMOTIVE FOR ORE HAULING.

pan amalgamation, but no attempt was made to handle ore containing less than 60 ozs. silver. This was known as Camp Lewis. Some of the old crosscuts and levels, by which parts of the property were opened 30 years ago, are of some utility in present-day operations.

Lewis canyon, the head of which is on the slope of Buck's peak, takes a northerly course, discharging into Humboldt valley. The most important part of this company's property lies within and on the west side of this canyon. The principal vein strikes north-south through a limestone formation, and has an average dip of 20° to the west. The vein cropping,

through all of which is sulphide of silver and ruby silver, accompanied by a low percentage of the sulphides of iron, antimony and copper. The most paying bodies of ore, however, occur in shoots and chimneys. The grade of ore runs from 5 ozs. up to several hundred; but it is stated that the mine run of mill ore is 15 to 20 ozs. in silver.

All operations during the last 5 years, or since this company got possession of the property, have been under direction of M. R. Thurston, general manager. Within that time the vein has been tapped by several crosscuts and adits, and drifts have been run in ore. The lowest crosscut, or Monitor level, starts



GASOLINE LOCOMOTIVE HAULING ORE TO MILL.



TREES IN BLOSSOM AMID SNOW DRIFTS.

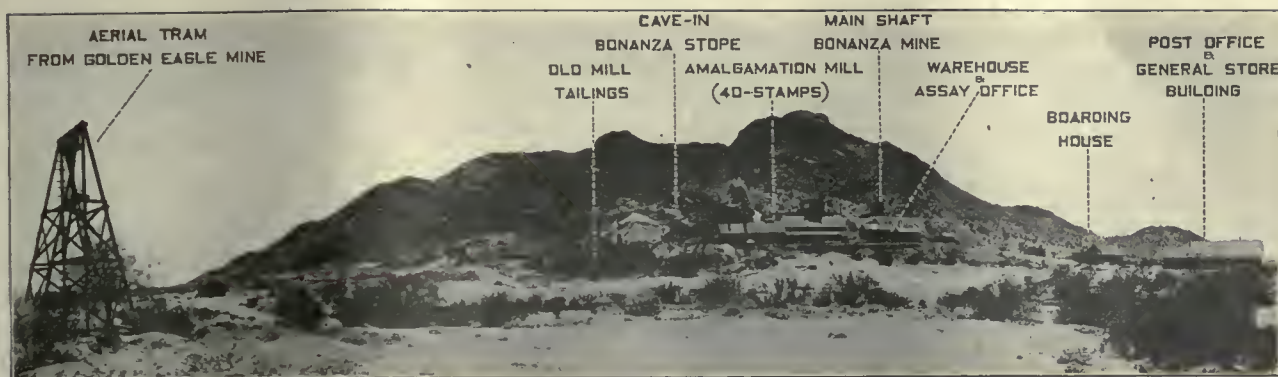
800 ft. from the mill, runs 800 ft. to the vein, and continues 1200 ft. as a drift on the vein. The next crosscut level is known as the Eagle. It is 2500 ft. farther south, and 269 ft. higher (vertically) than the Monitor. It was driven 200 ft. as a crosscut, and then 500 ft. farther on the vein. The Henry Logan crosscut, 3300 ft. south of the Eagle, and 800 ft. higher, was driven 936 ft. to the vein, on which drifts were run in ore 500 ft. north and 500 ft. south. Next is the Star-Grove crosscut, which goes in 500 ft. to the vein, on which there is 1000 ft. of drifting. The workings of Henry Logan and Starr-Grove are connected by a 185-ft. winze. Another crosscut, 600 ft. south of Starr-Grove and 165 ft. higher, was driven to the vein and advanced 300 ft. as a drift. These five working levels are connected with the mill and with each other by $2\frac{1}{2}$ miles of 20-in. gauge car tracks, built on a $7\frac{1}{2}\%$ grade, on which $1\frac{3}{4}$ -ton ore cars are hauled by a gasoline locomotive, designed by Manager Thurston and built in company's shop.

Ore is being taken from all these levels except the Monitor. It is estimated that there is 600 ft. of stopping ground between the Monitor and Eagle levels; 1500 ft. between Henry Logan, 280 ft. between Henry Logan and Starr-Grove, and 486 ft. between Starr-Grove and the highest level. Through these levels the vein is opened a distance of $1\frac{1}{2}$ miles on its strike, but not connectedly. The highest workings are connected to the main track by a 300-ft. surface tramway, built on a 37° incline. All levels are supplied with compressed air for drill power, the air lines having been laid from the power plant in the mill.

The mill building contains a 200-hp. 4-cylinder Diesel engine, furnished by the Dow Pump & Diesel Engine Co., Alameda, Cal. Power is transmitted from the engine to a line shaft, which extends the full width of the mill, by a $1\frac{1}{4}$ -in. rope drive. By this connection the air compressor and all mill machinery are operated by belt drives. This engine operates on $4\frac{1}{2}$ gals. 16-gravity crude oil per hour, which costs \$1.80 per bbl. at the plant. The mill equipment consists of a No. 4 Traylor jaw crusher, a 6-ft., type 63 Marcy mill, Dorr duplex classifier, an under-floor launder and Callow flotation machines, consisting of

3 rougher and 1 cleaner cells. It is noted that no tube mills are used, the ore being reduced to sufficient fineness by the Marcy mill in which 2, 3, 4 and 5-in. steel balls are used. Only about 2% of the Marcy product that passes from classifiers to flotation cells remains on a 100-mesh screen. The oil mixture, consisting of 45% coal tar, 45% coal tar creosote and 10% pine oil, is fed to the Marcy mill, the oil feed running $1\frac{1}{2}$ lbs. per ton of ore. The mineral froth from rougher cells is carried by bucket elevator to the cleaner cell, and from this the concentrates are passed to a 3-compartment settling tank, and afterwards dried in an 8 by 13-ft. sheet-iron pan, the heat being supplied by exhaust gas from the engine, and also by a crude oil burner. The tailings from cleaner cell are returned by a 2-in. Krogh pump to the Dorr classifier for re-oiling and mixing with the pulp going through the mill. The tailings from rougher cells pass to the tailings pond. No filter press is used in eliminating moisture. It is claimed that as these ores contain no carbonates nor oxides, a recovery of 95% can be made. The sulphides in this mine are very favorable to recovery of the metals by flotation. The plant is designed to handle 100 tons of ore per day. The flotation equipment was put in under direction of W. P. Cary, of the General Engineering Co., Salt Lake.

Cerium-Iron Alloys.—Alloys of cerium with iron, containing 55 to 85% cerium, are pyrophoric, which property is increased by quenching. A writer in the *Zeitschrift für Metallographie* states that a microscopical examination of cerium-copper alloys shows that the two metals in the molten state are completely soluble in each other, but that in the solid state there is no solid solution, the four intermetallic compounds being Cu_6Ce_7 , Cu_4Ce , Cu_2Ce and CuCe . Three typical eutectics, with 17, 44 and 45% of cerium, respectively, occur. Above 5% cerium, the hardness of the alloys increases, the greatest hardness being in the compounds Cu_6Ce_7 and Cu_2Ce , though the hardness of the eutectics is low. Metallic cerium is now being made electrolytically in the United States and is held at \$8 to \$9 per pound.



GENERAL VIEW OF THE HARQUA HALA MINE OF THE YUMA-WARRIOR MINING CO.

Reopening Old Mines in Arizona

By WILLIAM P. DE WOLF.

A noteworthy feature in connection with the increasing mining activity in Arizona, is the number of old-time bonanzas that are being re-opened under mining conditions which indicate they are soon again to occupy a position in mining affairs akin to that held by them in former years. The majority of these properties had, until recently, been dormant for a considerable period of years. There is ample warrant for the assertion that the development now underway, and planned for the future, will produce satisfactory results.

Among the properties of former days that have come back forcefully enough to demonstrate they have a future as well as a past is the Harqua Hala Bonanza. The mine is being worked by the Yuma-Warrior Mining Co., a close corporation whose shareholders are representative mining and business men of Chicago and Prescott. The property is situated in the foothills of the Harqua Hala range in Yuma county, short distance from the Yavapai county line, and within 8 miles of the railroad.

Early History of Mine.

The history of the Harqua Hala Bonanza mine dates back to the "days before the railroad" in Arizona—the days of hostile Indians and renegade whites, when a man's rifle was his best friend; the days of slow journeys over arid wastes beneath the pitiless rays of the desert sun. The railroad and the automobile have, however, robbed the desert of its terrors; and renegade Indian and white long since went the way of all flesh that set itself in opposition to the stern justice of the frontier.

Gold was first discovered in the vicinity of the Harqua Hala Bonanza mine in 1762, by a party of Spanish prospectors. Hostile Indians quickly put an end to their activities, however, and no further attempt was made to prospect in the Harqua Hala country until 1814. That effort, like the first, proved disastrous to all concerned. The first lode locations under American dominance were made there in Novem-

ber, 1888. These claims, known as the Harqua Hala Bonanza and Golden Eagle groups, are now being operated by the Yuma-Warrior Mining Co. From then until now the first mentioned has produced about \$5,000,000 in gold.

Find High Grade Ore.

Exceptionally rich ore was discovered in near-surface workings on each of the claims by the original locators and others; and when the news became known, there was a rush of prospectors to the locality. In the course of time the locators of the Harqua Hala Bonanza and Golden Eagle groups sold them to Phoenix parties, who proceeded to open them up. They erected a 20-stamp mill and in 30 days cleaned up \$96,000 in gold.

Subsequently the properties were purchased by an English syndicate, who sunk an incline shaft on the Harqua Hala Bonanza group to a depth of 200 ft, and equipped the property with mine and mill machinery. It is said they extracted \$4,000,000 worth of gold ore above the 200-ft. level. The bullion was teamed to Phoenix—120 miles distant. Road agents infested the trail in those perilous days and as a result of their activities several shipments of bullion from the Harqua Hala Bonanza and Vulture mines failed their destination. After a number of episodes of that nature, in one of which the manager of the Vulture mine was killed and \$60,000 worth of bullion stolen, the Harqua Hala bullion was moulded into bars of such massive size and weight the bandits could not make way with them across the arid stretches. Shipments of ingots having a value of \$365,000 each were for a time sent out from the property.

The "Bonanza Cave."

Owing to the long freight haul, the scarcity of wood in a country of dwarf sage and mesquite bush, and the consequent high price of mine timbers, the latter were sparsely used. As the ground was opened and stoped the custom was to leave supporting pillars

of ore, much of which was high grade. While attempting to remove these pillars, in later years, the ground caved from the third level to surface for several hundred feet in either direction from the shaft, leaving a chasm extending from wall to wall—a width of 70 ft.—and laterally along the vein workings a length of 400 ft. This great cavity is known as the "Bonanza Cave." It cut off access to the mine workings and forced the sinking of a new shaft. The latter is located about 400 ft. west of the old shaft, and intersects it at a depth of 286 ft. on the incline. Connection was made with the 2nd and 3rd levels of the old workings.

In drifting southwest from the new shaft a body of ore was opened and stoped that milled \$2,000,000 in gold. This stope is of enormous proportions, and presents the appearance of a natural cavern. Due to its unusual size and shape the miners called it "Castle Garden." On the same level an attempt was made to get under and draw the ore from the "Bonanza Cave" by means of a crosscut. As it was driven under the "cave" on the hanging-wall side it failed its purpose, owing to the unstable nature of the caved ground, which could not be safely timbered. Ultimately this crosscut caved to the solid rock below. These reverses were augmented by a barren streak in the vein, and the Englishmen, becoming discouraged, quit.

The New Regime.

About 3 years ago the Harqua Hala Bonanza and Golden Eagle groups were taken over by the present operators. Since then they have undergone development almost continuously. The deal included a 40-stamp mill, air drills, compressors, hoisting machinery, and a full complement of camp equipment and underground mining machinery tools, together with an aerial tram about seven-eighths mile long running from the Golden Eagle shaft to the Harqua Hala Bonanza mill. A pumping plant, and a water supply more than ample for camp and milling needs were also included in the deal.

Last February the company began milling the ore during development and to date has shipped about \$25,000 in bullion. Shipments of the latter in bars valued at \$4000 each, are made from time to time to the Bank of Arizona of Prescott. Work at present is confined to proving up new ore bodies that have been found in the Harqua Hala Bonanza mine. Geological conditions on the lower levels indicate that the Harqua Hala will come back as a copper mine carrying high values in gold.

Strike Pay Grade Ore.

When the present operators took over the property work was immediately resumed at the old 4th level and a crosscut drift driven around the caved portion of the "Bonanza" stope to the foot wall for the purpose of drawing the large tonnage of vari-grade ore. By utilizing supplementary milling appliances—soon to be installed—the greater portion of this tonnage can be reduced at a profit. In driving across the strike of the

old ore bodies to reach the foot wall of the "cave" 37 ft. of ore was encountered. Fifteen feet of it assayed \$17 gold. The remaining 22 ft., while low grade, has commercial value. The ore stoped from this deposit milled \$9.88 gold.

The same ore body has been opened on the 6th level (50 ft. below), by a crosscut 85 ft. long. Two veins—one pitching to the east and the other to the west—were tapped at that point. Subsequent development demonstrated that the ore body on the 4th level was formed by the juncture of these veins just below the floor of the level. The west vein, where undergoing development on the 6th level, gives assay returns of from \$6 to \$22 gold. The ore taken out milled better than \$8 gold. This vein proves to be the downward extension of the old "Bonanza" vein of which the "Castle Garden" and "Bonanza" ore shoots were a part. Connection has been made with the deposit opened on the 4th level by a winze and an upraise in ore.

Strike Copper Sulphides.

An air hoist was set up on the 6th level and a winze sunk 80 ft. in ore to the 7th level. There drifts were run on the vein, north, 40 ft., and south, 80 ft. The pitch of this ore body is to the south. It was in the south drift on this level that copper sulphides first made their appearance in the mine. Check assays demonstrate the ore carries about 5% copper and \$35 gold. As the copper-sulphide section lies against the foot wall of the vein, directly beneath the oxidized ore opened above, and pitches rather flat to the southwest, the winze was sunk an additional 80 ft. and the 8th level established.

On the 8th level drifts were run north and south in the oxidized ore. One hundred feet from the station copper sulphides were again encountered in the south drift. The crosscut at that point shows 16 ft. of ore, with the copper-sulphide section along the foot wall carrying ore of the same grade as that opened above. The oxidized ore on the 8th level samples \$13.90 gold and for a length of 50 ft. carries gold values as high as \$38. Later the drift on the 7th level was continued in the oxidized portion of the vein, and 90 ft. from the station entered the same ore body that is opened on the 8th level. The crosscut there shows 10 ft. of ore that gave \$12 gold at the mill heads. At that point a winze was sunk in ore about 40 ft., an upraise was made from the 8th level to connect therewith, and an intermediate level established. The ore in the latter has a width of 12 ft. That this ore body will prove of considerable size is apparent, as it has been opened a length of 45 ft. and a width of 10 ft. on the 7th level, a width of 12 ft. at the intermediate level, and a width of 16 ft. on the 8th level.

Ore Widens Out.

The drift on the 7th level has been extended beyond the winze a length of 210 ft., giving it a total length of 300 ft. For the last 25 ft. the ore has gradually widened until it extends beyond the sides of the drift. A crosscut will be run to determine its breadth.

Recent assays gave returns of \$21.40 gold-silver. This is the latest development of importance, inasmuch as the drift is now being driven under the old "Castle Garden" stope from which the valuable ore tonnage before mentioned was mined.

The work thus far done having demonstrated the presence of extensive ore bodies in the new workings along the strike of the "Bonanza" vein, the company is planning for more aggressive mining and milling operations. These plans include the sinking of a 3-compartment vertical shaft, and the addition of concentration and flotation units to the 40-stamp mill to reclaim the gold, silver and copper contents of the sulphide ore, as the present amalgamation plant is capable of treating only the oxidized ore exposed in the upper levels.

Portable Electric-Driven Air Compressors for Mines.

In order to present a means of securing the fullest benefits of compressed air machinery in electrically-equipped mines, while utilizing all of the advantages of the electric system of distribution, the Chicago Pneumatic Tool Co. has developed a portable, self-contained, electric-driven air compressor, known as the Class N-SE mine car.

With regards to economy the unit compares favorably with the central compressor plant on the surface. Its initial efficiency is of course not as high, due to its smaller capacity, but this difference is, in an appreciable degree, equalized by the losses resulting from leakage and drop of pressure in the line with the large plant, and the fact that the portable compressor may be located very close to the work so that the temperature of the air delivered to the drills, etc., is considerably increased. Feeder pipes are eliminated, thus effecting, if these lines are of any length, a saving in capital investment.

The portable unit may be moved from place to place without loss of time, or the necessity for extending or modifying existing pipe lines. For mines whose air requirements are not large it offers a very desirable installation. For others, the air requirements of which vary considerably from day to day, or week to week, it presents an opportunity to reduce the increased cost per unit volume of air resulting from operating a large plant at partial load. This last saving is very important in new development work, where it may take a year or two to reach an air consumption as large as the capacity of the central plant.

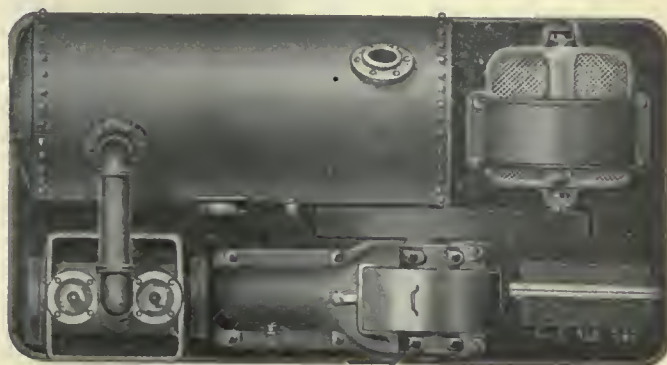
The compactness of the compressor is evident from the illustration. The unit consists of a horizontal, straight-line, single-cylinder air compressor, driven by means of a motor through the medium of herringbone gears. An air receiver of proper size, and a rheostat are provided. The entire apparatus is mounted upon a strong, but light, steel car frame.

Air cylinder is equipped with the "Simplex" inlet and discharge valves, which require no actuating mechanism, no lubrication, and which operate efficiently at high speeds. It is hopper cooled and needs no attention beyond filling the open water box once

a day. An automatic regulator unloads the compressor when the air delivered exceeds the demand.

Necessary fly-wheel effect is secured through the rotation of the heavy gear. Both gear and crankshaft are properly counter-balanced. The positive splash system of lubrication which assures a constant and copious supply of oil to all wearing parts is employed. The gears turn in a bath of oil.

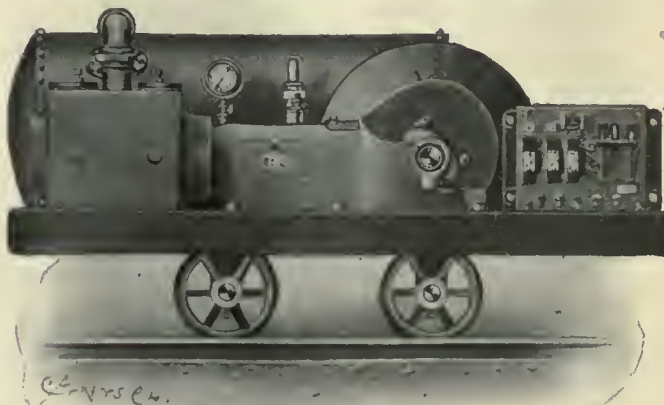
Rheostat is either of the hand-starting or auto-



TOP VIEW, PORTABLE ELECTRIC-DRIVEN COMPRESSOR.

matic type, depending upon conditions. On account of the wide range of voltage found in many mines the latter control is particularly desirable. Since it has a tendency to keep the motor running under low-voltage conditions, and should the current be interrupted the motor will start gradually without attention when it is resumed. With this type of starter a regulating device is connected to the unloader, so that when the load is thrown off the compressor, the motor is brought to a stop and continues inactive until air is again demanded.

Every part of this compressor unit is completely enclosed. Exposure to dampness will not injure it. Deli-



SIDE VIEW, PORTABLE ELECTRIC-DRIVEN COMPRESSOR.

cate or complicated features of construction have been avoided, and the machine is well suited to rough, heavy duty. It is so entirely automatic in action that it requires no attendant, the miner soon learning to handle it properly. The comparative lightness of the car permits of its removal from the rails when demanded by the conditions of operation. It is built in six sizes, ranging in capacity from 51 to 314 cu. ft. of free air per minute at pressures of 80 to 100 lbs.

What the Mining Companies are Doing

Ohio Copper Mining Co.

The reorganization plan of the Ohio Copper Mining Co. calls for the formation of a new corporation with \$5,000,000 new securities, of which \$2,750,000 will be stock and \$2,250,000 6% cumulative repayment convertible bonds. The plan also provides for inclusion of the Bingham Central Ry.

Foreclosure will take place Aug. 22. It is understood that holders of more than \$1,000,000 of the \$1,240,000 outstanding Ohio bonds have consented to the plan. In order that the Bingham Central part of the plans may become effective, the reorganizers of Ohio demand that 75% of the former company's bonds be deposited by Aug. 15.

Stockholders of the Ohio and Bingham Central companies may subscribe for the new bonds at par and accrued interest. The convertibles will also be issued in exchange for the Ohio Co. 6% first mortgage 20-year bonds on the basis of \$75 in new bonds for \$100 of old. Provided 75% of the \$975,000 outstanding Bingham Central bonds enter reorganization of Ohio Co. and the railway is turned over to the new company free from all liens and debts, there will be issued: \$453,375 par value of the new company bonds and \$453,375 of its stock. Or in lieu thereof, the Bingham committee may turn over to the Ohio committee all bonds deposited with it for which there shall be issued by the new company for each bond of the Bingham Central 46½% in bonds and 46½% in stock of the new corporation.

The reorganizers plan a 5 years' voting trust for the outstanding capital stock.

First National Copper Co., Calif.

The initial dividend of the First National Copper Co. is to be paid shortly and will amount to 25 cts. a share on its outstanding capital.

Vice-President Wm. A. Kerr says: "Through the 10-year contract which Balaklala (the operating company) has with the United States Smelting Co. dividends are at last possible. The first payment will be 25 cts. and others will follow as earned. We are now shipping 9000 tons of ore monthly to the Mammoth smelter. Our ore averages about 2.83% copper and carries \$1 in previous metals."

On Aug. 24, 1915, the Balaklala mine resumed shipments after a long idleness. Unable to use its own smelter on account of fume troubles, Vice-President Kerr arranged an advantageous contract with the United States Smelting Co. for 10 years. From the commencement of shipments to the end of the fiscal year, on June 30 last, the company made net profits of \$175,000 from 76,000 tons of ore. The company spent about \$25,000 in making necessary repairs incidental to resumption of operations and conducted development work equal to 33½ cts. per ton of ore mined.

The management now plans to increase development work, for which it will set aside 50 cts. per ton of ore mined. This new work will be confined chiefly to diamond drill operations.

International Nickel.

It is understood that the directors of the International Nickel Co. have decided on a policy of distributing dividends more evenly over the four quarters instead of waiting until close of the year to make a special distribution. That undoubtedly means a higher quarterly rate than 5%, or \$1.25, that prevailed during the last 12 months.

International Nickel's business is running heavier this year than ever before. Each month is showing larger earnings than preceding month. Demand for the metal is increasing so rapidly that the company finds itself unable to build up a reserve supply. Practically each pound of nickel is marked for a customer as soon as it comes out of the ground.

In shipping nickel abroad International Nickel Co., by

agreement with the British government, consigns the metal to Merton & Co. in London so that every safeguard is thrown around exports so far as the British government is concerned.

International Nickel is licensed by the Canadian government to export the nickel matte from its mines at Sudbury to its refinery at Bayonné. No nickel can be sent out of Canada except by license, but that restriction was not aimed at International Nickel, but at some small producers in Canada who were exporting without informing the government of destination. As soon as licensing policy was decided upon several months ago, a license was issued to International Nickel Co., which had all along conformed strictly to the requirements of the government in that respect. Thus Canada maintained her grip on all shipments of the metal without interfering with International Nickel, which is the world's greatest producer of nickel, turning out about 80% of the total.

Republic Iron & Steel.

The general balance sheet of the Republic Iron & Steel Co. as of June 30 compares with 1915 as follows:

Assets—	1916.	1915.
Cost of properties	\$72,141,634	\$69,484,869
Investments	928,051	943,234
Cash in trustees' hands	26,923	
Inventories	7,212,409	7,219,488
Ore contract payments	406,427	758,431
Accounts and bills payable	5,688,025	3,850,374
Cash	6,355,588	2,698,466
Deferred charges to operation	828,785	396,700
Total	\$93,587,848	\$85,931,562
Liabilities—		
Common stock	27,191,000	27,191,000
Preferred stock	25,000,000	25,000,000
5% sinking fund bonds	16,833,000	15,105,000
Potter Ore bonds	264,000	277,000
Martin & Palos Coke bonds and notes	237,500	265,000
Collateral notes		2,000,000
Dividend warrants		186,658
Accounts payable	2,584,125	1,434,546
Ore contract balance	142,553	170,094
Taxes accrued	221,362	229,616
Interest accrued	213,750	193,975
Dividends payable	937,500	
Unclaimed dividends	2,746	2,746
Reserves	7,472,282	6,253,139
Surplus	12,498,030	7,622,793
Total	\$93,587,848	\$85,931,562

Consolidated Interstate-Callahan.

The Consolidated Interstate-Callahan will be able to earn in excess of \$1,000,000, net annually, with metals at the average prices prevailing during the 10 years preceding the outbreak of the European war. This is indicated by the company's report to the New York Stock Exchange. These prices, according to the report, were 4.618 cts. for lead, 5.6775 cts. for zinc and 57.844 cts. for silver. The estimate is based on the production for May, which was nearly identical with that for several months preceding, the output for the period having been 6000 tons of 49½% ore and concentrates and 500 tons of ore that carried 50% lead and 20 ozs. silver.

Under the terms of the long contract for the treatment of the output, which becomes effective September, at the prices cited, the zinc product will be worth \$34.29 per ton, approximately \$205,740 monthly, less \$63,150 for freight and treatment charges, leaving \$142,590 net. The lead product will be worth \$27.47 per ton, less freight and treatment, or \$13,735 a month, making the total income \$156,325. From this must be deducted \$61,578 a month, or \$9 per ton, for operating costs, and \$4000 for overhead expenses, leaving a monthly net profit of \$90,747, or \$1,088,964 for the year. To this must be added \$15 a ton monthly, derived from the saving of the flotation plant, estimated at 400 tons every 30 days, or \$62,000 annually, making the total yearly net income \$1,150,964, or enough to pay dividends of approximately \$2.47½ per share

on the issued capitalization of 464,990 shares at \$10 each or about 20% on the \$4,649,900 outstanding.

The annual meeting of the stockholders will be held in Phoenix, Arizona, Aug. 21, and important changes in the articles of incorporation will be considered. One of them provides for increasing the number of directors from 12 to 15 and the retirement from office of one-third of the number every third year. Another change to be considered places the end of the fiscal period at Dec. 31, instead of June 30. It is to be proposed to create an executive committee of 5 members, including the president, who shall be ex-officio chairman.

Tonopah Mining.

A statement following the dividend checks of the Tonopah Mining Co., on July 21 shows the combined income and surplus account of the company and the Desert Power & Mill Co., for the quarter ended May 31, 1916. The net earnings of the two companies for the 3 months amounted to \$121,689.39, which, with miscellaneous income of \$39,743.54, brought the net receipts up to \$161,432.93. From this sum, there was deducted \$16,965.51 for exploration expense and \$26,454.78, the latter sum being on account of the Moore filter suit. The net income for the quarter, therefore, amounted to \$118,012.64. The statement for the quarter ended May 31, 1916, is as follows:

Combined Income and Surplus Acc't—

Gross value or milled.....	\$383,834.22
Metal losses in milling and refining.....	40,459.27
Gross value of mill products.....	343,374.95
Mining, milling, marketing and gen. expenses.....	221,685.56
Net earnings for quarter.....	121,689.39
Miscellaneous income.....	39,743.54
Profits from operation, etc.....	161,432.93
Exploration.....	\$16,965.51
Filter suit.....	26,454.78
Total.....	43,420.29
Net income for quarter.....	118,012.64
Quick Assets—	
Cash on hand May 31.....	75,270.27
Bonds purchased.....	1,019,831.25
Certificate of deposit.....	25,000.00
Silver bullion stored at 50 cts. per oz.....	431,010.95
Total May 31.....	1,551,112.47
Dividend payment July 21.....	150,000.00
Total quick assets July 21.....	1,401,112.47

Tonopah Placers Co., 83¼% of which is owned by Tonopah Mining Co., had net earnings for the quarter of \$39,454.46.

Besides the profits from the placer operations, it is confidently expected that the Eden Mining Co.'s plant, which will be put in commission some time this fall, will contribute largely to the earnings of Tonopah Mining. Construction work on the mill is proceeding, and the machinery is now being installed with promptness.

The report of mill operations of the Tonopah Mining for the week ending July 27th, shows that an average of 65 stamps were kept dropping and that 2167 tons of ore were put through the mill. The ore averaged \$12 per ton.

Dome Lake.

The Dome Lake Mining & Milling Co., Ltd., has decided to issue 459,088 shares of new stock at 20 cts. per share. It is now being offered pro rata to such stockholders as may on or before Aug. 15 request their share of such allotment. Under the above provision each shareholder is entitled to subscribe for 3 shares for every 10 shares held by him. No allotments of fractional shares will be made and any shares not taken by shareholders will be disposed of by the directors as they may deem advisable. The present stock issue will clear the company of all debt and provide working capital. The proceeds will be used exclusively for capital expenditure, that is, further development, addition to plant, etc. The following estimate of reserve tonnage has been submitted to the directors of the company by Mr. Thomas: No. 1 vein west, about 300-ft. level, 35,000 tons; value \$620,000. No. 1 vein west, about 400-ft. level, 11,600 tons; value \$233,500. No. 1 vein east, about 400-ft. level, 35,000 tons; value \$630,000. No. 3 vein, broken and above 400-ft. level, 10,000 tons; value \$200,000. Ore broken and on stock pile, 7,000 tons; value \$63,000. Total tons, 83,600; value, \$1,246,500.

Miscellaneous Company Notes.

Keweenaw Copper has levied an assessment of \$1 per share, payable either at office of company in Calumet, Mich., or at Old Colony Trust Co., Boston, Sept. 2, by stock of record Aug. 12.

Calumet & Hecla should soon have paid off all the notes issued at the time the company made its \$20,000,000 investment in the shares of the Bigelow companies. At that time the company made its first note issue, \$8,500,000. These notes have been called in until now there is outstanding only \$1,700,000. Of this the company has recently acquired \$1,300,000, leaving but \$400,000 to be secured.

E. N. Breiteng Co., Ltd., has concluded arrangements for taking over the Black Friday group. The first payments were met in Butte July 15. The initial funds will be used to retire outstanding obligations of the Black Friday Gold Mining Co., a Montana corporation, with capital of \$2,000,000, divided into 400,000 shares of a par value of \$5. Its officers are Willard Bennett of Butte, president; Albert Galen, formerly attorney general of Montana, vice president; R. M. O'Hearn, secretary, and A. B. Bennett, treasurer.

Directors of the Utah Metal & Tunnel Co. held to the original idea in declaring a dividend at their recent meeting. Last week there appeared some doubt that dividends would be inaugurated now, but the company's financial situation made it appear conservative. The company today has cash—in banks and represented by metals sold—amounting to \$1,024,396. As there are 685,266 shares outstanding, the 50-ct. dividend will reduce this by \$342,633, or say to slightly less than \$700,000, which is amply sufficient for all present and prospective needs. Earnings are naturally showing some falling off from the high levels of a few months ago, but an increase in production in the near future will in large part offset the decline in metal prices.

It is said that at the September meeting, Ray Con. will raise the dividend from 50 cts. to 75 cts. per share. Present and prospective earnings would seem to justify the increase. Ray Con. earned, in the 6 months ended June 30, \$5,272,000, or \$3.25 per share, on 1,600,000 shares. As the company paid \$1 in dividends in the period, it added to surplus \$2 for every \$1 dividend. There is reason to believe that the last half of the year will make an even better showing of earnings. The plant was nearly shut down at two different times in the first quarter, due to floods. The result was that production was below normal and costs above. Net for that quarter was \$2,200,000. The second quarter showed a comeback in production and earnings; profits were about \$3,000,000.

No shipments of ore have been made by the Trinity Copper Co. despite the high copper metal prices, and none appear to be in prospect. President Lawson in 1914 through the medium of a typewritten report presented at the annual meeting stated that "Trinity is still waiting," and called attention to the unsatisfactory condition of the metal market. The general manager's report likewise referred to the market conditions by saying that "economical extraction of the ore is ready when the market shows improvement." All this was supplemented by Director Albers' remark to the effect that "it is better to let the copper remain in the ground than to try and produce it with the metal under 14 cts. a pound." Copper metal crossed 14 cts. a pound in January, 1915, and has since sold as high as 31½ cts.

The Republic Mines Corporation, organized to operate the Lone-Pine Surprise, got into serious financial difficulties 3 years ago. It will pay off all obligations within the next few weeks. The funds to retire the obligation have been received from Republic Con. Mines Co., which has the property under bond. The last payment of \$82,000 was supplied by the Northport Smelting & Refining Co., which has the privilege of taking over the entire property upon terms not yet made public. It is believed that a dividend of approximately 5 cts. per share will be available for stockholders of the bankrupt concern after outstanding debts have been retired. The amount will probably be distributed in two equal amounts, one within 3 weeks and the second within 3 months.



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*Illustrated.

Reviewing the Metal Markets.

The swing of metals, which has been downwards, is now beginning to turn the other way. Business and prices are beginning to increase. Confidence of producers in the future is now being borne out. Consumers who looked for further reaction are hastening to cover. The three principal metals have received the first impulse. Copper, lead and spelter are once more receiving attention. Beginning with a buying-movement in copper, the other metals have felt the first signs of increased buying. Europe, once more, furnishes the starting power. Orders for copper for delivery this year and negotiations for a tremendous block for next year removed the last vestige of doubt as to the future of the metal. Retrospection indicates that the Entente Allies, while maintaining a good poker face, failed to cause American metal interests to solicit business. Instead producers on this side sat tight, and the business is beginning to come to them as they expected.

Last May and June Lloyd George issued many announcements to the effect that England would soon be independent of the United States with respect to shells. As to raw materials his regulation of the metal markets was aimed to depress the prices. Ever since May metal producers have been waiting. They risked a great deal, but are now enjoying the fruits of their sagacity. Instead of taking Lloyd George's remarks at their full worth, they used their own deductions to show that England must continue to depend on this country as long as hostilities continue. Late in July orders for shell steel began coming across, and then followed orders for completed shells. Since July 29 steel mills have taken orders for over 600,000 tons shell steel on which deliveries are to be made by the end of the first half of 1917. These orders were forerunners of an improvement in non-ferrous metals.

Last week authentic information was obtained of negotiations for a large block of copper. Estimates place the total at 300,000,000 to 500,000,000 lbs. Combined with this development came orders for copper for delivery in the fourth quarter. Russia, Italy and France bought round lots. Prices began to look up. Domestic consumers who were allowing their future needs to go uncovered were once more caught. They quickly entered the market. As a result copper producers are busily engaged in taking orders. Indications are that the buying movement now gaining momentum will eclipse the April movement. Liquidation of excess holdings of consumers has ceased. The copper situation once more is commanding attention. Electrolytic for the fourth quarter is being sold at 26½ to 26¾ with spot up to 27½. Business for the first quarter has been done at 26. The history of the last movement will repeat itself. When foreign and domestic demands are satiated 2 or 3 months hence, copper producers will have booked orders that

will take the bulk of their output over the first half of next year.

Lead and spelter have begun to show improvement. Foreign absorption of spelter has been heavy and now lead is being taken in large lots. The tide is beginning to rise. Prices have reflected the improved demand. The upward movement will more than likely continue. While spelter may never again sell at 25, it is certain that a price of 15 cannot be beyond thought. Lead may go back to 8 or 9. Thus the ore producers of the Middle West who have been glum can look forward to an early renewal of prosperity.

Whether antimony, tungsten, aluminum, quicksilver and other metals can again rise to the fabulous prices that have prevailed in the past 6 months is problematical.

The Electrification of Railroads Proves Big Cost Saving.

Under its contract with the Montana Power Co., the Milwaukee & St. Paul railroad is paying at the rate of something like \$550,000 a year for electric power to run its 450 miles on the main portion of its line between Harlowtown, Mont., and Avery, Idaho. It paid for coal to operate its steam trains over the same line approximately \$1,750,000, and the company furnished its own coal from its own mines on its road, and one-third of its equipment was used in hauling coal for its own use. With electric power there is no such waste, and in consequence the saving is enormous.

Another case of large savings is that of the Butte, Anaconda & Pacific railway, an Anaconda holding, which is now paying less than \$100,000 a year for its electric power, whereas formerly it cost near \$270,000 for coal to operate its steam road, a saving of approximately \$170,000 annually.

As a result of these signal successes in electrification, it is a foregone conclusion that but a few years will have elapsed before all roads operating in a mountainous country, where hydro-electric power can be developed cheaply, will operate their trains with electric power.

At the present time nearly 50,000 miles of railroad are operated in the states California, Oregon, Washington, Idaho, Montana, Wyoming, North Dakota, South Dakota, Utah, Arizona, Colorado and Nevada, and as it is estimated that 10,000 hp. is needed to operate 100 miles of single track it will require some 5,000,000 hp. to electrify all the railroads of these states.

As a great portion of the trackage in the above states is over mountains, the use of electricity in place of coal would result in great economy in operation, would largely lessen the dangers of forest fires, and by elimination of noise, smoke, gas and dust would make travel far more safe, comfortable and pleasant than at present.

The wood-burning locomotive of 50 years ago weighed 20 tons; the electric locomotive of today is 112 ft. long and weighs 285 tons. These wonderful motors absorb the mechanical energy of the train going down grade by gravity and return it in the form of electrical energy to substation for use by trains running along the level or going up grade. Thus, through regenerative braking, from 25 to 50% of the power is recovered.

Electrification of railroads means a long step towards true conservation through the saving of coal and the utilization of wasting water powers.

Investment in a prospect is always more or less of a risk, but it can be made less by care. Would-be investors must remember that development is necessary to convert a prospect into a mine. It is assumed that any prospect that is seeking funds for development has showings or indications of ore that warrant taking the risk of putting up money for the work. Investment in a prospect is somewhat of a risk and should be recognized as such. It is assumed here that the venture is being promoted honestly, otherwise the risk becomes a certainty—a certainty of failure. The development of a prospect is a legitimate field for investment, and a necessary one. On such investments depends the future of mining.

Shipments of iron ore on the great lakes during July made a new record at 9,750,157 tons, which exceeded the June movement by 242,581 tons. It had been the general belief in the trade that the June movement had made a record that would stand for the year. Ore shipments to Aug. 1 have broken all former records by more than 5,000,000 tons. The total carried was 29,365,724 tons. The former high record was made in 1913. Carriers now freely predict a season approximating 50,000,000 tons. The American head of the lakes has shipped 20,376,405 tons up to Aug. 1, against 13,678,166 tons a year ago, or an increase of 6,698,239 tons.

Investigators on mining undertakings should be aware of companies that issue incomplete and evasive reports to shareholders. Every shareholder has a right to know the financial condition of his company, the physical condition of the property and other details that have an effect on the security or value of his investment. When officials placed in office by shareholders to manage the company's business affairs for the welfare of all, attempt to maintain secrecy concerning their acts, there is good reason to suspect that all is not well and an investigation is warranted.

Researches in the treatment of low-grade ore have been rich in results particularly with respect to gold and copper-bearing ores. Perfection, however, has not yet been reached and there are still attractive fields of investigation yet to be explored.

PERSONAL.

D. F. Hewitt, with the U. S. Geological Survey, is in Peru, S. A.

Frank S. Baillie is now superintendent of the Baker Mines Co., Cornucopia, Ore.

J. A. Wittier, operating near Slocum, B. C., is in Spokane, Wash., from Vancouver, B. C.

J. W. Boyle, manager of the Canadian Klondyke Co., Dawson, Y. T., is now in London, E. C.

George A. Packard, mining engineer with the Bingham Coalition Mines Co., is in Butte, Mont.

Pope Yeatman, consulting mining engineer, New York, will resume his private practice after Sept. 1.

P. A. Robbins, manager of the Hollinger Con. Mines Co., has returned to Toronto, Ont., from New York.

A. E. Hall has been made superintendent of the mines and mill of the Sable River Copper Co., Massey, Ont.

Nathan O. Lawton will have charge of reopening the old Vermont Copper Co.'s mines at South Strafford, Vt.

George Austin, Wallace, Idaho, manager of the Mammoth mine, Missoula, Mont., has been in Spokane, Wash.

H. W. Leonard, former chief engineer for the Cerro de Pasco Mining Co., Cerro de Pasco, Peru, has left for the United States.

W. Spencer Black, mining engineer, Los Angeles, Cal., is in Pioche, Nev., relative to inspecting property in the Jack Rabbit district.

James F. Callbreath, secretary of the American Mining Congress is in Chicago making arrangements for the society's meeting in November in that city.

George O. Bradley, engineer in charge of construction for the D. C. Jackling interests, has been in Garfield, Utah, from his headquarters at San Francisco.

Carl F. Schaber, mining engineer with the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has been in Houghton, Mich., and will go to Jackson, Mich., before returning.

G. H. Wolhaupter, engineer with the Utah Copper Co., Garfield, Utah, has resigned and is now in Houghton, Mich. On returning he will conduct flotation experiments for the Stimpson Equipment Co., Salt Lake City.

D. C. Jackling has recently been inspecting the Utah Copper Co.'s holdings around Salt Lake City, Utah, and left for Butte, Mont. He has also recently been appointed a director of the American Zinc, Lead & Smelting Co.

Charles A. Randall, mill superintendent for the Tough Oakes Mines Co., Schumacher, Ont., has resigned to take charge of constructing two mills for the Simons and Burns interests in Cuba. He will be in New York for some time drawing up plans for construction.

OBITUARY.

On Aug. 6, 1916, Frederick F. Thomas died in Berkeley, Cal. He was born in New York state in 1843 and in 1863 was graduated from Yale. In about 1867 he went to California and operated considerable on the Mother Lode. He was later joined in his adventures by David McClure and together they operated the Gwin property. At one time he was manager of the Central mine, Broken Hill, Australia, and served in the same capacity at the United Verde mine, Arizona, and the Kenedy mine, Amador, Cal. The United Verde he opened up as well as having managed it for several years after.

SCHOOLS AND SOCIETIES.

American Electrochemical Society.—The society has planned a series of interesting meetings and will open its meeting Sept. 28, with a technical session devoted to a review of American progress in the electrochemical industry. A complimentary smoker will be held on Thursday evening and on Friday evening there will be a joint banquet at the Waldorf-Astoria of the members of the American Chemical Society, the American Electrochemical Society and the Technical Association of the Pulp and Paper Industry. This will be a subscription banquet and the price of tickets to members will be \$3.50; additional tickets for guests will be obtained at cost, or about \$7.

American Chemical Society.—Official announcement of the meeting of the society, to be held in New York Sept. 25 to 30, in conjunction with the second National Exposition of Chemical Industries, will be issued to the members by Dr. Charles L. Parsons, secretary, on Aug. 15. Dr. Charles H. Herty, of the University of North Carolina, president of the American Chemical Society, will open the exposition on Monday, Sept. 25, at 2 P. M., with an address reviewing the history of chemistry and the chemical industries in this country and outlining developments since the outbreak of war in Europe. The presidents of co-operating societies, such as the American Electrochemical Society, the American Institute of Mining Engineers and the American Paper and Pulp Association will follow Dr. Herty with speeches of welcome and reviewing the progress made in the industries represented by them. On Wednesday and Thursday morning a general symposium on colloids will be held, theoretical considerations being discussed on the first day and the industrial applications of colloidal chemistry on the second day.

COMMUNICATIONS.

[This department is for the exchange of ideas bearing on all branches of the mining and metallurgical industries. Mining and Engineering World will not be responsible for the statements made nor opinions expressed by correspondents.—Ed.]

The Editor—Several anomalies have struck me on a recent visit to the Menominee range and to the Cuyuna range.

In spite of the activity in mining there seems to be little demand for newly discovered ore bodies. This may be explained in various ways, but no one explanation seems thoroughly satisfactory.

In spite of the above fact there is great activity in exploration on the Cuyuna. Over 30 drills are now running.

Possibly because of the above fact there is very little exploration on the Menominee-Crystal Falls range. Only some two or three drills are running. Is the real explanation here to be found in the exceedingly erroneous taxation laws of Michigan? Take note that there is doubtless far larger area of promising unexplored territory on these Michigan ranges than on the Cuyuna.

Another anomaly: The public is clamoring for the conservation of national resources. And yet the tendency of tax legislation as to mining is decidedly to discourage such conservation.

F. I. CARPENTER.

Barrington, Ill.

NEW PUBLICATIONS.

An Anticlinal Fold Near Billings, Noble County, Oklahoma. By A. E. Fath, Washington, D. C., U. S. Geological Survey. Bulletin 641-E; pp. 18; illustrated.

Gas was struck in this vicinity during February, 1916, in small quantities and at fairly shallow depth. The location of the strike is about 20 miles from any other producing location. But since there was a large anticlinal fold in the

area, which when taken with the formation would indicate possible oil and gas, it was decided to describe the anticline, the country's formation and point out such peculiarities as would make the accumulation of a deposit possible.

Pottery in 1915. By Jefferson Middleton. Washington, D. C., U. S. Geological Survey. Min. Res. of U. S.

Reviews the situation and production in the industry in general for the country, pointing out causes which have affected the same. The production of various states is shown in tabulated form.

Secondary Metals. By J. P. Dunlop. Washington, D. C., U. S. Geological Survey. Min. Res. of U. S. I:3; pp. 8.

A general description of the sources of secondary metal and the industry in general is first given. Copper, lead, zinc, tin, antimony and aluminum, which are derived from scrap and other old metal are reviewed separately.

Silica in 1915. By Frank J. Katz. Washington, D. C., U. S. Geological Survey. Min. Res. of U. S. II:8; pp. 6.

A general review of production and conditions is first given and followed by one more in detail and made separately by states. The uses of silica are spoken of and briefs are given on some of the other siliceous materials.

Ozokerite in Central Utah. By Heath M. Robinson. Washington, D. C., U. S. Geological Survey. Bulletin 641-A; pp. 16; illustrated.

Particular veins and deposits are located and described in some detail though for the greater part the bulletin dwells on a general description of the geology of the deposits and formation of the area being considered.

Spirit Leveling in Arkansas, 1896 to 1915, Inclusive. By R. B. Marshall. Washington, D. C., U. S. Geological Survey. Bulletin 636; pp. 56; illustrated. For sale by Mining World Co. 15c.

A list of all of the bench marks established by the U. S. G. S. in the state. The elevation of each and a brief description to serve in locating the same is given.

Asphalt, Related Bitumens and Bituminous Rocks. By John D. Northrop. Washington, D. C., U. S. Geological Survey. Min. Res. of U. S. II:13; pp. 16.

An economic review is made of the occurrence of asphalts as well as manufactured asphalt. The market is reviewed regarding prices and production and separate briefs are given on the principal producing states in this country and the principal producing countries of the world.

Effects of Temperature and Pressure of the Explosibility of Methane-Air Mixtures. By G. A. Burrell and I. W. Robertson. Washington, D. C., U. S. Bureau of Mines. Technical Paper 121; pp. 14; illustrated. For sale by Mining World Co., 15c.

The methods of testing are described and the effects of the following changes are given: Increasing initial temperature; exposure to high temperature without sparking; increasing initial pressure and decreasing the same; and varying sources of ignition. The results obtained from each of these tests are discussed and conclusions given.

Limestone and Marls of the Coastal Plains of Georgia. By J. E. Brantly. Atlanta, Ga., State Geological Survey. Bulletin No. 21; pp. 300; illustrated.

A geologic review of the formation is first made and classified by the different geologic areas in which the formations occur. The calcareous deposits are then described separately according to the country in which they occur. Under this division analyses of samples and detailed nature of the formation are described as ascertained from operations. Part III dwells on the uses and preparation of the lime and limestone in these deposits. In reviewing methods of preparation, methods of quarrying the material and crushing it are given as commonly practiced in the state.

PATENTS RELATING TO MINING.

Concentrator. Clinton B. Ripley, Joplin, Mo. (1,193,190; filed Nov. 10, 1915.)

Core-Drill. James H. Okell, Los Angeles, Cal. (1,193,468; filed Sept. 8, 1915.)

Ingot-Mold. Charles W. Lummis, Worcester, Mass. (1,192,919; filed Sept. 9, 1913.)

Grab. Dudley James Barnard, East Ham, England. (1,192,490; filed Apr. 26, 1915.)

Stamp-Mill. Henry L. Doherty, New York, N. Y. (1,192,997; filed Jan. 17, 1911.)

Ore Classifier. William Henry Weigand, Trojan, S. D. (1,192,806; filed June 19, 1914.)

Ore Concentrator. Jacob Lampert, Rapid City, S. D. (1,192,534; filed July 29, 1911.)

Surveying Instrument. Edward Wright Arms, Troy, N. Y. (1,191,936; filed Dec. 3, 1915.)

Drafting Instrument. William Rew Pearson, Sheridan, Oreg. (1,191,990; filed Nov. 3, 1913.)

Method of Extracting Gold. Albert W. Smith, Cleveland, Ohio. (1,193,197; filed Aug. 15, 1911.)

Trip Valve for Oil-Well Pumps. Robert Y. Watson, Taft, Cal. (1,192,587; filed Sept. 28, 1914.)

Swinging Ore Mill. Jacob Lampert, Rapid City, S. D. (1,192,535; filed Jan. 20, 1912; renewed Dec. 20, 1915.)

Process of Volatilizing Metals. Selden Irwin Clawson, Salt Lake City, Utah. (1,192,037; filed Oct. 28, 1912.)

Electric Furnace. Samuel H. Fleming, Cleveland, Ohio, assignor to National Carbon Co., Cleveland, Ohio. (1,192,050; filed Jan. 7, 1914.)

Hoisting Mechanism. Harry E. Jenkins, Joplin, Mo., assignor of one-half to George H. Glade, Joplin, Mo. (1,192,322; filed Sept. 27, 1915.)

Fuel Made from Anthracite Coal Refuse and Process of Making Same. Andrew Schmidt, Philadelphia, Pa. 1,192,942; filed Sept. 2, 1909.)

Propelling Means for Dredging Machines. Lewis L. Chapman, Arthur D. Chapman, and Carl C. Chapman, Celina, Ohio. (1,192,752; filed Jan. 6, 1916.)

Plunger and Valve for Artesian or Water and Oil Wells. Edgar Seckler Goss and Sylvester A. Barrickman, Franklin, Pa. (1,192,619; filed Aug. 19, 1915.)

Loading Apparatus. Francis Lee Stuart, Baltimore, Md. Original application filed Oct. 13, 1915. (1,192,016; divided and this application filed Apr. 7, 1916.)

Treating Phosphates. Christopher G. Memminger, Lakeland, Fla., assignor to Coronet Phosphate Co., New York, N. Y. (1,192,545; filed Dec. 4, 1915.)

Apparatus for use in Connection with the Distillation of Petroleum and Products Therefrom. John L. Gray, Webster Groves, Mo. (1,192,889; filed Dec. 30, 1914.)

Process of Making Coke. Henry W. Buhler and Charles J. Emerson, Boston, Mass., assignors of seven-eighths to George D. Haskell, Boston, Mass. (1,191,943; filed Nov. 7, 1914.)

Rotary Air-Compressor. Otto C. Buss, Havre, France, assignor to Société Anonyme pour l'Exploitation des Procédés Westinghouse-Leblanc, Paris, France. (1,192,855; filed April 15, 1910.)

Placer-Machine. Herman Fesenfeld, San Diego, Cal., assignor of one-fourth to K. L. Kidd, one-fourth to C. T. Davenport, and one-fourth to A. B. Bowman, San Diego, Cal. (1,193,248; filed May 27, 1915.)

Apparatus for Sampling Ores. Fredrick O. Colar, Ashtabula, and Herbert E. Wetherbee, Cleveland, Ohio, assignor of one-half to Benedict Crowell and Charles B. Murray, doing business under the firm name of Crowell & Murray, Cleveland, Ohio. (1,192,990; filed Oct. 30, 1915.)

TRADE PUBLICATIONS.

Microscopes. The Bausch & Lomb Optical Co., Rochester, N. Y. Catalog; pp. 130; illustrated.

The catalog has been carefully prepared and includes accessory parts as well as complete microscopes. A number of apochromatic objectives are described and are said to be the first ever made by an American manufacturer.

Overhead Mono-Rails. The Randall Tramrail Co., Philadelphia, Pa. Catalog; illustrated.

This system is of particular use in smelters for the handling of molds and materials about the plant. A number of practical views showing the various uses of the system are given. Detail views are included showing safety cross-overs, clamps, hangers, safety switches and plans for the installation of the system in plants.

Weighing Scales. The Standard Scale & Supply Co., Pittsburgh, Pa. Catalog; illustrated.

The catalog is gotten up in pocket size and outlines the features and applications of different kinds of scales. The different types are listed and prices given. Illustrations are shown of the practical uses to which the scales may be put. The contents includes types from small balances to large scales for railroad cars and trucks.

Wire Rope. The John A. Roebling's Sons Co., Trenton, N. J. Pamphlet; illustrated.

Various uses of wire rope are taken up in the pamphlet and the discussion is made clear by the addition of many suggestive illustrations. Physical data of use in designing equipment where wire rope is used, is given as also is data of use in the design of aerial rope conveyors, general wire rope practice and inclined plane operations.

Overhead Carrying Devices. New Jersey Foundry & Machine Co., New York. Catalog 88; pp. 48; illustrated.

Overhead tracking, trolleys, hoists, buckets, cars, etc., make up the contents of this catalog. Each of the many different types of equipment are illustrated, briefly described and accompanied with a table of details and prices. The catalog is not confined to complete equipment only, but information is also given on accessory parts. In the concluding pages storage battery locomotives are considered and illustrations of overhead carrying systems in use are shown.

Traveling Water-Screens. Chain Belt Co., Milwaukee, Wis. Bulletin No. 64; pp. 8; illustrated.

The screens have been designed to clean waters from foreign materials before entering the circuit for use in power plants, steel mills, metallurgical plants, concentrating plants, etc. Views, drawings and description of the equipment and its operation are given. The screens are constructed so that a battery of any number of units may be used to obtain or handle the required amount of water. One sectional drawing is given showing a complete plant installation.

Single Compressors Steam and Power Driven. Chicago Pneumatic Tool Co., Chicago. Bulletin 34-N; pp. 20; illustrated.

Two classes of compressors are taken up including class N-SB and N-SS. Illustrations and drawings of the machine are given with tables showing the details of capacity and dimensions for the different sizes in each class. The capacities range from 52 to 1113 cu. ft. of free air per minute. A treatise on the details of construction is given and the concluding pages show a new type of compressor mounted for portable use.

Gyratory Crushers. Traylor Engineering & Mfg. Co., Allentown, Pa. Bulletin G 3; pp. 26; illustrated.

With the aid of illustrations both of the assembled crusher and separate parts a clear and complete description of the construction of the crusher is given. A table is included giving the details for different sizes of Traylor

gyratory crushers and a crusher with a short head for fine grinding is mentioned. Revolving stone screens are given attention in two pages. Complete crushing plants are discussed in the last 10 pages. Most of the information is on correct design and crushing practice in plants. Curves and detailed information of value to those interested in crushing plants is given and drawings showing complete crushing plants of both large and small capacities are reproduced. In tabulated form and accompanied with drawings the detail dimensions for use in designing but not erecting, are given. The dimension is designated by a letter on the drawing and in the table under the letter the particular dimensions for all sizes of crushers may be found.

INDUSTRIAL AND TRADE NOTES.

The Intermountain Tungsten Milling Co., of Denver, Colo., is remodeling the Black Cloud mill near Salina, Boulder County, and have given the Denver Quartz Mill & Crusher Co. an order for one No. 2 Denver quartz mill, 8 by 12-in. Denver Crusher and other equipment.

J. R. Fleming & Sons Co., Inc., of Scranton, Pa., have been appointed mine-car bearing representatives in the Anthracite coal district for the Hyatt Roller Bearing Co. They will carry a complete stock of Hyatt roller bearing journal boxes for both inside and outside wheelers.

The large mill at Leadville known as the Yak Mill, situated near the portal of the Yak tunnel, was recently purchased by the Morse Bros. Machinery & Supply Co., and will be dismantled and moved to Denver. This was a 500-ton zinc lead mill equipped with crushers, rolls, roasters, dryers, Cleveland-Knowles magnetic machines, tables, etc., all electrically driven. The original cost of the equipment was over \$200,000.

The Geyser mine at Westcliffe, Colo., equipped with the largest hoisting engine in the state of Colorado, a 28x72 Wester, Camp & Lane double-reel engine, weighing over 400,000 lbs., and a complete plant of boilers, compressors, rails, cars, drills, pipe, etc., is being dismantled by the Morse Bros. Machinery & Supply Co., and is being shipped to their Denver yards for resale. Thus ended the history of the "Dream" Mine, a 2700-ft. shaft, and no ore.

Because of the increasing popularity of oxy-acetylene welding and cutting for the repairing and treatment of machinery in place and especially large pieces which would be difficult to move the Prest-O-Lite Co., Indianapolis, Ind., has issued an instruction book on the process. It is written by H. Sidney Smith and A. F. Brennan, and has been gotten up for the use of those who have little or no knowledge of the system. Practical applications of the process are described avoiding technical language as much as possible. Besides description of methods of using this process description of different types of apparatus is also given. The book is titled "Instruction Book on Oxy-Acetylene Welding and Cutting," and may be obtained for 50 cts. direct or from the Mining World Co.

Another triumph was recently added to the many already credited to the mechanical engineering profession when the Johnson & Barry Steel Co., North Birmingham, Ala., accomplished the almost impossible by restoring 12 large oil tanks, 30 ft. long and 10 ft. in diameter, belonging to the Texas Oil Co., to their former career of usefulness. These tanks were a mass of burned and melted iron, full of great holes, bursted by various explosions during a recent fire. With a "Chicago Pneumatic" Boyer hammer, the tanks were completely cut apart and straightened out. All rivets were removed by Boyer rivet busters and the plates were riveted with Boyer riveting hammers. New iron was used of course to mend the spots where the iron was bursted out. Little giant air drills were also used on this job and a "Chicago Pneumatic" compressor supplied all the air used.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Anchorage.

P. R. Strong, from Indian creek, reports his placer claims are showing up and that he has pay.

The Doherty coal mine has been put in condition for production and there are now 1000 tons of coal on the dump waiting to be hauled out. It will sell in this city from \$8 to \$10 per ton. It is employing 30 men at present. The main tunnel, 7 by 8 ft., is driven from the Moose creek entrance and is in 430 ft., with nine shoots in all, 34 ft. apart. The first air shaft is in 90 ft. from the mouth of the tunnel and it is 60 ft. to surface, while the second air shaft at the end of the tunnel, 430 ft., rises 300 ft. to surface. The bunkers with a capacity of 700 tons are being built for storage and the Alaskan Engineering Commission is co-operating to make this mine a success.

Fairbanks.

Mining Inspector William T. Maloney in his quarterly report says that the number of underground placer workings in the Fairbanks section has decreased, but several rich spots have been struck in that region on many of the creeks which will bring the average yield up to the figures of 1915. It is expected that the output from Fairbanks and Tolovana section will exceed that of 1915 on account of increased production from Tolovana. Lode operations in Tolovana have this summer been confined to antimony mining. Over 1000 tons of the ore will be shipped from there during the summer. Of the 10 quartz mills in the section, only one is being operated, and that intermittently. Several small outfits are working on tungsten lodes. Ott shipped 1600 lbs. of the ore by parcels post in March, but it was delayed in delivery until June, when the price had dropped from \$65 per 100 lbs. to \$25.

Cleveland and Howell have been operating with success this past season on Woodchopper creek. Their first clean-made recently is estimated at about \$68,000.

J. W. Toole, a Fairbanks miner, has recently patented a shovel for underground work and now has one on his ground. He took a new generator and motor set in with the shovel. He is operating at the mouth of Fairbanks creek. The shovel works on underground placers and will handle 1000 ft. of bed rock per 24 hours, it is said.

Knik.

Jesse Garber has made a recent strike at the head of Peterson creek. The property is 8 miles northwest of the Martin and 6 miles north of the Gold Bullion mine. In opening up the Jesse B. claim proper Garber took out 15 tons of free milling ore and uncovered 5 leads of milling ore within 150 ft. of each other; with the veins ranging from 2 to 8 ft. wide. The ore is a chloride.

The Martin mine has produced another gold brick and the new tram and bunker were put in commission Aug. 1. The mill at the Mabel mine is crushing ore at present said to assay \$250.

Skagway.

Headed by J. P. Harper and H. A. Kyer, an association known as the Lakinaw & Tagish Co., has taken a bond on the Conrad properties on Tagish lake. Harper in speaking of the work says that they have been operating only 6 weeks. In that time the showing is even beyond their expectations, and while real mining has hardly begun, we have taken out 3 carloads of ore which were sacked and has been brought over and will be shipped to the Tacoma smelter. Fourteen men are employed, but this force is being increased as fast as good men can be secured. The mine has

been sufficiently opened up to make increased shipments during the balance of the summer and throughout the fall and winter. Arrangements are being perfected for the shipment of the ore instead of sacked as at present, and if plans are not retarded the bulk shipments will begin by Aug. 15.

ARIZONA.

Bisbee.

The Calumet & Arizona will shortly start a new working shaft. It will be sent down between Bakerville and the Cochise siding, 1800 ft. deep, 5 compartments, and will be concreted from surface. Sinking the shaft has been contemplated for many months by the management and has become a necessity with the development work of the company and the increasing production. The new shaft will serve as ventilation, development and possibly the hoisting of a large part of the ores from the Junction and Briggs country. Both Junction and Briggs exploratory workings have practically reached a point where the new shaft will be sunk. They are now in the Bakerville neighborhood and some outlet is needed. As to the exact amount of ore found in the lower levels no information is to be had. At present the Junction, which is down 1800 ft., is unwatering the surrounding country. When the new shaft is down 1800 ft. it will unwater another portion of the surrounding workings and aid the Junction in this work. Just exactly when the initial work will be started on the new shaft is not known, but that it will be made in a few weeks appears certain.

Chloride.

Plans are well matured to build a flotation mill of 50 tons capacity at the Keystone mine, owned by G. S. Holmes. The equipment is being supplied by Utah Machinery Co., Salt Lake, the ball mill and Akins classifier to be used being manufactured by Colorado Iron Works; the two flotation cells ordered are the J. D. Fields pattern, this machine being handled by the Utah Machinery Co. There are to be three Wilfley tables. Electric power will be used.

Oatman.

The largest single shipment of corrugated iron into Mojave county has just arrived at Kingman and is being hauled to Oatman. The shipment is for the sides and roof of the new United Eastern mill. More than 60% of the machinery has arrived and work of erecting the structure and placing the machinery will be started at once. Foundations are completed.

The Iowa Mining Co. has resumed operations. The old shaft, which had been sunk on the vein, has been straightened and timbered. It was 300 ft. in depth. The shaft has now reached the 330-ft. point, and a No. 7 Cameron pump is taking care of the water which is coming in at the rate of 40 gals. per minute.

A syndicate composed of Seely W. Mudd, Frank A. Keith, Phillip Wiseman and D. C. Jackling has, according to this announcement, taken over the Sunnyside property, which joins the Lucky Boy and Telluride on the south west. This property is near the extreme southeasterly end of the Tom Reed properties, and is believed by geologists to be traversed by an extension of the Tom Reed vein system. The price involved is said to be in the neighborhood of \$100,000. The above gentlemen, with Long and McIver, are owner of the United Eastern, and really financed the operations of Long & McIver when they were developing this property. It is rumored that the same interests are negotiating for the control of the Oatman Queen property,

which lies more directly south of the United Eastern, and in which a considerable tonnage of milling ore has been exposed. Sunnyside, also, has some remarkable surface showings, while the Telluride and the Lucky Boy, in this same vicinity, are regarded as coming mines when they shall have been properly developed.

Development on the 400 and 485 levels of the Big Jim property continues to add large quantities of ore to the known reserves, and it is officially stated that the average value of all ore being exposed is above \$20. Foot for foot of work done to date, the Big Jim is fully equal to the Tom Reed at similar levels, according to assay maps of both properties.

The Tom Reed continues to develop large bodies of ore in its Ben Harrison (its main mine) and its Black Eagle workings. Arrangements are being made to do extensive development work on other parts of its large estate, which extends for some 6 miles across the Oatman district. Indications favor the belief that several large mines will be developed in the Tom Reed holdings. Its mill is now dropping its entire 20 stamps on company ore.

The Gold Road mill is steadily operating on its own ore and on 30 tons per day from the Gold Ore Co.

The Ivanhoe is drifting on its vein on the 500 level, as is the Fessenden.

Work in other properties, such as Carter, Boundary Cone, Arizona, Tom Reed, Oatman Pioneer, North Star, United Northern, Times, Gold Dust, Gold Key, Gold Road Bonanza, Black Range, Jerome Oatman, Lexington, Adams, Nellie, United Western and others is steadily progressing.

Oatman United, delayed for a long time by inability to secure delivery of its 60-hp. engine to drive its compressor, has at last received its engine, and this is now being placed. The big 3-compartment shaft is now down 175 ft., and will be driven to the 500 point with all possible speed as soon as its power drills can be used.

Oatman Queen and Lucky Boy will soon resume operations, and Lazy Boy and Esperanza will follow shortly with resumption of operations.

Eastern capital is now coming into the Oatman district and several deals of magnitude are said to be pending. Large blocks of stocks of a number of Oatman companies have recently been placed in New York, Philadelphia and Boston. A number of these were companies which were none too well-financed at the start, but which managed to get along very well during the first flush of excitement when Oatman development stocks were selling briskly. Now that eastern capital is becoming interested and is being made available for the development of the properties in the district, mining operations are gradually increasing. Nothing has as yet developed in the camp to prove that the opinions of the eminent engineers who reported favorably upon the district were incorrect, but, on the contrary, developments in those properties which are well advanced in their exploration work are exactly in line with the predictions made last fall and winter by such engineers as J. Parke Channing, Etienne A. Ritter, H. C. James, J. K. Turner, C. D. Jackling, Frank A. Keith, Seeley W. Mudd and others. Ore deposits in the district are so deep lying that considerable time—an average of much more than one year—must be devoted to development and exploration work before important ore bodies are to be expected. A number of companies are now approaching the stage where pay ore may be found at any time, and a still greater number are steadily and quietly developing, with the expectation of going several months before developing anything of general public interest. The spirit of optimism manifested among the operators in the district is in striking contrast to the market for mining securities.

Miami.

N. W. Tanner and his assistant W. L. Card, have just returned to Miami, after having spent 3 weeks in the district southeast of Miami, known as Mineral Creek section, examining the property of the Greater Miami Copper Co. The property consists of 20 claims, located, approximately, 15 miles southeast of Miami. A good deal of development work has been done; besides numerous minor shafts and tunnels, a tunnel is in 110 ft., and a contract to push it in 100 ft.

further will be let at once; also two more crosscut tunnels will be started at once. The property has the advantage of plenty of water, sufficient to run a small electric plant the year round. It is the intention of the company to enlarge the present camp and increase the number of men employed. Work on the road is under way, 35 men being employed on a road leading through Russell Gulch and across the company's property. There is also a crew of railroad engineers making a survey along, approximately, the same route as this road.

CALIFORNIA.

Darwin.

The Darwin Development Co. has completed a flotation plant at the Lane mine and will have it in operation by the end of August. The management reports a large tonnage of good-grade ore available, and if the process proves as satisfactory as anticipated production will be maintained on a large scale.

Two shoots of excellent ore have been opened in the Custer mine, managed by John H. Thornkike. Portions of the vein contain some of the richest ore ever found in the property. Important discoveries have been reported from the Lucky Jim and Christmas Gift properties. The latter is operated by Skinner Bros.

The 300-ton mill of the Tungsten Mines Co., at Tungsten City, has been completed and will go into operation within 10 days. Mule teams are hauling ore to the bins, and the motor trucks will be placed in service before the end of the week. The tunnels and shaft at the mine continue in ore of good grade.

The deposit of zinc carbonate recently uncovered in the Cerro Gordo mine, at Keeler, is proving the most extensive ore body of its kind ever found in the old producer. It was intersected 500 ft. southeast of the shaft, on the 200 level, and is 25 ft. wide. The new winze has gone down on the ore 40 ft. with the vein increasing. The ore is stated to average 25% zinc and occurs as a replacement in limestone. The company is shipping 700 tons of ore and 1500 tons of material from the old slag piles every month.

Downieville.

Henderson & Hodgkinson are driving a new tunnel to intersect the vein in the City of Six mine at a point 60 ft. below the bottom of the 40-ft. shaft. It is expected the objective will be gained within 125 ft. Following this the main lower tunnel, now in 1300 ft., will be continued to the ore body. Some good ore has been exposed in the shaft workings.

Dolan & Bell have erected a small quartz mill at their Rock Creek property and are ready to start crushing. A shoot of rich mill ore has been opened for 100 ft. and 35 tons of selected quartz are ready for the stamps. Arrangements have been made to prosecute work at further depth.

Engineers said to represent the Jackling Exploration Co. have taken options on several groups of low-grade gold properties near Downieville and are sampling the quartz. It is reported an experimental mill is to be constructed to facilitate thorough testing, and that satisfactory results will be followed by the construction of a large plant.

Alleghany.

The Twenty-One mine is idle as a result of an injunction filed against it on behalf of the Sixteen-to-One Co. The latter charges the Twenty-One owners with extracting ore from plaintiff's property, and has entered suit for \$100,000. The Twenty-One people maintain that the other party has invaded Twenty-One territory and are arranging for an injunction against the Sixteen-to-One. Considerable rich ore has recently been opened in disputed territory.

Auburn.

Control of the Borealis Con. group, in the Ophir district, has passed to a syndicate of New York people headed by J. C. Winters. A 100-ton flotation unit is to be installed and the old mine plant replaced with modern equipment.

The group comprises the Eureka, Kirkland and Hataway mines, and contains extensive reserves of good ore. E. P. Stephenson, of Auburn, is manager.

Forks of Salmon.

The Gold run mine, 9 miles from this point, has been purchased by New York capitalists from W. L. Beall, and preparations are being made for operation on a more extensive scale. The mine is equipped with a 10-stamp mill and mine equipment, and contains much ore of good grade. It was recently reopened after lying idle several years.

Ione.

The shaft at the Allen copper mine is down 500 ft. and stoping has commenced on a large block of good ore. The vein averages 5 ft. wide and carries copper and gold. Large reserves are exposed and shipments will start in the near future. C. N. Johnson, of Cutter Creek, is manager.

Washington.

The stamp mill formerly operated at the Grover-Murphy mine, near Nevada City, is being assembled at the Ocean Star, recently acquired by the Columbia Co. Mines Co. A large amount of new work is proceeding in the mine with encouraging results. Good ore is going to the Columbia Con. mill from the Columbia property. Much new work is in progress at the German claim.

Shipments of chrome ore are going to eastern steel mills from the Red Ledge mine, and the vein shows strength as developments advance. The gold bearing ore bodies continue to develop well and a good tonnage is going to the mill.

Nevada City.

The mill at the Texas mine, in Willow Valley, is crushing good-grade ore and the company operating the property under bond has arranged for greater operations. Arrangements are also being made to work several adjoining claims by way of the Texas shaft. W. H. Tuttle is manager.

Roy Tremereux, assistant superintendent of the Champion mine, has been selected to manage the Delhi mine at Columbia Hill, which is being reopened by local capitalists. Unwatering of the lower levels is proceeding and as soon as this has been accomplished a larger pump will be installed and sinking resumed. The mine is equipped with a 20-stamp mill and excellent mine plant.

Atolia

Heavy shipments of high-grade tungsten ore continue to be made by the independent companies, and new work is constantly extending the productive zone. A large acreage of new ground is being worked between Atolia and Bandsburg and leasing companies are particularly active.

Chico.

C. L. Crowder and W. H. Whitten of Chico have bonded their Mugford gold mine to a Nevada company. The property has produced well in the past and the new operators have started work. The Mugford lies 16 miles east of Chico.

Lotus.

The new shaft at the Wagner mine has intersected at a depth of 60 ft. a 4-ft. vein of ore averaging \$35 to \$40 in gold. A 4-stamp mill, compressor, 22-h.p. gasoline engine and other equipment have been recently installed, and plans have been made to send the shaft deeper. The Wagner was extensively worked 20 years ago but has long lain idle.

Tungsten City.

The Standard Tungsten Co. is erecting a 1600-ft. gravity tramway, a new mill with a capacity of 10 tons, and other equipment. This will increase the output of tungsten concentrates fully 80%. Developments continue to uncover good bodies of tungsten-bearing ore.

Yreka.

W. R. Beall of Yreka has made the first payment of \$10,000 on the \$20,000 purchase price of the Gold Run mine, near Forks of Salmon; 20 men are at work and 10 stamps are dropping steadily. Beall reopened the Gold Run several months ago after the property had lain idle 5 years. Large deposits of copper ore have been found in the Forks of Salmon district and it seems likely the region will attract much attention in a mining way in the coming year. Numer-

ous gold ledges are being prospected with encouraging results. The district lies near the new government road from Forks of Salmon to Somes bar and is readily accessible for the first time.

Oroville.

A deposit of rich gravel has been encountered in the Butterfly mine, in Morris ravine, 4 miles from Oroville. It was tapped at the end of a 500-ft. tunnel and appears to be 4 ft. thick. Crosscutting is proceeding to determine its width. Among the principal owners are C. F. Belding, R. S. Kitrick, W. T. Baldwin, C. L. Bills and Herman Legrunde.

The Big Blue Lead gravel mine, near Bangor, has been acquired by F. F. Ford and C. G. Fowler, and arrangements have been made to work it along broad lines; \$20,000 will be expended on development work, and the 2500-ft. tunnel will probably be extended to intersect a series of rich channels believed to course through the property. The property lies about 10 miles from Oroville and is in one of the richest placer sections of California.

COLORADO.

Cripple Creek.

Under Supt. Kissel shaft work is progressing at the War Eagle Con. A new electric fan for use in sinking the Happy Year shaft has been installed. This 3-compartment shaft has obtained a depth of 125 ft., and is gaining at the rate of 3 to 4 ft. daily. The shaft is timbered with Oregon pine. A station has been cut out at 125 ft. and a crosscut is being carried east in close proximity to the main Happy Year vein, lying an estimated distance of 40 to 50 ft. east of the new shaft, and between it and the old Josephine shaft. This old shaft, although but 70 ft. deep, is accredited with a total production of close to \$70,000, when litigation stopped further operations. The lateral from the Happy Year shaft, lower down the hill, will cut under the old workings on the Josephine at an approximate depth of 150 ft., or 75 ft. deeper than the level from which the output was made. It is expected that with the vein tapped paying values will be obtained. The 200 level of the Happy Year shaft is planned to connect with the Happy Year tunnel workings. In driving this tunnel a basalt dike was followed and numerous cross veins intersected. The low values obtained in these veins was too low to permit of development, but such grade may now be mined at profit. Connection with the tunnel will also ensure perfect ventilation, and until this work is completed, the electric fan will be kept in operation. The old Happy Year shaft is between 400 and 500 ft. deep and was sunk in granite. Samples, it is said, range from \$14 to \$40.

A vertical vein at the Ella W. is now being prospected by a winze from the 100-tunnel level. It is showing up good and assays are as follows: Coarse quartz 3.33 oz. gold \$66.60 and screenings 4.32 oz. gold \$86.40. These samples were taken from the 4 ft. of vein matter as broken with machine drills. The first shipment of the higher grade quartz, a carload to be loaded out by teams of the Colorado Trading & Transfer Co., will, it is estimated by the mine superintendent, bring settlement at a rate of between \$35 and \$40 to the ton. A carload of the richer screenings will have accumulated by the end of the week and will then be shipped from the lease by the Consolidated Mines & Reduction Co.

The Jerry Johnson produced \$25,632.50 in ore during the first 6 months of 1916. During this time 33 lots of ore were consigned to mill or smelter and values as shown in the report of Supt. D. C. Smith, of the Cripple Creek Deep Leasing, Milltown Extension combination, ranged from 0.5 oz. gold \$10 to as high as 3.01 ozs. gold \$60.20. The company's lease extends from the 650 level of the main Jerry Johnson shaft downwards. The Deep Leasing Co. is mining and shipping a good grade of ore from the bottom or 850 level. A crosscut at the 750 level now being carried to the breccia-schist contact should reach the objective point by Aug. 14, when it is expected that another ore shoot will be entered. During July the production made by the Deep

Leasing Co. totaled 9 cars or 300 tons of ore that averaged better than 1 oz. gold.

Idaho Springs.

In Buttermilk Gulch, the old Queen mine on Seaton mountain is to again be operated after an idleness of 25 years. The property is to be worked for tungsten. Oscar Hayes, Dr. Polly, Denver, and his brother, a Cripple Creek mining man, have formed a company known as the Polly Brothers & Hayes Co. They have obtained a lease and bond on the property from the Holly Mercantile Co., Central City, and have started work. In the early days the property was worked for silver. They have built ore flats and put a hoist at the 20-ft. shaft from which they are producing tungsten. In an old shaft, sunk when everybody was looking for gold and silver, there is a 2½-ft. streak of tungsten that shows 24%. At the present market price this is worth \$12.50 per unit. The shaft was sunk the entire distance on a vein which averages about 2½ ft. wide, work on the shaft being abandoned because the vein matter showed no gold or silver and tungsten at that time was undesirable. The old dump is most all tungsten, and in the bottom of the shaft the streak is 3 ft. wide and shows better value than tungsten.

Silverton.

Shipments from this camp during July were as follows: Davey Leasing Co., 37; Gold King, 36; Sunnyside, 31; S. D. & G., 17; Iowa-Tiger, 16; Congress Mine, 13; St. Paul, 13; K. P. & G., 9; Davey L. & M. Co., 7; Genesee, 7; Davies Lsg. Co., 6; Atlantic Lease, 1; Kittimac, 3; Nevada Lsg. Co., 3; Pueblo Mine, 3; Big Giant, 2; North Star, 2; Pride of the West, 2; Barstow Mine, 2; Silver Ledge, 2; Intersection, 1; Silver Lake Mine, 1; Highland Mary, 1; Harding Sub-Lease, 1; Rogers Lease, 1; Kansas City, 1; Joker Tunnel, 1; Hudson Lsg., 1; Morgan & Chino, 1; John A. Johnson, 1; Andren & Jackson, 1; total, 227. This is 118 more cars than were shipped from this camp a year ago.

IDAHO.

Arco.

Wilbert Mining Co., whose mine and mill are 40 miles from Arco, on the Blackfoot-Mackay line, is shipping about 225 tons per month of concentrates, running 50 to 55% lead, and 5 to 15 ozs. silver, which is handled at Salt Lake by Knight & Warnock.

Gilmore.

The Pittsburg-Idaho Co., the Gilmore Mining Co., and the Latest Out Mining & Smelting Co., all operating at Gilmore, are shipping lead carbonate ore to Knight & Warnock, ore shipping agents, Salt Lake, for smelter markets at that place. These ores sample 33% lead, 15 ozs. silver and 60 cts. gold. The Pittsburg, H. F. Ellard, manager, produces close to 50 tons per day; the Gilmore, managed by E. C. Ross, recently began shipments, which now amount to 5 to 7 cars per month; Latest Out, D. Nichols, manager, is shipping about 15 cars per month.

LAKE SUPERIOR.

COPPER.

Houghton.

Mass tonnage is about 1200 daily and the yield per ton is remaining about the same, nearly 16 lbs. The opening of another shaft, as was announced a short time back, will have to be deferred for some time owing to the difficulty in getting new men.

Adventure is progressing in retimbering the shaft below the 80-ft. collar and is now down about 70 ft.; this work is somewhat slow owing to the poor condition of the old timbers. The management is pushing the work as fast as possible to take advantage of the high prices of metal.

Victoria will increase its daily tonnage with the one skipway and the old hoisting engine after some improvements have been made at the mill, to about 700 tons. The

skipway will have the rails laid to the bottom level, the 26th, and the hoisting engine ready about Sept. 1. The 19th level west has been very good and it gives promise for a large block of ground from the 15th level to the 22nd which has never been explored.

Copper Range now has a force of men—in fact, all that it can employ—and will increase its tonnage, though no effort is being made for a great increase; whatever additional tonnage is produced will come mostly from the Champion. This mine is preparing to concrete its collar at the No. 4 shaft. It is likely that the other three shafts at the Champion will be improved in the same way. The change has been made at the three Trimountain shafts, but it is not required as yet at the Baltic.

New Arcadian has holed through its new shaft to the 50 level, and as soon as the plat or loading station has been cut out, drifting will be pushed both ways. The 900 level has reached the New Baltic boundary and this work will be discontinued; the ground there for the past few weeks has been as rich as at any place in the mine. The shaft is down about 110 ft. below the 1250 level and is being pushed along rapidly with two drills.

Houghton Copper has, it has been quite definitely established, found the West vein of the Superior mine with copper constantly in the north drift, with a stretch of 20 ft. that has good values. The drill will soon be shifted to the south side of the shaft towards the Superior. On the 12th level the Northern drift is in the same good ground, and a distance of about 70 ft. has been covered, almost all of which has commercial grades.

South Lake has sent its mineral to the Quincy smelter, but it will have to wait until the large drop hammer that is used to break off waste rock from the masses is received and put in position at the rock house. This hammer is expected daily. In about 2 weeks or so the smelting will take place. The same values are being taken out, the Butler lode being somewhat better than the others.

Isle Royale has been shipping between 3100 and 3300 tons daily, and is now pretty close to the former figures. In addition it is keeping up the development work as previously stated. The present daily tonnage, as large as it is, will appear small in another year or two, because the aim of the management of this low-grade mine is the greatest tonnage possible. The connection will be made between the surface and the 5th level at No. 7 shaft during the present month. The whole bottom, that is, the lower levels, is disclosing very good rock.

Carp Lake's force of 12 men under Supt. Rourke have cleared out a third shaft, which is about a half mile east of No. 9, the first shaft reopened, and a mile east of No. 11, subsequently unwatered; all of these shafts show the 6-ft. strip, the upper mineralized portion of the 300-ft. wide sandstone bed with rich copper, and at No. 9 a crosscut has recently determined the lower mineralized strip 10 ft. wide to be as rich as where opened on the face of the cliff. The drift on the tunnel from the surface at No. 9 shaft will now be cleared of its caved ground and crosscuts driven into the lower mineralized strip. It is proposed to mine the copper by opening an adit in from the west about 1500 ft. below the top of the bed, and then to hole through a shaft on the bed by sinking and raising. So far wherever opened the two strips of copper ground average just as good as when they were first examined in this recent period of exploration.

Algonac is waiting now, as it has completed its diamond drilling, for the managing director, Angus Smith, of Detroit, who will probably arrive here this week and consult with John R. Stanton, one of the pool that owns this property, and the president of the Mohawk, Wolverine and Michigan and other properties, who is making his summer inspection of the properties in which he is interested. This property lies between the Nonesuch to the east, and the White Pine Extension to the west, is owned in thirds by Angus, representing himself and his family, T. F. Cole and J. R. Stanton.

Michigan has 7 to 10 ft. of excellent stamp rock in a new lode encountered by the exploratory crosscut, which

is to pass through all the lodes of the Knowlton and Evergreen series, about 180 ft. from the line of the shaft. It is most likely that this lode is the Ogimah; at any rate, it is very close to the strike of that lode. After it has been traversed for its entire width, it is probable that it will be opened up by drifting. With the Knowlton, Evergreen and the North lodes of the South Lake yet to open, and the success at the Butler and Ogimah, it seems probable that one or two lodes will prove commercially profitable—sufficiently to make a paying property. That the mine is earning more than its expenses seems to be a fact, but this cannot be fully determined until the product has been smelted.

Allouez is having its steel frame work so altered that one of the largest sized crushers—the same size and type that has been installed at the Calumet & Hecla and many of the shafts of its subsidiaries during the past few years so successfully—built in the shops of the Calumet & Hecla, can be put in at its No. 1 shaft. This new crusher will be used in conjunction with the tilting pan or apron that has been just constructed, and will effect a great saving through its ability to handle more rock. No. 2 has had this improved equipment for some time. Sufficient men are to be had here, so that this is one of the properties that is not falling off in its daily tonnage. This mine, as is generally conceded, has as promising a future as any in this district.

Cherokee is now down about 30 ft. with its shaft, and is constantly disclosing the same great amount of mass, both large and small, as at first. The shaft is now wholly in the lode, and these good values completely cover the bottom. A mining engineer who is as well acquainted with the lodes of this portion of the mineral series as any man in the district, visited a short time ago this property, and says the showing is very good, and of such a nature that it is likely to persist, with of course the usual poor and barren stretches, as in all of our lodes, especially the amygdaloids.

IRON.

Duluth.

Since a 1-in. raise in the water level allows the lake ore boats to carry about 80 tons more per trip this season has been favored in that the Great Lakes' water level has been high. Another high shipment record was made during July, which, even for the Mesabi strike, surpassed all previous months. It was 9,750,157 tons, against 9,507,576 tons in June. It now looks as if the total shipments for the season would come close to 60,000,000 tons, as 29,365,724 tons has been handled to Aug. 1. The furnaces need the ore and the shippers are going to do everything possible to get the product there. The ore shipments by ports for July were as follows: Escanaba, 1,044,368; Marquette, 680,779; Ashland, 1,302,682; Superior, 1,986,631; Duluth, 3,012,492; Two Harbors, 1,723,205; total, 9,750,157.

Ironwood.

In electrifying its mines on the Gogebic range the Oliver Iron Co. has let many large contracts for machinery. The largest contract went to the Wellman, Seaver, Morgan Co., of Cleveland, which will construct five man hoists and five ore hoists for the A, C, D, E and H shafts of the Norrie-Aurora group. The hoists will be 12 ft. in diameter and will be built of cast steel. They will be driven by Falk herringbone gears, operated by a forged-steel pinion on the motor shaft. Four of the hoists will be for operating 5-ton skips in balance in inclined shafts and the other will be for operating skips of the same size in a vertical shaft. The maximum rope speed for the ore hoists will be 1500 ft. per minute, while the maximum speed of the man hoists will be 1000. Each ore hoist will be operated by a 900-hp. 3-phase, 60-cycle, 2200-volt induction motor, with primary control and liquid rheostat secondary control. The man hoists will be operated by similar synchronous motors of 500-hp. The speed of the motors will be 360 revolutions per minute. The contract for the hoist motors, the generator set and a turbine was given to the General Electric Co. The Sullivan Machinery Co. was awarded a contract for two air compressors, with the necessary electric equipment to operate them. Each machine will have a capacity of 2250 cu. ft. of free air delivered. The motors will be 400-hp. each.

The Lake Shore Engine Works will construct three small, double drum hoists. Two will be placed in service on the Gogebic range, and the other will be installed at the Dober mine, Menominee. These four contracts will require the expenditure of about \$400,000. It is estimated the Oliver Co. will spend \$1,000,000 when the intended work is completed.

Ishpeming.

Contracts have been let by the Cleveland-Cliffs Co. to J. S. Wahlman for a new office building at the Cliffs Shafts property and to Victor Carlson for a dry house at the Homes mines near Gwinn. The dry house will be of brick construction and in most details similar to the one at the Cliffs Shafts mines. Work will be started immediately on both buildings.

MISSOURI-KANSAS.

Joplin.

The week just closed showed a general shutdown of many of the mines in the sheet ground and the low-percentage disseminated camps of the district. Just the number of plants that have closed down has not yet been determined, but it has been very large, and the announcement of many others just as soon as they can clean up their mines has been made. Not a single mine is now running in the Wentworth camp, which formerly shipped from 6 to 8 cars per week. The West Joplin disseminated camp shows a majority of its mines closed down, while the Webb City field shows very much the same conditions. Only those camps with very rich ores continue to show a regular production, and even in these camps the surplus tonnage is mounting rapidly, because the operators are unable to sell their product. This condition must eventually force the closing down of even these mines, unless there is an improvement in the market which will increase the demand for ores sufficient to take up the surplus tonnage now in the field. This is the first month after the expiration of many of the powder contracts, and this has resulted in a higher cost for powder for these mines. This has been one of the main factors in forcing the closing of mines all over this district. There are still a few contracts that have not expired, but each week sees the expiration of one or two.

On the other hand, there have been a large number of properties in those camps of the district subject to overflow, and which were flooded 3 months ago by the heavy rains at that time, which are just now getting their ground drained and are ready to return to production. Most of these are properties with rather rich deposits of ore and can afford to operate at lower costs than the majority of the mines in the field. It is probable that these mines will replace a number of those shut down and will thus help maintain production. Among these mines is the Buckeye of Cave Springs, which has just been pumped out and is ready to resume operation. Another is the Ethel Gray at Chitwood, the entire Lone Elm tract northwest of Joplin and a number of plants in the northwest Joplin area.

MONTANA.

Butte.

Report gives the Anaconda July production at 28,200,000 lbs. of copper. The monthly output for the year so far was as follows, in pounds: January, 23,200,000; February, 23,300,000; March, 26,600,000; April, 33,300,000; May, 30,000,000; June, 28,100,000; July, 28,200,000.

W. L. Creeden, general manager of the Davis-Daly property, in a recent interview states: "Davis-Daly gives indications of developing into a profitable mine. We have pinned our faith on the Hesperus ore body, which has been definitely located on the 2500 level. At this point the ore body has been opened for 450 ft. in length, with an average width of 12 ft., the ore assaying between 5 and 7% copper. The breast of the drift on this level is still in ore. The development contemplates openings above and below the 2500. A

drift is also being run in the 2400. The new hoist should be in commission by October, when production should be doubled—the present 135 tons per day. The aim is to keep income and outgo balanced pending the time when Hesperus ore body has been developed to a point where a substantial tonnage of ore can be economically mined. With copper at its present prices it is figured that the Hesperus will easily pay for its own development. Davis-Daly has about 200 acres of mineral ground. Aside from the favorable showing in the Hesperus, Davis-Daly has a good asset in its Hibernia claim, which lies next to the Nettie property. No work is being done on the Hibernia at present."

Articles of incorporation have been filed by the Montana Mining Co. The incorporators are A. J. Haggerty, John Couch and Steve Mihelich. The principal office is to be in Butte. The capital stock is \$100,000, non-assessable, and is issued in 100,000 shares of a par value of \$1 each.

The Colusa-Leonard Extension Copper Mining Co. has deeded its property to the Syndicate Copper Mining Co. all of the stock which the Colusa-Leonard owns. An agreement has been entered into with the Tuolumne Copper Co. to sink the Colusa-Leonard shaft to the 1600 level, and there a crosscut will be made. When the Tuolumne Copper Co. has finished its contract it will own 51% of the Syndicate Copper Mining stock, and the Colusa-Leonard Co. will own the remainder of the stock, which will be issued in one certificate. Work has been resumed and the superintendent in charge states that he will be shipping copper ore from the Colusa-Leonard claims as early as September first.

Great Falls.

Work will be started at once by the Montana Power Co. upon the enlargement of the hydro-electric plant at Rainbow falls. This announcement was made by Frank W. Kerr, general manager. The proposed changes will mean the providing for an additional 130,000 hp. and will cost approximately \$500,000. Plans for the changes will be made under the direction of Henry A. Herrick of the Charles T. Main Co. of Boston, original designers of the dam and power house. The construction work will be in charge of Frank Scoten. This installation, in view of the construction of the Holter power plant of 50,000 hp., serves to demonstrate to a degree the heavy demands now being made upon the power company for electrical energy.

Libby.

The mill which is being built by the Rose Con. Mining Co. will be completed and placed in operation this month. The company has been at work for some time running the tailings from the old dump on tables for recovery of tungsten values. Oscar Nordquist, manager, says it is expected that these values will produce sufficient to pay the cost of the mill. All the machinery for the 10-stamp mill is on the ground and is being assembled rapidly. Another force of men is engaged in getting out timber for the mine. A crew is employed in the mine, the work at present being on the raises between the 1st and 2nd levels. The ore runs about \$16 in gold. Estimates as high as \$18 have been made. The ore also carries profitable tungsten values.

Race Track.

Anaconda people have organized a company to develop a tungsten property in the Danielsville district. The company will be known as the National Tungsten & Silver Mining Co., and the officers are: W. R. Brown, president; J. J. Hammers, treasurer; Austin Adams, secretary, and W. J. Hunter, engineer. Anaconda will be the headquarters.

NEVADA.

Goldfield.

The first 500-ton flotation unit of the Goldfield Con. has been in operation a month, with results entirely satisfactory. It is planned to have the second unit of like capacity in service during August. Developments in the lower levels of the Mohawk and Red Top-Laguna are proving highly satisfactory, confirming the belief that ore of excellent character existed on the deeper levels. On the 600 level of the Mohawk

ore averaging from \$11 to \$17 gold and copper is being opened; \$17 ore is coming from the 600 workings of the Red Top-Laguna. On the 260 level of this property some \$42 ore was recently intersected. The triplex pump formerly in operation on the 1350 level of the Goldfield Merger has been moved to a like point in the Grizzly Bear shaft of the Consolidated and will handle water from it, Atlanta and the Merger.

The main shaft of the Silver Pick has advanced to a depth of 850 ft. and interesting developments are expected. As soon as the shale-latte contact is gained a crosscut will be extended to open the body of ore recently indicated by the Calyx drill. The company has completed installation of a 65-hp. hoist and a more powerful pump. The drill operating from the 500 level has gone down 600 ft. and intersected three veins without disclosing the shale.

Streaks of rich ore continue to show in the 6-ft. vein recently intersected at a depth of 240 ft. in the Great Bend, and Engineer J. K. Turner believes the work is nearing a strong body of good ore. A shipment of the rich quartz is being prepared and arrangements made to drive a new level to strike the ore body at greater depth.

The enlarged flotation plant of the Florence Goldfield Co. is in operation and being steadily worked up to capacity. The management reports the mine in the best shape for several years, with considerable shipping ore exposed on the 600, the present deepest working level. The shaft is 1100 ft. deep and it is understood extensive work from the deepest levels is projected as soon as the flotation plant begins to earn profits.

The management of the Atlanta is preparing to double the working force and to drive the crosscut from the 1750 level. This work is being done with a view to intersecting the Consolidated vein. It is rumored the company is arranging to have a fair tonnage of ore treated at the Florence flotation plant. About 20 other properties are active, with developments in the Lone Star, Kewanas and Sandstorm-Kendall holding much of promise.

Austin.

A leasing company, composed largely of Cleveland people, has arranged to operate the Maricopa mines in New York canyon. Work will begin within 30 days. A good tonnage of medium-grade ore is exposed. Earl G. Hill is manager.

Development has been resumed in the Austin-Dakota group. The power house has been finished and the new compressor plant is in operation. Sinking of the X-Ray shaft is proceeding rapidly and lateral work will soon start.

Contact.

Regular shipments of high-grade copper ore are maintained by the properties of this district. The Seattle-Contact Mining Co. has shipped 35 cars since Feb. 14, averaging 12% copper, 30 ozs. silver and 30 cts. to \$2 gold. The mine has been opened to a depth of 275 ft. by tunnel and winze. Ore bodies range from 2 to 10 ft. wide. A shaft is being sunk and a hoist and compressor have been installed.

The Mt. Helene Development Co. is working the Bonanza group with good results. On the Mammoth group the Nevada Copper M. M. & P. Co. is opening wide bodies of good-grade ore. Two 5-ton trucks and several 4-horse teams are engaged in hauling ore to Rogerson, Ida., 35 miles distant, from which point it is sent to Salt Lake smelters. A movement has been launched for the building of a custom plant embodying the flotation process.

Battle Mountain.

James Dahl has carried on placer mining every season since 1912 at the mouth of Copper canyon, 20 miles out from Battle Mountain. He takes water from Willow creek and brings it down by a 4-mile ditch that carries 3-second-feet of water, and discharges it into a reservoir 60 ft. wide, 150 ft. long and 6 ft. deep. By this means he provides water sufficient to sluice 250 cu. yds. in 24 hours. The material handled is cemented gravel, and has to be blasted in some cases, and where it is not blasted picks have to be used before shoveling. The stuff is hauled in cars by mules and dumped into the ore bin at the head of the sluiceway. The pay gravel is found on a shale and porphyry bed rock. It is taken out by

drifting up-stream on bed rock, the drifts in places being $5\frac{1}{2}$ ft. high and 40 to 60 ft. in lateral extent. This requires thorough timbering. This excavating extends about 2 ins. into the bed rock. A tunnel is being driven at a lower point to open a new channel, 45 ft. below the old or false bed rock. With a force of 50 men about 150 yds. per day are being mined and sluiced. This is understood to run \$2.50 per yard in gold, and possibly higher. Previous to this year a big yardage of gravel was mined and sluiced which ran at least \$15. Other placer ground above these holdings is reputed to be rich, but they are not being operated.

The Copper Canyon mine of the Glasgow & Western Co. is under option to a New York syndicate, represented by F. Sommer Schmidt, of Battle Mountain and Salt Lake. In this syndicate are some of the men who are concerned in United Verde Extension, Arizona. This property was located in 1866, and in the early days of mining in Nevada, 40,000 tons of ore running 40% copper were shipped from this mine to Swansea. The property has a 590-ft. vertical shaft, from which there was extensive development down to 470 ft. Present operations, under direction of Mr. Schmidt, consist of unwatering the mine, the water level last month being at 440 ft. As soon as the workings are clear of water the old levels, started at 530 and 590-ft. stations, will be driven to the ore, those stations being off the vein in the foot wall. The vein strikes north, and dips 65° west, and if the ore shoot that was opened in the upper workings continues with depth much ore can be mined without sinking deeper. The ore consists of chalcocite, cuprite and native copper, with some argentite. Equipment for pumping, hoisting and drilling are in position.

Hill Top.

Kimberly Con. Mines Co. is operating a 10-stamp mill on gold-bearing quartz, assaying \$13, recovering 72 to 75% of the gold on amalgamating plates. E. Ross Carver, manager, states that the company's cyanide plant is to be started in the next 30 days to treat iron-sulphide ore, carrying gold, which has been developed in deeper workings. The plant is equipped for fine pulverizing and the all-slime process of cyaniding, and filtration by Oliver continuous filters. Machinery is all operated by Fairbanks-Morse oil engines.

Tuscarora.

The De Vol-Sheehy mine, 33 miles north of Tuscarora, has free-milling gold ore which is being treated in an arastra. The intention is to erect a 450-ft. aerial tramway and install a mill built by the Straub Mfg. Co., Oakland, to recover the gold by amalgamation and table concentration. The ore is taken from open cuts and drifts on a vein which is exposed a distance of 300 ft. It is said that 20 tons treated by arastra averaged \$125 per ton. In addition to gold, the vein contains hematite, carrying silver and galena.

Pioche.

An option has been taken on the Uvada Copper holdings for \$150,000 by New York people, the option extending over a period of 50 days. The company owns properties in Nevada and Utah, including the Day-Bristol group near Pioche. Heavy shipments of good ore have been going out from this mine for several weeks.

The Hamburg Mines Co. is installing air drills preliminary to more extensive developments. The ore being shipped averages around 15% lead, 15 ozs. silver and \$4.50 gold.

Pioche.

The Prince Con. company, which owns 120,000 tons of mill tailings at Bullionville, lately started its mill to treat them by oil flotation. These tailings resulted from milling operations 40 years ago, Pioche ores having been milled there on account of the water supply in Meadow Valley, Wash. The material here runs about 7% lead, 11 ozs. silver, and \$2.60 gold. The sands are about 40 mesh, and the slimes 200. A more explicit description of this mill will be given later.

Prince Con. Mining & Smelting Co., controlled by A. H., M. C., and E. L. Godbe, Salt Lake, is shipping 15,000 tons of carbonate and oxidized ore per month to Salt Lake smelters, the approximate content being 3 to 5% lead, 3 to 7 ozs. silver, and 35% excess iron manganese over silica. Shipments of ore have been continuous for the last 3 years.

A. H. Godbe, president of the company, estimates 18,000,000 tons of ore in the mine. The main deposit is said to be 1500 ft. long, 1000 ft. wide and 120 ft. thick. It is opened by levels run from a 600-ft. incline, which reaches a vertical depth of 500 ft. All ore is being mined above the 600, which is at water level. Diamond drill holes sunk, show the existence of bodies of sulphide ore below water level. The company owns the railroad, 9 miles long, extending from Pioche to the mine, connection being made at Pioche with the Salt Lake railroad. M. C. Godbe is general manager.

Belmont.

Spanish Belt Mining Co. is driving a 1400-ft. crosscut tunnel to tap the workings of the mine at the 600 level, to drain the mine, which is filled with water. The ores are sulphides, containing gold and silver. Plans contemplate the building of a mill. Victor Barndt is general manager and D. H. Walker is superintendent. The mine contains some lead and cinnabar.

Beatty.

Bull Moose mine, under option to Tonopah-Belmont Development Co., Tonopah, is being developed by that company, the work being under direction of John M. Fox, E. M. In this property low-grade gold ore occurs in a series of sedimentaries, bedded limestone, shales and quartzites, the gold being in the fracture zones, cutting the series. They have a gasoline operated air compressor for hoist and drills, the power costing \$2.90 per horsepower month, by using 27° oil. Development is being carried on from an incline winze, by laterals through the reef. The property is 9 miles south of Beatty.

Sodaville.

C. E. Noble and associates will build a 10-ton concentrating mill at Rhodes station, to concentrate ore which runs 8 to 10% tungsten. Their mine is an extension of Silver Dike tungsten mine, being operated by Atkins, Kroll & Co., San Francisco. On this belt are about 15 veins in white quartz, which parallel each other. The metal occurs in diabase and quartz. There will be a haul of 6 miles from their mine to the proposed mill at Rhodes, where there is a salt marsh.

Mason.

McConnell mine, owned by O. H. Sonne of Reno, and S. B. Elbert of Denver, is being operated under direction of the former. The property adjoins the Bluestone and Western Nevada. It has a 400-ft. shaft and 5,000 lineal feet of tunnels and drifts. Copper carbonates and oxides have been mined to a depth of 200 ft., below which is mostly a sulphide. This is a deposit, rather than a vein, and has a width of 200 ft. in some places. The ore occurs in white crystalline lime and in garnetized lime, these bodies lying contiguous to a granite intrusion. Small shipments are being made of oxidized and secondary ores, which are mined from the surface by use of scrapers. It runs 8% copper.

Winnemucca.

The Gem group of 6 claims, on East range, 20 miles southwest of Winnemucca, is controlled by H. H. Sheldon and C. W. Kershaw, who have explored by making open cuts, trenches, pits, tunnels and shafts, on several veins of quartz and altered rock which cut through a formation of rhyolite and blue lime. They have also a contact vein between rhyolite and lime. The group includes the old Gem claim, where high-grade silver and gold ore was mined in early days. The ore occurs in chambers, shoots and lenses, the relative amounts of metals being about 1 oz. gold to 50 ozs. silver. The gold seems associated with chloride of silver and gray copper. The old workings showed the rich ore to be in the blue lime. They find ore running 400 ozs. silver and 15 ozs. gold, but a general average is placed at \$11 per ton. The equipment now on the property consists of hoist, air-compressor, blacksmith shop, ore cars and camp house. The plan is to develop to greater depth and if possible expose enough ore to justify building a mill.

Midias.

The Gold Circle district is gradually increasing its output with several new discoveries reported in the past few weeks. The Elko Prince, Rex and Coot mills are running at capacity and treating a good grade of ore. Eight bars of gold-silver bullion were shipped from the Elko Prince mill

in June, valued at over \$75,000. A crosscut is being driven from the main workings of the Elko Prince to the June Bell vein, which has been profitably worked by the Paul Ehlers lease for several months; 1000 tons of \$15 ore are ready for shipment to the mill.

* Lessees have opened a fine body of ore in the Gold Circle Queen mine, located between the Eastern Star and Esmeralda properties. It was uncovered in the south drift from the 125 level and shows 8 ft. of ore assaying around \$16; 4 ft. is said to average around \$50 in places. Shipments are being made to the Coot mill.

Arrangements are being made for an early resumption of work at the Gold Crown, lying between the Elko Prince mine and Midas. Some good ore has been exposed and several lessees are endeavoring to secure blocks of ground. It is stated extensive work will be prosecuted on company account.

NEW MEXICO.

Mogollon.

Machine drills are now in use at the Pacific mine, operated by the Socorro Mining & Milling Co., and drifting is being pushed on the 500 level. All lumber for terminal station for aerial wire rope tramway at mill end is now on the ground, and the ore bins and headframe are nearing completion. Timber for construction at the Pacific end is being delivered. No definite date has been set for placing the tram in commission, but it is understood it will be in use in the early future.

Operations for last half of July on the Last Chance mine, conducted by Mogollon Mines Co., yielded 17 bars gold and silver bullion and 4.2 tons high-grade concentrates. Ore treated for the period was 2125 tons. The new shaft is now some distance below the 800 level and sinking continues at rate of 2 ft. per day. The counter-balanced, self-dumping skips recently installed in shaft have relieved the congested hoisting conditions.

No. 2 ore body in Eberle mine, on which developments are conducted by the Oaks Co., has been cut in a drift run south from main shaft and has all appearances of producing an extensive tonnage.

This district is credited with a total production to date of some \$15,000,000, and is yielding at the rate of about \$1,500,000 per annum in gold and silver. With the consummation of larger and more centralized operations now pending, in connection with decreased mining and reduction costs that will be effected by hydro-electric power installations and more direct shipping facilities, an unlimited tonnage of lower grade ores will become available and insure a greatly increased annual output for a long period of years. There is a total of 35 miles of vein outcropping in the district, but a comparatively small portion of which has been explored, and the development companies are steadily proving the value of new ground throughout the region.

Santa Rita.

The Silver Glance Mining & Development Co. has recently been incorporated with a capital of \$25,000, divided into shares of \$1 each. It owns and is developing a group of 10 claims including a millsite in Camp Fleming, 6 miles northwest of Silver City, containing silver and copper ores. The president and general manager of the company is N. P. Grenfell, Jr., Silver City, and the stockholders are mostly of the same place. The property has been developed by a shaft 70 ft. deep. It is located on a dike and cross spurs running each way from the dike. This main dike is 150 ft. wide, strongly mineralized, and has a northwest strike. The cross spurs on veins vary in width from 4 to 10 ft. and contain silver and copper. While the highest assays are 3434 ozs. silver and 26.6% copper, the average runs \$113, in silver and copper.

The Santa Rita Development Co. has been formed to develop 15 claims adjoining the Chino Copper Co.'s ground. Until the first stockholders' meeting to be held on Sept. 26, the following officers and directors will hold office: President, W. H. Lawhon; secretary, D. A. Richardson; treasurer and

assistant secretary, Edward C. Bradford, all of Douglas, Ariz. The above officers, with H. W. Loomis of Douglas, and Elmer S. Morton of San Francisco, constitute the board of directors. H. W. Loomis is general manager. The property is located only half a mile from the Santa Fe railroad and Loomis will commence work at once. After sufficient ore is developed a reorganization will be made and a mining company with a capitalization of not to exceed \$5,000,000 will be formed to absorb the stock of the development company. This was the method so successfully employed in the earlier stages of the Calumet & Arizona.

OREGON.

Grant Pass.

Haulage of ore is being pressed at the Queen of Bronze mine at Waters Creek station. They are now taking out about a carload a day at the rate of 1 ton per horse per day. There is one 6-mule team with 2 wagons, one 6-horse team with 2 wagons, three 4-horse teams and 2 wagons each and one 2-horse team in the ore-hauling outfit, which lands about 30 tons of copper ore at the station each day.

SOUTH DAKOTA.

Lead.

Universal effort is being made for a larger production at the Wasp No. 2, and it is said it is having some trouble in finding enough labor with which to carry on its increased activities. They are taking out, in the face of the working, from 500 to 600 lbs. of 60% tungsten daily and are understood to have on hand about 50 tons. They have made no shipment since the record single shipment was made some months ago, when a shipment of about \$100,000 was made. The cyanide plant treating low-grade, gold-bearing quartzite ore is now handling upwards of 250 tons daily, running at about half capacity. They are taking out ore that averages close to \$3, a material that would have paid a very satisfactory profit, when the mining was practically quarry work. Before going underground a \$2 ore would permit dividends, but now \$3 is showing but a small profit. It is estimated that the gold mill will pay the expenses of all operations, leaving whatever is received from the shipment of tungsten to become a net profit. The last gold clean-up amounted to a little over \$10,000. The tungsten on hand, if it can be sold at \$30 per unit, should bring about \$120,000.

Hill City.

Efforts are now being made to raise funds to install machinery which is on the ground at the Hill City Mining & Development Co.'s property. The steam hoist, not yet installed, has a capacity for sinking 1000 ft. Last fall it purchased a 20-stamp mill and saw mill, located a few miles from the mine, which can be hauled to the property and set up at no great cost. With these three items of equipment in operation, the company will be ready to proceed with the plans of development decided on. It is planned to sink to a depth of 500 ft. It is probable milling operations will be undertaken when a depth of 300 ft. is reached. The main shaft is now down 110 ft. on a gold-bearing ledge of ore, which has been traced for a distance of 6000 ft. The vein shows a width of 16½ ft. at the bottom of the shaft, where it has been crosscut and otherwise prospected. This is said to carry values of better than \$6, a large percentage of the gold being in the free state. The remainder of the ore is a suitable concentrating and cyaniding product.

UTAH.

Salt Lake.

Salt Lake Copper Co., whose mine is near Tecoma, Nev., has 12 sets of lessees at work and other leases have been let. They are mining a carbonate ore running 4 to 5% copper.

The ore is shipped and marketed by the company, which settles with the leasers. July shipments amounted to 23 cars. Average shipments run 12 to 15 cars per month. Geo. B. Church, Salt Lake, is manager for the company. The mine is in western Utah.

Bingham.

Silver Shield mine, under management of H. S. Joseph, Salt Lake, is shipping 100 tons per month of silver-lead ore, worth about \$20 per ton. A ventilating shaft is to be sunk 350 ft., the collar of which will be higher on the slope, above the tunnel level. This will make it practicable to mine bodies of ore in the stopes 350 ft. above the haulage level.

Colton.

Wasatch Ozokerite Co. has thoroughly opened stringers and lenses of ozokerite, or mineral wax, in shale, the bulk of material mined running about 2% ozokerite. A plant, having the capacity to handle 50 tons per day, has been erected and put in operation. The process is to crush the material, then concentrate by means of hot water vats and filtration. About \$100,000 has been expended on development and equipment. This material is a hydrocarbon, worth about 60 cts. per pound, and its uses are for insulating for lining acid tanks, and for making high-grade candles.

Milford.

Cedar-Talisman Con. Mining Co. has plans matured for building a dry concentrating mill for treating 100,000 tons of zinc, lead and silver ore contained in the accumulated mine dump. The grade of ore is estimated at 12% zinc, 10% lead and 7 ozs. silver. The plant will be equipped with a crusher, rolls and Stebbens dry concentrating tables. H. S. Joseph, Salt Lake, is manager. The property is 12 miles southwest of Milford.

Big Cottonwood.

Mines Development Co., Salt Lake, which has a lease on the Alta tunnel, has developed mixed sulphide and carbonate ore, some of which runs 55 to 60% lead and 30 ozs. silver. All work is above the tunnel level. This tunnel, which belongs to Alta Tunnel & Transportation Co., managed by F. V. Bodfish, is in 2100 ft., and crosses a number of veins between Silver Fork canyon and Alta.

Mercur.

West Mercur Mines Co., under management of C. A. Bennett, recently started its new cyanide plant of 150 tons' capacity, and is treating gold-bearing quartz, the vein being in limestone. The workings have reached a depth of 800 ft. on the dip of the vein. An Oliver filter was lately installed and an Ingersoll-Rand air compressor has been ordered.

Park City.

Mines Development Co., having a lease on the old workings of American Flag mine, is shipping 60 to 70 tons per month of ore that samples 90 ozs. silver, \$16 gold and 6 to 7 ozs. silver. Park City Mines Co., which owns the American Flag, is beginning development in new ground. After pumping out the water, now at 1100 level, the shaft will be sunk 200 ft. deeper. The American Flag vein, which dips to the east, and the Easter vein, which dips west, are 125 ft. apart at the 1000 level, and it is figured that they come together below the 1200. There are other veins between the Easter and the old Ontario vein, and development work is being carried on in that direction. A crosscut, driven from the 1100 level has cut the Ravenswood vein, which is 20 ft. wide.

Frisco.

Caldo Mining Co., which began last January, operating an oil flotation plant on the 200,000 tons of Horn Silver mill tailings, has been handling 150 tons per day, and is increasing the plant's capacity to 200 tons. It will be operating at this larger capacity in September. The product thus far has amounted to 20 tons per day of concentrates, running 40 to 45% zinc, and contains some silver and lead. Ed Lidvall is superintendent in charge. This dump of tailings has lain there for many years. A tube mill is used for emulsifying and to break up the cemented lumps. The pulp is then passed to six Callow rougher flotation cells, the concentrates therefrom passing to two Callow cleaner cells, and the tailings from the latter are concentrated on tables made by Deister Concentrator Co. The concentrates are then passed

through a Portland filter press to reduce the moisture. A filter press plant is being built to recover the water from the tailings as a means of securing the water for the mill. The tailings, as they come from the dump, are about 60 mesh. The tonnage still there is sufficient to keep the mill in operation 2½ years from this date. The company is controlled by J. M. Callow and associates, Salt Lake.

WASHINGTON.

Spokane.

It is probable that the action of the British government in blacklisting American firms under the "enemy trading" rule will affect the Standard Silver-Lead Mining Co., which owns and operates the Standard mine and mill at Silverton, B. C. Beer, Sondheimer & Co. are among the proscribed concerns, according to the recently published official list, and the Standard markets a considerable portion of its output through this concern. Beer, Sondheimer & Co. are metal brokers and agents for many smelters, including plants in Germany and Belgium. In connection with the operation of the latter plants they have long done a big business with British Columbia producers of metals, and especially zinc. They were for some years represented by J. L. Retallack of Kaslo, through whose agency they secured a considerable tonnage from various mines in the Slocan district. The only important contract they are now known to hold from British Columbia producers is for the purchase of 500 tons monthly of zinc concentrates from the Standard Silver-Lead Co. "We shall take the matter up at once with Beer, Sondheimer & Co. and the Canadian authorities," said Charles Hussey, secretary of the company. "As yet we do not know how the British order affects our contract. Whatever the laws of Canada provide we shall, of course, abide by. In the event that we are prohibited from shipping any more concentrates under our contract we shall be compelled to curtail our operations unless we are successful in opening up some ore bodies containing a good deal more lead and less zinc than those we are now mining. As a matter of fact we have been working our plant beyond its economical capacity to take advantage of the high metal prices, so that a curtailment of production was due soon anyhow, owing to the lower price of spelter of late, and the fact that we had been unable to secure a satisfactory contract for our zinc output in excess of that contracted to Beer, Sondheimer & Co. Presumably the Canadian or British Columbia governments will shortly take some steps to provide adequate reduction works in their own country for zinc ores, as otherwise the mining industry may be seriously affected."

Activity in the Chewelah district has been stimulated remarkably in the last few months by the high metal prices, and there is more development under way in that part of the region than ever before, according to L. K. Armstrong, general manager of the Security Copper Co. "At the United Copper mine all departments are operating at capacity, and the shipments have been increased considerably in the last month," says Armstrong. "Several teams, a 4-wheel-drive Jeffery truck and a tractor with five trailers are employed transporting the product to the shipping bias at Chewelah, 5 miles distant, and the consignments are going forward to the smelter at a rate never equalled before. The company now is installing a 30-ton tube mill, which will be in operation soon, the concrete foundations already having been placed, and it is believed that this will prove a valuable addition to the 74-stamp mill now in service."

WISCONSIN-ILLINOIS.

Linden.

An accumulation of low-grade ores here is aggravating the situation seriously. The prices submitted for the week offered no hope of improvement, and operators seemed willing to clear at any price. Milwaukee-Linden Development Co. shipped 7 cars to Cuba, 280 tons; Stoner, 1 car, 32 tons;

Ross Bros. Co., 1 car, 29 tons; Saxe-Pollard Co., 3 cars, 94 tons; all to Mineral Point. Linden Zinc Co. shipped 2 cars to La Salle, 61% zinc content, 80 tons. Optimo Nos. 1 and 2, to Linden Zinc Co., 7 cars, 293 tons. About 2000 tons of concentrates were carried over.

Highland.

Offerings of carbonate zinc ore showed decided slump in price, and only 3 cars cleared, one coming from the Waters-Fecht Co, 25 tons; 2 cars from the Dry-Hollow mines, 45 tons, all delivered to the Mineral Point Zinc Co.

Montfort.

The O. P. David mine shipped 1 car, 44 tons, of low-grade ore for separator treatment to National Separating Works, Cuba. Several cars of ore remained in bin. Operations were resumed underground, and much new ground is being opened up to good advantage.

Miffin.

Shipments for the week came from the Peacock mine, 2 cars, to American Metals Co., 77 tons; Lucky Six to La Salle, 43 tons; Biddick mine to Benton Roaster Co., 3 cars, 119 tons; Coker mines to Mineral Point, 6 cars, 237 tons. The Senator remains shut down, with about 300 tons of ore in bin, with no bids. The Vinegar Hill Co. is shifting operations from the Rundell to new deposits recently opened on extensions of the range, and is providing a complete new mining outfit. Much new ground is being opened up for both the Lucky Six and B. M. & B.

Mineral Point.

Receipts of raw ore at refining plants of Wisconsin zinc ore totaled 31 cars, 1169 tons. Shipments of finished product to smelter at DePue, 15 cars, 560 tons. Locals delivered 1 car to furnaces at Mineral Point, 38 tons. Mulhairn Mining Co., a new undertaking, is meeting with success in the Hazel Patch section, and is supplying a new mining outfit.

Platteville.

Deliveries of ore from mines to track last week were 121 cars of crude ore, 4832 tons. Very little ore came to the refining plants from independent operating companies. Three cars of lead ore cleared, one each coming from the Kittoe, Penn-Benton and Gray mines. Shipments of pyrites were light, 403,000 lbs. coming from the National Separators. About 6500 tons are held in reserve. Gross recovery crude ore for last week were 3867 tons; net deliveries to smelter, almost entirely high-grade refinery product, 2152 tons.

Local producers made a light turn-in for the week, the Hodge shipping 1 car to Cuba, 43 tons; West Hill, 1 car high-grade to La Salle, 42 tons; Klar-Piquette to Galena Refineries of the Wisconsin Zinc Co., 82 tons; East End to Galena, 2 cars, 85 tons.

Prices on zinc ore were, standard, 60%, and top grades going on a basis of \$57, with second and medium grades as low as 50% on a basis of \$50 per ton. It is more than likely that many low-grade producers will drop out of the producing list, as labor, powder and supplies are so high many contend better profits were being reaped on a much lower market than at present.

Cuba City.

National Separating Co. received 14 cars ore last week, 586 tons. The plant is well stocked. Shipments last week were made to Illinois Zinc Co., 5 cars, 183 tons; Granby Con., 1 cars, 154 tons; Utt-Thorne Co. to Benton Roasters, 3 cars, 125 tons.

Big strikes of ore in a new shaft going down for the Big Eight Mining Co. warrant new equipment and a plant will now be supplied.

Benton.

Vinegar Hill Zinc Co. has installed a Whaley type of electric shovel, in operation at the Martin mine, excavating two 1000-lb. cans of mill feed per minute. The machine cost \$8000, and General Manager Smith announces that more machines will be installed at the leading producers now operated for the Vinegar Hill Co.

Shipments of zinc ore for the week of Aug. 12 were light, only 39 cars reaching track, 3,314,000 lbs. Much ore was carried over. Burr mine, 2 cars, 92 tons, and Bull Moose mine, 5 cars, 231 tons, to Grasselli Chemical Co.; Fox and Penna-Benton mines, 9 cars to Mineral Point, 380 tons;

Fields Mining & Milling Co. to Galena Refinery Co., 7 cars, 260 tons; Vinegar Hill Co. to Cuba, 5 cars, 219 tons; Wisconsin Zinc Co., Skinner Refinery, to Grasselli Chemical Co., 2 cars, 87 tons; to Lanyon Zinc Co., 5 cars, 231 tons; Champion mine, surplus ore to Galena, 3 cars, 127 tons. Shipment of zinc ore was made from the Rowley mine, newly equipped, to Wisconsin Zinc Roasters at Galena, 30 tons.

Gillette Mining Co. is installing pumps and hoists. Acker Mining Co. is raising lead ore, after a shutdown due to repairs on milling plant. Hoffman Mining Co. is operating with new equipment. Frontier Mining Co. has struck a 22-ft. run of jack southeast of the Bull Moose Mine. Dr. Richard Kittoe struck a big jack with drill on his farm at Cuba at 80 ft., and again at 100 ft. The Maud, North Pole and Dickens mines are meeting with signal success in mining for lead ore on the Jas. Calvert farm.

The Galenaite Mining Co. has been organized here. The officers elected are Edw. Longhenry, president, F. H. Brainard, secretary-treasurer. Ivan Coast has been appointed superintendent. The company has secured mining rights to the Buxton lease of 40 acres at Leadmine and adjoining the Drumm mine. Drills have been engaged to prospect the land.

Hazel Green.

Shippers for the week were the Kennedy, with 4 cars to Mineral Point, 164 tons; Cleveland to Galena, 40 tons; Lawrence to Galena, 3 cars, 121 tons.

Robert L. Hammil, general manager for the Monmouth Zinc Mining Co., reports a successful trial run of a new 200-ton power and milling plant, and the shipment of the first 2 cars of zinc ore to the Mineral Point Zinc Co. This mine and plant promoted by business men of Monmouth, Ill., and represents the outcome of nearly 1 year's diligent labor in developing a property. The ore is uniform in the range and runs up close to 10% ore in the mill rock. Drilling insures extensive production for 2 years or more. The equipment includes laboratory, assay office, miners' cottages, administration building, which is one of the finest in this section of the field.

Producers here going in good shape are now the Kennedy, Cleveland, Lawrence and Monmouth mines. The McMillan has not undertaken shipments to date, but is turning out ore successfully and has a wonderful deposit to run on.

Another new producer with equipment is in going shape for the McMillan Zinc Co., which transferred the big double equipment taken from the old Board of Trade mine. A. C. McMillan, general manager, has resigned in order to give his entire time to the management and development of the Rio mine adjoining the McMillan, and where drills have located one of the richest deposits of zinc ore yet discovered in the field. This work continues very successfully, but enough has been accomplished to warrant the erection of a new 150-ton power and concentrating plant.

Shullsburg.

The Winskill mine was the only one in the district to report last week, 6 cars going to roasters at Galena, 232 tons.

Potosi.

The Wilson mine delivered 1 car of high-grade blende last week to La Salle, 35 tons. The range now nearing development has been followed for years without success by various companies and now is opening up under the present management.

Galena.

The Black-Jack mine shipped 3 cars last week to Mineral Point, 125 tons; Galena Refining Co., to Illinois Zinc Co., 30 tons, and to Lanyon Zinc Co., 80 tons; Federal mine to refinery, 42 tons. Little Corporal, newly equipped and developed, shipped 36 tons. Wisconsin Zinc Co. to M. & H. Zinc Co., La Salle, 3 cars premium blende, 120 tons.

WYOMING.

Lander.

On Aug. 2 there were 5 wells considered in the field. The Hall Co. had four and the Valentine Co. one. Hall well

No. 1, the only one that is producing, has been estimated to run around 100 bbls. a day. The Valentine well looks like from 100 to 200 bbls. a day. The other Hall wells are going to be good pumpers. A number of dry holes and holes with only a limited amount of oil in them in the first sand has convinced operators that the lower sand, not yet drilled into, has the oil. A number of drills are now being started for the lower sand and in another 30 days ought to reach it in several places. The first tankage is about completed. Hall Co. twelve 250-bbl. steel tanks about ready for use. Another 2500-bbl. steel tank is being erected.

The Hall Co. is endeavoring to increase its production so as to warrant a tank pipe line installation. The Hudson Co. has commenced to pump another well and now has 9 wells on its list.

CANADA.

BRITISH COLUMBIA.

Slocan.

Development work at the Alice S. silver-lead mine is proving satisfactory. A new tunnel has been driven 250 ft. and will shortly open up a large body of high-grade ore, some of which assays over 2000 ozs. and 45% lead. Operations have been in progress since May 1, 1915. Work on the tunnel now being driven was started when a vein of about 20 ins. was encountered in the bottom of the old workings, which consist of 350 ft. tunneling. One care of ore has been shipped.

Three Forks.

The operating report of President A. F. McClaine of the Rambler-Cariboo shows the gross income to have been \$16,094. The disbursements totaled \$9860. Net earnings for the month were \$6734. In the two preceding months the net earnings approximated \$11,000 each. The cash surplus of the company Aug. 1 was \$16,797, as compared with \$10,064 on July 1. Shipments in July totaled 140 tons of lead concentrates and 30 tons of crude lead ore, as compared with shipments of 160 tons of lead concentrates in May and 160 tons of concentrates and 30 tons of crude ore in June. In May 70 tons of zinc concentrates were produced, as compared with 60 tons in June and 65 tons in July. These concentrates are not of high enough grade to be readily marketed, and it is intended to retreat them, with a large stock of similar concentrates previously accumulated, at the new electric separator being installed as a part of the concentrator being built at Kaslo. Operating expenses average a trifle under \$7000 monthly. The larger deduction than usual from gross earnings in July is due to the payment in that month of taxes and insurance and heavy purchases of supplies, especially mill accessories. The company pays dividends every second month. The next profit disbursement will be made Aug. 15 and will total \$17,500, at the rate of 1 ct. a share.

Sandon.

The pebble mill at the Slocan Star property was started on Aug. 7 and is treating 80 tons per day. About Sept. 15 the flotation plant will be started and the capacity of the mill will then be 160 tons. The new tramway from the mill to the railroad is working smoothly and the company is now shipping as fast as cars are furnished. Between July 28 and Aug. 7 it shipped 8 cars of 40 tons each. Of this amount 240 tons were lead and 80 tons zinc concentrates. The former averaged 70% and 90 ozs. silver and the latter 34% and 18 ozs. silver. Lead concentrates go to Trail and the zinc product to the Kusa Spelter Co., Dewar, Okla. The lead product at present is worth \$120 a ton net, or \$1800 a car. The zinc product will net \$15, or \$600 a car. The daily production of the mill at present is 7 tons of lead and 10 tons of zinc concentrates. With flotation in operation it will average 14 tons of lead and 30 tons of zinc concentrates. There is on hand now 150 tons of accumulated lead and 500 tons of zinc concentrates. Much of the zinc concentrates will require treatment by flotation before shipping. John B. White, director, says: "Now that we are producing again, and especially in view of the fact that our production will be doubled without increasing our operating ex-

penses, we figure that all indebtedness of the company, bonded and floating, will be cleaned up and a surplus accumulated by the end of October. The construction work is making progress, though we are being delayed to some extent by the failure to receive material for the new flume. Until the flume is completed we shall continue to be hampered for lack of air to run sufficient drills in the mine. All the working stopes and faces in the mine are looking well, and the manager reports particularly satisfactory improvement in the No. 3 and No. 8 levels."

ONTARIO.

Cobalt.

The Silver Queen Mine has been reopened and about 2 carloads of mill rock have been taken out and from 10 to 12 carloads remain to be hoisted. This will be shipped to the Northern customs concentrator as soon as arrangements can be made. The mill rock is being taken from the old stopes and as soon as the quantity in sight has been taken out cross-cutting will be resumed in exploring a strip of about 5 acres of ground which has not yet been prospected.

During July at Nipissing favorable results continued in development of vein 490 at the 500 level. About 470 ft. of drifting has been done on the vein and both faces still show ore of good width and value. The vein in the north face during the month, averaged 5 ins. assaying 1200 ozs. Towards the latter part of the month, the 5 ins. assayed 2200 ozs. The vein in the face has now turned considerably to the left and it is practically assured that it will continue on the Nipissing side of the boundary line. As drifting in the north face proceeds, it is becoming evident that vein 490 is the same as one of the branch veins on vein 98. This branch vein is still unstopped, the most important development being a raise which was started at the 4th level and shows 2 to 3 ins. of ore assaying 2500 ozs. to a height of 93 ft. above the level. If the two veins prove to be the same then considerable ore will be available for future stoping. Results from drifting to the south were not as favorable as those obtained in the north drift. The vein continued to aggregate 6 to 8 ins. in width but silver values were erratic, assays varying from 50 to 3200 ozs.

The People's Mining Co. is now down 50 ft. below the old 300 level. Some delay was occasioned on the start on account of water troubles, but a bulkhead was built on the 200, 25 ft. from the shaft. On the old 100 level a dam was built so that the workings now are comparatively dry. The shaft is now down 350 ft. and 200 ft. more will reach the desired contact.

Porcupine.

Development has resulted in new finds at the Newray mine. Thirty-six samples taken clear across the 25-ft. dike, including both vein matter and rock, gave an average of \$4 for the first 22 samples, while the next 14 gave 68 cts. up to \$38 in gold. At one part of the dike, a 26-ft. section, gave an average value of better than \$5, while another strip 16 ft. wide gave in sampling average assays of better than \$11. In all the sampling across the dike there were no blanks in the samples gathered, the lowest assay being 68 cts. Work is being carried on in the shaft with the object of locating the old vein lost in faulting and diamond drilling is under way. One drill hole is down 290 ft. The drill was pointed at a distance of 450 ft. from the shaft and at 42 degrees so as to cut the vein at a depth of 420 ft. Along the new vein shots are being put in at various points, and tests pits sunk.

South Lorrain.

Sinking is to be resumed at the Lorrain Con. The shaft is down 100 ft. and some drifting has been done on the 100 level on an 8-in. vein of calcite, well mineralized with smaltite and nickelite and carrying low silver values. The vein is well defined and strong, and consistent in width. The work now outlined calls for the sinking of the shaft to the contact, a distance estimated at 200 ft. or more below the present level, and from that point to carry on exploratory and development work. In order to carry on the work the compressor plant of the Frontier Mining Co. has been leased. The diabase is very hard. Manager Harkness estimates that he can sink 40 ft. per month. At that rate the contact should be reached by January, 1917.

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Dunlop, J. P.; Butler, B. S.—*Silver, Copper, Lead and Zinc in the Central States in 1915*. [Separate reviews of the area, districts, states and companies].—*Min. Res. of U. S.* 1:5; pp 93.

Lewis, J. H.—*Zinc and Lead Districts of Wisconsin*. [On the mining and smelter operations and production during the first half of 1916].—*Mg. World Aug.* 5 1916; p 243; pp 4*; 10c.

Lyon, Burt W.—*Half-Year in the Joplin Lead-Zinc District, Missouri*. [Reviews prices, production and operations].—*Mg. World Aug.* 5 1916; p 239; pp 3*; 10c.

Sisley, George E.—\$137,849,095 in Dividends by Mines and Works in Half Year. —*Mg. World Aug.* 5 1916; p 223; pp 5¼*; 10c.

— *Six Months of Wonderful Prosperity for United States Mining*. [Reviews the first half of the year's production].—*Mg. World Aug.* 5 1916; p 229; pp 8¼*; 10c.

— *The Peugeot Process of Zinc Electrolysis*. [A complete but concise description of the method is given].—*S. L. Mg. Rev. July* 30 1916; p 17; pp 2¾; 25c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Dewolfe, E. C.—*A Modern Coal Mining Organization in Illinois*. [From Electrical Mining. The equipment, operation and methods of managing at the Madison Coal Corporation's mines are reviewed].—*C. Tr. Bull. Aug.* 1 1916; p 43; pp 8*; 25c.

Geismer, H. S.—*Revolving Dumps at Coal Mines*. [On the use and description of various installations of this type].—*Coal Age Aug.* 5 1916; p 224; pp 1½*; 20c.

Mairet, F. F.—*Fuel Economy at Collieries*. [A paper read before the Midland Inst. of Mg., Civil & Mech. Eng.].—*I. & C. Tr. Rev. July* 21 1916; p 70; pp 2*; *Colly Guard. July* 21 1916; p 114; pp 2½*; 35c.

Warden-Stevens, F. J.—*Coal Shipping and Bunkering in Australia*.—*Colly Guard. July* 21 1916; p 109; pp 2½*; 35c.

Watts, A. C.—*Coal Mining Methods in Utah*. [Treats on the nature of the coals and peculiar geological features of the formation which control the methods of mining].—*Coal Age Aug.* 5 1916; p 214; pp 5¼*; 20c.

Wilson, E. B.—*Slope Haulage in Alabama*. [Describes a slope haulage-way with varying grade over a mile long. It has handled the record coal output of the state].—*Coal Age Aug.* 5 1916; p 220; pp 2*; 20c.

Yuvanalieff, N.—*Gas Liberation in Russian Mines and Its Cause*. [From Gorno-Savodskoie Delio].—*C. Tr. Bull. Aug.* 1 1916; p 53; pp 3; 25c.

— *Cool Exports and Bunker Shipments in 1914 and 1915 in the United Kingdom*. [Parliamentary report showing the amount of coal shipped from each United Kingdom port to each foreign port].—*I. & C. Tr. Rev. July* 21 1916; p 74; pp 2; 35c.

— *Italy's Coal Trade During War Doubles with America*. [Reviews the situation, production, imports and exports].—*C. Tr. Bull. Aug.* 1 1916; p 40; pp 2½; 25c.

— *Koepe Winding at Plennmeller Colliery, England*.—*I. & C. Tr. Rev. July* 21 1916; p 65; pp 3*; 35c.

— *Six Months of Wonderful Prosperity for United States Mining*. [Reviews the first half of the year's production].—*Mg. World Aug.* 5 1916; p 229; pp 8¼*; 10c.

(C) OTHER NON-METALS

Arsenic

Browning, P. E.; Simpson, G. S.; Porter, L. E.—*On the Qualitative Separation and Detection of Tellurium and Arsenic, Iron and Thallium, and Zirconium and Titanium*. [Details of procedure for this chemical method are given].—*American Jnl. of Sci.* Aug. 1916; p 106; pp 3; 60c.

Ichikawa, Shimmatsu.—*Some Notes on Japanese Minerals*. [Treats on the peculiar nature of some mineral crystals found in Japan].—*American Jnl. of Sci.* Aug. 1916; p 111; pp 9*; 60c.

Reid, J. H.—*The Comet Mine, Sundown, Ballandean, Queensland, Australia*. [A geological description of the ore deposits and ore].—*Queen. Govt. Mg. Jnl.* June 15 1916; p 258; pp 2*; 35c.

Turner, W. A.—*The Separation of Vanadium from Phosphoric and Arsenic Acid and from Uranium*. [A description of a chemical method].—*American Jnl. of Sci.* Aug. 1916; p 109; pp 2; 60c.

Mica

Dunstan, B.—*Queensland Mineral Deposits*. [A review of occurrences, production, values and prospects of mica in Queensland, Australia].—*Queen. Govt. Mg. Jnl.* June 15 1916; p 263; pp 2; 35c.

Ichikawa, Shimmatsu.—*Some Notes on Japanese Minerals*. [Treats on the peculiar nature of some mineral crystals found in Japan].—*American Jnl. of Sci.* Aug. 1916; p 111; pp 9*; 60c.

Potash

Hicks, W. B.—*Simple Tests for Potash*.

—M. & S. P. Aug. 5 1916; p 207; pp 1½; 20c.

Phalen, W. C.; Hicks, W. B.—*Potash Salts* in 1915. [Chemical qualitative tests and methods of analysis are also given. The economic geology and occurrence of this mineral are reviewed, with an account of the progress made in developing the resource in this country].—Min. Res. of U. S. 11:12; pp 39.

Salines

Way, Herbert, W. L.—*The Minerals of Sze-Chuan, China*. [Brief descriptions of the deposits, their possibilities and operation. Salts have been mined, petroleum is plentiful and gold, silver and copper give promise].—Mg. Mag. July 1916; p 20; pp 4*; 50c.

Mixter, W. G.—*The Thermochemistry of Silicion and Heat of Combination of Silica with Water*. [Experiments of the author and comparison of them with others' results].—American Jnl. of Sci. Aug. 1916; p 125; pp 7½*; 60c.

Sulphur

Drushel, W. A.; Elston, C. M.—*On the Quantitative Estimation of Small Quantities of Sulphide Sulphur*. [The work is done with the inner tube of a Liebig condenser].—American Jnl. of Sci. Aug. 1916; p 155; pp 4; 60c.

Toso, Pietro.—*Sul Modo di Formazione dei Giacimenti Petroliferi e Solififeri*. [On the method of formation of petroliferous and sulphurous materials].—Ind. Chim. Min. & Met. June 10 1916; p 177; pp 5; June 25; pp 193; pp 3¾*; 70c.

—*Operations of Midwest Sulphur Co., Cody, Wyoming*.—S. L. Mg. Rev. July 30 1916; p 15; pp 2*; 25c.

III. TECHNOLOGY

MINES AND MINING

Prospecting

Brothers, Charles S.—*Mining and Prospecting in National Forests*. [Reviews the laws and rights of the miner and prospector in the National Forest reserves].—Mg. & Oil Bull. July 1916; p 185; pp 3*; 25c.

Herr, Irving.—*Sampling Placer-Gravel Deposits*. [Describes the system by which the holes were placed and method of plotting the same].—E. & M. J. Aug. 5 1916; p 261; pp ¾*; 25c.

Surveying and Drafting

Simmons, Theodore; Hanst, J. F.—*Dip and Strike Calculations*. [Graphical methods for determining].—E. & M. J. Aug. 5 1916; p 270; pp 1*; 25c.

Yaste, G. L.—*Care of Mine Maps*. [Notes the misuse of originals and states that it be eliminated by keeping tracings of them up to date].—Coal Age Aug. 5 1916; p 223; pp 1; 20c.

Pumps and Pumping

Gochnauer, H. W.—*Pumping Costs with Diesel Engines*.—Engg. Rec. April 1 1916; 20c.

Eddy, Lewis H.—*The Argonaut Mine, California*. [On the installation of a dam for storing tailings, power pumps and experimental work with flotation].—E. & M. J. Aug. 5 1916; p 265; pp 2¾*; 25c.

Gabelein, Paul W.—*Air Lifts at a Cyanide Plant*. [From the E. & M. J. describing this type of installation at the Baker Mines Co., Oregon].—Comp. Air Aug. 1916; p 8075; pp 1¼*; 20c.

Dredging

Smith, Howard D.—*Gold Saving on Dredges*. [Results are tabulated and drawings of jigs, etc., used in saving the gold from the dredged gravel are shown].—M. & S. P. Aug. 5 1916; p 202; pp 2¼*; 20c.

—*Gold Dredge at Hamonton, California*. [Reported as the largest ladder dredging bucket constructed].—Engg. Rec. June 24 1916; p 20c.

Mine Sampling

Herr, Irving.—*Sampling Placer-Gravel Deposits*. [Describes the system by which the holes were placed and method of plotting the same].—E. & M. J. Aug. 5 1916; p 261; pp ¾*; 25c.

Haulage and Conveying

Dewolfe, E. C.—*A Modern Coal Mining Organization in Illinois*. [From Electrical Mining. The equipment, operation and methods of managing at the Madison Coal Corporation's mines are reviewed].—C. Tr. Bull. Aug. 1 1916; p 43; pp 8*; 25c.

Geismer, H. S.—*Revolving Dumps at Coal Mines*. [On the use and description of various installations of this type].—Coal Age Aug. 5 1916; p 224; pp 1½*; 20c.

Trautschold, Reginald.—*The Economics of Material Handling in Manufacturing Plants*. [Costs, details and curves of use in designing are given of standard practice in belt-conveying].—Engg. Mag. Aug. 1916; p 734; pp 13*; 35c.

Wilson, E. B.—*Slope Haulage in Alabama*. [Describes a slope haulage-way with varying grade over a mile long. It has handled the record coal output of the state].—Coal Age Aug. 5 1916; p 220; pp 2*; 20c.

—*Snake Creek Tunnel, Utah*. [A concrete tunnel. The construction and methods used in driving it are described].—M. & S. P. Aug. 5 1916; p 205; pp 2*; 20c.

Labor and Management

Balcomb, J. C.—*A Remarkable Tunnel Rapidly Driven in Brazil*. [Gives details of operation with drawings. A bonus system and unusual method of blasting are described].—Comp. Air July 1916; p 8040; pp 5*; 20c.

Dewolfe, E. C.—*A Modern Coal Mining Organization in Illinois*. [From Electrical Mining. The equipment, operation and methods of managing at the Madison Coal Corporation's mines are reviewed].—C. Tr. Bull. Aug. 1 1916; p 43; pp 8*; 25c.

Kellor, F. A.—*Making Americans of Foreign-Born Workmen*.—Mg. & Oil Bull. July 1916; p 181; pp 1¼*; 25c.

Production

Dunlop, J. P.; Butler, B. S.—*Silver, Copper, Lead and Zinc in the Central States in 1915*. [Separate reviews of the area, districts, states and companies].—Min. Res. of U. S. 1:5; pp 93.

Hess, Frank L.—*Six Months' Tungsten Production*. [From a U. S. G. S. report].—Mg. World Aug. 5 1916; p 247; pp 2*; 10c.

Lewis, J. H.—*Zinc and Lead Districts of Wisconsin*. [On the mining and smelter operations and production during the first half of 1916].—Mg. World Aug. 5 1916; p 243; pp 4*; 10c.

Lyon, Burt W.—*Half-Year in the Joplin Lead-Zinc District, Missouri*. [Reviews prices, production and operations].—Mg. World Aug. 5 1916; p 239; pp 3*; 10c.

—*British Fertilizer Notes*.—American Fertilizer Aug. 5 1916; p 36; pp 3; 25c.

—*Coal Exports and Bunker Shipments in 1914 and 1915 in the United Kingdom*. [Parliamentary report showing the amount of coal shipped from each United Kingdom port to each foreign port].—I. & C. Tr. Rev. July 21 1916; p 74; pp 2; 35c.

—*Italy's Coal Trade During War Doubles with America*. [Reviews the situation, production, imports and exports].—C. Tr. Bull. Aug. 1 1916; p 40; pp 2½; 25c.

—*Six Months of Wonderful Prosperity for United States Mining*. [Reviews the first half of the year's production].—Mg. World Aug. 5 1916; p 229; pp 8¼*; 10c.

MILL AND MILLING

Sampling

Rose, Hugh.—*Santa Gertrudis Mill, Pachuca, Mexico*. [Abst. from A. I. M. E. Bull. All-sliming process is used and details of construction, operation and equipment are given].—E. & M. J. Aug. 5 1916; p 247; pp 6*; 25c.

Woodbridge, T. R.—*Ore Sampling Conditions in the West*. [Excerpt from an advance proof of the Bureau of Mines Tech. Paper 86].—Mg. World July 29 1916; p 183; pp 3*; 10c.

Crushing, Grinding, Etc.

Eddy, Lewis H.—*The Argonaut Mine, California*. [On the installation of a dam for storing tailings, power pumps and experimental work with flotation].—E. & M. J. Aug. 5 1916; p 265; pp 2¾*; 25c.

Rose, Hugh.—*Santa Gertrudis Mill, Pachuca, Mexico*. [Abst. from A. I. M. E. Bull. All-sliming process is used and details of construction, operation and equipment are given].—E. & M. J. Aug. 5 1916; p 247; pp 6*; 25c.

Scott, W. A.—*Commonwealth Mine and Mill, Pearce, Arizona*. [Gives details on operations and description of methods used].—Mg. World July 29 1916; p 187; pp 1½*; 10c.

Flotation

Eddy, Lewis H.—*The Argonaut Mine, California*. [On the installation of a dam for storing tailings, power pumps and experimental work with flotation].—E. & M. J. Aug. 5 1916; p 265; pp 2¾*; 25c.

Hughes, Ben.—*Concentrating Cobalt Silver Ores by the Oil Flotation Process*. [Brief description of plants using the system in the Cobalt district, Ontario].—Canadian Mg. Jnl. Aug. 1 1916; p 365; pp ¾; 35c.

Hyde, James M.—*An Improved Pneumatic Flotation Machine*. [Description of the machine, its application and operation].—M. & S. P. Aug. 5 1916; p 199; pp 3*; 20c.

Rose, Hugh.—*Metallurgical Experiments at Santa Gertrudis Mill, Pachuca, Mexico*. [Abst. from A. I. M. E. Bull. Flotation and electrolytic regeneration of cyanide are discussed].—E. & M. J. Aug. 5 1916; p 263; pp 2*; 25c.

Cyaniding

Carpenter, Jay A.—*Ore Treatment at the West End, Tonopah, Nevada*. [Gives some costs and discusses in detail the results of operations rather than the methods].—M. & S. P. Aug. 5 1916; p 197; pp 1½; 20c.

Gabelein, Paul W.—*Air Lifts at a Cyanide Plant*. [From the E. & M. J. de-

scribing this type of installation at the Baker Mines Co., Oregon.—Comp. Air Aug. 1916; p 8075; pp 1¼*; 20c.

Rose, Hugh.—*Metallurgical Experiments at Santa Gertrudis Mills, Pachuca, Mexico*. [Abst. from A. I. M. E. Bull. Flotation and electrolytic regeneration of cyanide are discussed].—E. & M. J. Aug. 5 1916; p 263; pp 2*; 25c.

Rose, Hugh.—*Santa Gertrudis Mill, Pachuca, Mexico*. [Abst. from A. I. M. E. Bull. All-sliming process is used and details of construction, operation and equipment are given].—E. & M. J. Aug. 5 1916; p 247; pp 6*; 25c.

CHEMISTRY AND ASSAYING

Chemistry

Browning, P. R.; Simpson, G. S.; Porter, L. E.—*On the Qualitative Separation and Detection of Tellurium and Arsenic, Iron and Thallium, and Zirconium and Titanium*. [Details of procedure for this chemical method are given].—American Jnl. of Sci. Aug. 1916; p 106; pp 3; 60c.

Drushel, W. A.; Elston, C. M.—*On the Quantitative Estimation of Small Quantities of Sulphide Sulphur*. [The work is done with the inner tube of a Liebig condenser].—American Jnl. of Sci. Aug. 1916; p 155; pp 4; 60c.

Hicks, W. B.—*Simple Tests for Potash*.—M. & S. P. Aug. 5 1916; p 207; pp 1½; 20c.

Mixter, W. G.—*The Thermochemistry of Silicon and Heat of Combination of Silica with Water*. [Experiments of the author and comparison of them with others' results].—American Jnl. of Sci. Aug. 1916; p 125; pp 7½*; 60c.

Pogue, Joseph E.—*The Chemistry of Minerals*. [Discusses the impurities of minerals and their effects on the mineral].—E. & M. J. Aug. 5 1916; p 434; 25c.

Sidener, C. F.; Pettijohn, Earl.—*Notes on the Determination of Aluminum*. [A discussion on the determination of aluminum as an oxide being precipitated with ammonium hydroxide].—Jnl. Ind. & Engg. Chem. Aug. 1916; p 714; pp 2; 60c.

Thornton, W. M., Jr.—*The Separation of Thorium from Iron with the Aid of the Ammonium Salt of Nitrosophenylhydroxylamine*.—American Jnl. of Sci. Aug. 1916; p 151; pp 4*; 60c.

Turner, W. A.—*The Separation of Vanadium from Phosphoric and Arsenic Acid and from Uranium*. [A description of a chemical method].—American Jnl. of Sci. Aug. 1916; p 109; pp 2; 60c.

Analysis

Browning, P. E.; Simpson, G. S.; Porter, L. E.—*On the Qualitative Separation and Detection of Tellurium and Arsenic, Iron and Thallium, and Zirconium and Titanium*. [Details of procedure for this chemical method are given].—American Jnl. of Sci. Aug. 1916; p 106; pp 3; 60c.

Drushel, W. A.; Elston, C. M.—*On the Quantitative Estimation of Small Quantities of Sulphide Sulphur*. [The work is done with the inner tube of a Liebig condenser].—American Jnl. of Sci. Aug. 1916; p 155; pp 4; 60c.

Kelley, G. L.; Conant, J. B.—*The Determination of Chromium and Vanadium in Steel by Electrometric Titration*.—Jnl. Ind. & Engg. Chem. Aug. 1916; p 719; pp 4¼; 60c.

Sidener, C. F.; Pettijohn, Earl.—*Notes on the Determination of Aluminum*. [A discussion on the determination of aluminum as an oxide being precipitated with ammonium hydroxide].—Jnl. Ind. & Engg. Chem. Aug. 1916; p 714; pp 2; 60c.

METALLURGY

Electrometallurgy

Rose, Hugh.—*Metallurgical Experiments at Santa Gertrudis Mill, Pachuca, Mexico*. [Abst. from A. I. M. E. Bull. Flotation and electrolytic regeneration of cyanide are discussed].—E. & M. J. Aug. 5 1916; p 263; pp 2*; 25c.

—*The Peugeot Process of Zinc Electrolysis*. [A complete but concise description of the method is given].—S. L. Mg. Rev. July 30 1916; p 17; pp 2¼; 25c.

Thermic Metallurgy

Harbord, F. W.; Hall, J. W.—*The Metallurgy of Steel*. [A complete treatise on the subject].—Charles Griffin & Co., Strand, E. C.; book; \$10.

Mixter, W. G.—*The Thermochemistry of Silicon and Heat of Combination of Silica with Water*. [Experiments of the author and comparison of them with others' results].—American Jnl. of Sci. Aug. 1916; p 125; pp 7½*; 60c.

Stansbie, J. H.—*Elementary Practical Metallurgy for Technical Students and Others*. [The book is meant for use in connection with laboratory study. Mechanical testing of non-ferrous metals and alloys is treated on].—P. Blakiston's Sons & Co., Philadelphia; book; pp 151*; \$1.40.

Hydro-Metallurgy

Stannard, O. J.—*Chemical Methods of Extraction*. [Deals with the chemistry and brief description of thermic, electro and hydro metallurgical processes. A discussion of costs is also given].—Mg. Mag. July 1916; p 15; pp 5; 50c.

—*The Peugeot Process of Zinc Electrolysis*. [A complete but concise description of the method is given].—S. L. Mg. Rev. July 30 1916; p 17; pp 2¼; 25c.

POWER AND MACHINERY

Electricity

Dewolfe, E. C.—*A Modern Coal Mining Organization in Illinois*. [From Electrical Mining. The equipment, operation and methods of managing at the Madison Coal Corporation's mines are reviewed].—C. Tr. Bull. Aug. 1 1916; p 43; pp 8*; 25c.

Luscomb, H. T.—*How to Select Prime Movers for Industrial Electrical Generating Plants*. [A discussion and detailed data on generating electricity from steam plants].—Engg. Mag. Aug. 1916; p 705; pp 11¼*; 35c.

Taylor, W. G.—*Motor Equipment for Petroleum Recovery*. [A paper read before the American Inst. of Elect. Eng. Deals with the use of induction motors in drilling, pumping, and cleaning oil wells].—Elect. Rev. & West. Elect. Aug. 5 1916; p 232; pp 5½*; 20c.

Compressed Air

Gabelein, Paul W.—*Air Lifts at a Cyanide Plant*. [From the E. & M. J. describing this type of installation at the Baker Mines Co., Oregon].—Comp. Air Aug. 1916; p 8075; pp 1¼*; 20c.

—*Snake Creek Tunnel, Utah*. [A concrete tunnel. The construction and methods used in driving it are described].—M. & S. P. Aug. 5 1916; p 205; pp 2*; 20c.

Steam and Steam Engines

Dewolfe, E. C.—*A Modern Coal Mining Organization in Illinois*. [From Electrical Mining. The equipment, operation and methods of managing at the Madison Coal Corporation's mines are reviewed].—C. Tr. Bull. Aug. 1 1916; p 43; pp 8*; 25c.

Hubbard, Charles L.—*Making the Steam Plant Adequate for Both Power and Heating*. [Details on the operation of such a combination].—Engg. Mag. Aug. 1916; p 716; pp 7; 35c.

Luscomb, H. T.—*How to Select Prime Movers for Industrial Electrical Generating Plants*. [A discussion and detailed data on generating electricity from steam plants].—Engg. Mag. Aug. 1916; p 705; pp 11½*; 35c.

IV. MISCELLANEOUS

Miscellaneous Costs

Gochbauer, H. W.—*Pumping Costs with Diesel Engines*.—Engg. Rec. April 1 1916; 20c.

Luscomb, H. T.—*How to Select Prime Movers for Industrial Electrical Generating Plants*. [A discussion and detailed data on generating electricity from steam plants].—Engg. Mag. Aug. 1916; p 705; pp 11½*; 35c.

Trauttschold, Reginald.—*The Economics of Material Handling in Manufacturing Plants*. [Costs, details and curves of use in designing are given of standard practice in belt-conveying].—Engg. Mag. Aug. 1916; p 734; pp 13*; 35c.

—*Analysis of Merrill Report on Water-Power*. [Comment on this government report is made saying that the information and conclusions are at error].—Elect. World July 1 1916; pp 20; 40c.

Testing

Hicks, W. B.—*Simple Tests for Potash*.—M. & S. P. Aug. 5 1916; p 207; pp 1½; 20c.

Hubbard, Prevost; Jackson, F. H., Jr.—*The Results of Physical Tests of Road-Building Rock*. [Gives nature and results of tests with location of place from which sample was obtained].—U. S. Dept. of Agric. Bull. 370; pp 100*.

Rose, Hugh.—*Metallurgical Experiments at Santa Gertrudis Mill, Pachuca, Mexico*. [Abst. from A. I. M. E. Bull. Flotation and electrolytic regeneration of cyanide are discussed].—E. & M. J. Aug. 5 1916; p 263; pp 2*; 25c.

Stansbie, J. H.—*Elementary Practical Metallurgy for Technical Students and Others*. [The book is meant for use in connection with laboratory study. Mechanical testing of non-ferrous metals and alloys is treated on].—P. Blakiston's Sons & Co., Philadelphia; book; pp 151*; \$1.40.

Societies

—*Midland Institute of Mining, Mechanical and Civil Engineers*.—Coll'y Guard. July 21 1916; p 117; pp 1; 35c.

—*South Staffordshire and Warwickshire Institute of Mining Engineers*.—Coll'y Guard. July 21 1916; p 111; pp 1; 35c.

—*The South African Institution of Engineers*. [The outgoing president, W. Ingham's, valedictory address].—S. Afr. Mg. Jnl. June 24 1916; p 291; pp 2; 35c.

Financial

Lyons, Burt W.—*Half-Year in the Joplin Lead-Zinc District, Missouri*. [Reviews prices, production and operations].—Mg. World Aug. 5 1916; p 239; pp 3*; 10c.

Sisley, George E.—*\$137,849,595 in Dividends by Mines and Works in Half Year*.—Mg. World Aug. 5 1916; p 223; pp 5¼*; 10c.

Ore and Metal Markets; Prices-Current

New York, Aug. 16, 1916.

Silver.—Quotations for silver per standard ounce at London and per fine ounce at New York for the week ended Aug. 16 were as follows:

	New York. Cents.	London. Pence.
Aug. 10.....	66½	31½
11.....	66½	31½
12.....	66½	31 11/16
14.....	66½	31½
15.....	66½	31½
16.....	66½	31½

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London Standard Oz.		
	1916 High.	1916 Low.	1915 Avg.	1916 Avg.	1915 Avg.	1915 Avg.
January	57½	55½	56.775	48.890	26.875	22.744
February	57	56½	56.755	48.477	27.000	22.759
March	60½	56½	57.935	49.926	27.080	23.650
April	73½	60½	64.415	50.034	31.375	23.269
May	77½	68½	74.27	49.915	34.182	23.560
June	68½	62½	65.02	49.072	31.038	21.577
July	65	60	62.94	47.519	29.870	22.950
August .....	.....	.....	.....	47.178	.....	22.750
September .....	.....	.....	.....	48.68	.....	23.600
October .....	.....	.....	.....	49.285	.....	23.923
November .....	.....	.....	.....	51.713	.....	24.640
December .....	.....	.....	.....	55.038	.....	26.232
Year .....	.....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Once more foreign buying of copper has furnished the initial impulse to the market, which is now steadily gaining in momentum. Already there is talk of the buying movement now underway exceeding in volume and, naturally, profits that of last April. First of all comes the impending purchase of the Entente Allies that will cover their requirements over 1917. This purchase is estimated to involve 150,000 tons of copper and may possibly run to 200,000 tons. The business will be apportioned among the leading producers. Second in importance are the orders for the red metal recently placed. The Russian government ordered 5000 tons for delivery in the last quarter and is seeking 5000 tons additional. An order for 1400 tons for Italian delivery has been closed, while it is understood that a French purchase also for the last quarter involves 5000 tons. Thus in the space of a week actual foreign sales amount to over 12,000 tons.

The combined Allied purchase is of greatest interest. One price has already been offered and rejected and the producers are now discussing new terms. The sale is expected to be announced within a week and will co-ordinate with the new English loan now under negotiation. Right on the heels of the foreign business, closed and pending, has come a revival in the domestic demand. Consumers on every hand are sending in their orders for last quarter delivery, and to some extent over the first quarter of next year. The situation strikingly bears out the confidence of copper producers that another period of activity would come in the fall. Of course the continuation of hostilities made this possible, but copper producers figured also on a tremendous peace in the event of the termination of hostilities this year.

As a result of the influx of business and the prospects for the loading up of order books over the greater part of next year prices have begun to move to higher levels. It is noteworthy that large producers are not discussing higher prices. The figures now being obtained are satisfactory, and to a large extent price increases in the present movement will be largely due to the workings of the law of supply and demand rather than control of the metal by producers. Electrolytic for delivery before October is scarce. Resellers withdrew their copper when it became evident that a new buying movement had set in. Spot and September electrolytic is difficult to obtain at 27½ cts. A week ago over 10,000,000

lbs. electrolytic were in brokers' hands for resale. Today these brokers are bare of spot copper. Producers have taken business for the last quarter at 26¾ cts. for October and 26¼ to 26½ cts. for November and December. Some orders for the first quarter were closed at 25½ cts., but at this writing sellers are demanding 26 cts. Study of the situation indicates that 30 cts. for last quarter copper may be paid. Domestic users neglected to cover needs on hopes of a re-action, and with a heavy foreign absorption of nearby metal on new orders the competition that home users must face can only result in advances in prices.

An interesting development is that new refining capacity is not coming into operation as fast as producers had figured. Thus one of the largest interests states that monthly output is nearer to 165,000,000 lbs. than to 180,000,000 lbs., whereas the reported output of 200,000,000 lbs. a month is considered inflated. A good deal of the new refining capacity will not be available until late in the first quarter, and therefore the outlook for enlarged supplies of copper is lessened.

At London the market has been very strong in standard, while latterly electrolytic has begun to show animation. Last week standard went up £5 10s in spot and £6 10s in futures, while at the opening of the current week spot advanced £4 10s further and futures £3 10s. Electrolytic opened this week £1 higher at £125 and on Tuesday advanced £1 additional.

Quotations for copper per pound at New York for the week ended Aug. 16 were as follows:

(For Fourth Quarter Delivery.)

	Lake.	Electrolytic.	Castling.
Aug. 10.....	25¼ @ 26¼	25¼ @ 26¼	25 @ 25½
11.....	26 @ 26½	26 @ 26½	25 @ 25½
12.....	26 @ 26½	26 @ 26½	25 @ 25½
14.....	26¼ @ 26¾	26¼ @ 26¾	25 @ 25½
15.....	26¼ @ 26¾	26¼ @ 26¾	25 @ 25½
16.....	26¼ @ 26¾	26¼ @ 26¾	25 @ 25½

Quotations for copper per ton at London for the week ended Aug. 16 were as follows:

Aug.	Standard			Electrolytic.
	Spot.	Futures.	Futures.	
10.....	£110 10 0	£108 10 0	£124 0 0	£124 0 0
11.....	111 10 0	109 10 0	124 0 0	124 0 0
12.....	111 10 0	109 10 0	124 0 0	124 0 0
14.....	116 0 0	113 0 0	125 0 0	125 0 0
15.....	114 0 0	111 0 0	126 0 0	126 0 0
16.....	115 0 0	112 0 0	126 0 0	126 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916			1915. Average.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.891
February	28.60	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.82
July	27.20	26.10	26.745	19.423
August .....	.....	.....	.....	17.472
September .....	.....	.....	.....	17.758
October .....	.....	.....	.....	17.926
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915. Average.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.90	27.90	19.173
July	27.20	26.10	26.745	19.08
August .....	.....	.....	.....	17.222
September .....	.....	.....	.....	17.705
October .....	.....	.....	.....	17.859
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	1916— High.	Low.	Avg.	1916. Avg.	1915. Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.76	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.33	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August .....	.....	.....	.....	.....	67.350
September .....	.....	.....	.....	.....	68.560
October .....	.....	.....	.....	.....	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—Efforts of users to take advantage of the low prices on tin to cover requirements over the last 3 months of the year failed of success, owing to the bull control of the London and Singapore market, combined with the insistence of spot holders to wait for higher prices on their holdings, on which they paid prices higher than those now prevailing. A fair amount of business has been done since our last report, but each succeeding day also brought higher prices. Users in their endeavors to conduct buying operations without stimulating the market found sellers wary and the influx of business quickly brought higher quotations. The situation is one where consumers have postponed covering operations just a little too long. London sellers have accumulated supplies, this being evidenced by the end of the bear campaign abroad, and are now ready for American orders. That they expect higher prices is indicated by the limits received here, which were often ½ to ¾ ct. above the market.

Consumers, however, took up the bulk of the foreign offerings. Spot straits is now held at 39½ cts., against 38c a week ago, while spot Banka, which sold down to 36½ cts., is now firm at 37 cts. A few sales of off-grade Chinese tin were made at 35½ cts., but now the market is firmer and higher. Tin for delivery in the last quarter is inclined to be scarce. Shipments from the straits in June and July were not very large, and on this basis London operators are forcing prices higher. Straits for October delivery is held at 38¾ to 39 cts., with November and December quoted at 38¾ to 38½ cts.

Foreign markets displayed a slight upward trend last week and opened this week with a sharp advance which carried tin at Singapore up £4 to £176. London straits tin went up £2 10s to £174. Standard tin has also moved to higher levels.

Quotations for tin per pound at New York and per ton at London and Singapore during the week ended Aug. 16 were as follows:

Aug.	New York		London.	Singapore,
	Spot.	Sept.	Straits, spot.	shlpments.
10.....	38¼c	38c	£170 0 0	£171 0 0
11.....	38¼c	38¼c	171 10 0	172 0 0
12.....	38¼c	38¼c	171 10 0	172 0 0
14.....	39¼c	38¼c	174 0 0	176 0 0
15.....	39¼c	38¼c	172 15 0	177 15 0
16.....	39¼c	38¼c	171 15 0	133 15 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	62.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August .....	.....	.....	.....	34.386
September .....	.....	.....	.....	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.756
Year .....	.....	.....	.....	38.664

Lead.—After having remained dormant for several months, the lead market has suddenly come back to life with a heavy demand for spot and futures. For the first time in a year or more independents are asking and securing more than the price quoted by the principal producer. This presages an early advance by the A. S. & R. Co., although a week ago the outlook was for a reduction. Late last week new business came into the market, and thus far orders for about

2500 tons have been placed. Some of this lead is for export, but the bulk is being taken by domestic users. The placing of new shell contracts accounts for the renewed demand for lead. While the A. S. & R. Co. is quoting 6.00 cts. New York on open price contracts, independents have declined to take orders under 5.85 cts. St. Louis, which, plus a freight rate of 17½ cts., brings the price up to 6.025 cts. New York. Sales of 350 tons were made at Chicago at 5.90 cts. delivered, while before the buying movement gained full headway business was done at 5.80 cts. St. Louis and 5.95 cts. New York.

It is understood that the export business is for a European and not Asiatic consumer. Whether the newly found strength in lead will last is problematical. Producers are hoping for the best and, from the urgent desire of some consumers to cover for the last quarter, it appears that the market is entering a period of sustained activity. Producers did not accept many of the offers to buy futures, while dealers who formerly were willing to sell short have since withdrawn their offers. At London the lead market has displayed a steady upward trend. Last week spot advanced 10s and futures 7s 6d, opening the current week 5s higher in spot and 2s 6d in futures.

Quotations for lead per pound at New York and per ton at London for the week ended Aug. 16 were as follows:

Aug.	New York		London	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
10.....	5.95c	6.00c	£29 2 6	£28 10 0
11.....	5.95c	6.00c	29 5 0	28 12 6
12.....	5.95c	6.00c	29 5 0	28 12 6
14.....	6.02½c	6.00c	29 10 0	28 15 0
15.....	6.10c	6.05c	30 0 0	29 15 0
16.....	6.10c	6.95c	30 0 0	28 17 6

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	1916— High.	Low.	Avg.	1916. Avg.	1915. Avg.
January	6.20	5.50	5.926	6.730	31.92
February ...	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August .....	.....	.....	.....	4.750	.....
September ..	.....	.....	.....	4.627	.....
October .....	.....	.....	.....	4.612	.....
November ..	.....	.....	.....	5.152	.....
December ...	.....	.....	.....	5.346	.....
Year .....	.....	.....	.....	4.675	.....

Lead Ore.—In the Missouri-Kansas-Oklahoma district the prices remained at \$65 and \$67, as during the previous week, though during the week ended Aug. 12 the ores were in better demand and little weakness was noted. There were produced in the district during the week 1,245,630 lbs. of concentrates, bringing the total production for the year to date at 65,616,172 lbs., and these amounts were valued at \$40,429 and \$2,832,628.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.16	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9375	59.00
August .....	.....	.....	.....	47.50
September .....	.....	.....	.....	48.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—Prices in the Missouri-Kansas-Oklahoma district were again down \$5 and \$65 was paid for the better grades, the price ranging down to \$45 for those not so much in demand. Production during the week ended Aug. 12 was placed at 6,435,810 lbs. and the total for the year was brought up to 416,715,164 lbs. The value of the week's production was \$179,188 and the year's \$19,042,611.

Calamine.—Though prices during the week for this ore were identical with those of the previous week at \$35 and \$45, the condition of the market was noted as being weaker. The week's production was 51,200 lbs., valued at \$1000, and the

year's production to date was 19,454,720 lbs., valued at \$713,665.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August .....	.....	.....	.....	60.25
September .....	.....	.....	.....	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—A heavy foreign demand for spelter has developed since our last report. Business to an aggregate of 7000 tons has been closed. Producers took these orders gladly. The market is now free from surplus holdings. Conditions are shaping for a general advance. Domestic consumers have heeded the influx of business and are sounding the market, but producers are not willing to sell beyond September. With metal prices rising, ore costs will also go up. Thus producers are cautious. Spot has advanced moderately, now being held at 8½ cts. New York and 8½ cts. St. Louis. The improvement in copper is taken as a sign of betterment in spelter and therefore smelters are disposed to wait for higher prices. At London the market has advanced, spot last week gaining £5 and futures £3. Orders from the other side have been large, and with home consumers evincing renewed interest sellers are once more optimistic.

Quotations for spelter per pound at New York and per ton at London for the week ended Aug. 16 were as follows:

	New York.	London.	
	Spot.	Spot.	Futures.
Aug. 10.....	8.375c	£47 0 0	£40 0 0
11.....	8.50c	49 0 0	43 0 0
12.....	8.50c	49 0 0	43 0 0
14.....	8.75c	49 0 0	43 0 0
15.....	8.875c	49 0 0	44 0 0
16.....	8.875c	49 10 0	44 10 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	High.	Low.	Avg.	1915.	1916.
January	19.42½	17.30	18.801	6.519	89.840
February	21.17½	18.67½	20.034	8.866	97.840
March	20.50	16.60	18.40	10.125	100.720
April	19.37½	17.75	18.76	11.43	98.103
May	17.60	13.75	15.98	15.825	89.507
June	13.62½	11.25	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August .....	.....	.....	.....	16.110	.....
September .....	.....	.....	.....	14.493	.....
October .....	.....	.....	.....	14.196	.....
November .....	.....	.....	.....	16.875	.....
December .....	.....	.....	.....	16.675	.....
Year .....	.....	.....	.....	13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Business has been limited and sellers have lowered prices to the extent of \$1.00 a flask. Powder makers are apparently well supplied and current orders are coming in from regular consumers only. Thus with increased stocks the market is inclined to be easy, with sellers offering at \$74 per flask.

Antimony.—Weakness continues apparent in this metal, with Asiatic interests offering at concessions. Spot has been sold as low as 9.50 cts., but the general asking price of handlers is 10¼ cts., while for November and December arrivals 9 cts., duty paid, is quoted. Demand has been very small and selling interests here have accumulated considerable supplies, which were shipped on prospects of being sold en route.

Aluminum.—New business has been limited, with the market holding fairly steady at 57 to 59 cts. per lb. for No. 1 virgin ingots in ton lots. Automobile makers have not been

in the market to any great extent. In fact, some of the makers of cheap cars have eliminated the use of aluminum on the 1917 models. Other consumers are well covered for their immediate needs and are not disposed to take on additional supplies at current prices.

Nickel.—There has been no change in the situation. Demand is of fair proportions, with prices repeated, namely, 45 to 50 cts. for ordinary forms and 5 cts. additional for electrolytic.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	2.00	to	3.00
Muriatic, 20 deg.....	1.67½	to	3.25
Nitric, 36 deg.....	.07½	to	.08½
Nitric, 40 deg.....	.09	to	.09½
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured 183 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.71
Alum—Powdered, lb.....	.05½	to	.07
Lump, lb.....	.05½	to	.06½
Ground, lbs.....	.041	to	.07½
Ammonia—			
Muriate, white grain, lb.....	.08½	to	.08½
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06½	to	.06½
Red, lb.....	.55	to	.60
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.14	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.00	to	5.65
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	2.50	to	2.75
Foundry.....	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese—Spot.....	175.00	to	.....
Last half.....	175.00	to	.....
Ferrosilicon, 50%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....			2.60
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.65
White crystals.....	.15½	to	.15½
Broken, cakes.....	.14½	to	.15
Powdered.....	.17	to	.17½
Lead—Granulated, lb.....	.17	to	.17½
Brown sugar.....	.13½	to	.14
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.29½	to	.30
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.31½	to	.32½
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.16	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	80.00	to	84.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.38	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.45	to	.50
Prussiate, yellow.....	.75	to	.90
Prussiate, red.....	2.40	to	2.50
Saltpeter—Crude, lb.....	.12	to	.14
Refined.....	.25½	to	.26
Soda—Ash, 58% (43% basis), bbl.....	1.25	to	1.50
Strontia Nitrate, casks, lb.....	.47	to	.48
Sulphur—			
Crude, ton.....	28.00	to	29.00
Flowers, 100 lbs.....	2.50	to	2.70
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.29½	to	.30
Oxide, lb.....	.44	to	.46
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization.				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization.			
				Paid in 1916	Total to date	Latest						Paid in 1916	Total to date	Latest	
						Date	Am't.							Date	Am't.
Acacia, g.....	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g....	Colo.	490,915	\$1	\$.....	\$98,916	Sept. '01	\$0.01
Adams, s i c.....	Colo.	80,000	10	.....	778,000	Dec. 18, '09	.04	Golden Star, g....	Ariz.	400,000	5	.....	120,000	Mar. 15, '10	.06
Adventure, c.....	Mich.	100,000	25	50,000	50,000	July 20, '16	.50	Gold' d Com. Fra., g.	Nev.	922,000	1	.....	92,111	Oct. 16, '09	.10
Ahneek, c.....	Mich.	200,000	25	1,200,000	5,250,000	July 10, '16	3.00	Goldfield Com.	Nev.	3,553,148	10	.....	28,999,831	Oct. 31, '16	.10
Alaska Goldfields.	Alaska	250,000	5	.....	403,250	Jan. 10, '16	.16	Good Hope, g. s....	Colo.	500	100	.....	941,250	Jan. '03	.25
Alaska Mexican, g.	Alaska	150,000	5	.....	3,507,381	Nov. 28, '15	.10	Good Sp. Anchor, z.s	Nev.	550,000	1	33,000	119,755	June 16, '16	.01
Alaska Minee Sec.	U. S.	200,000	25	250,000	16,780,000	May 29, '16	.50	Grand Central, g....	Utah	600,000	1	.....	1,645,200	Dec. 23, '15	.02%
Alaska Treadwell, g	Alaska	200,000	25	54,060	2,046,270	Feb. 28, '16	.30	Grand Gulch, c. s.	Nev.	239,845	2.50	9,584	11,992	June 1, '18	.03
Alaska United, g....	U. S.	100,000	25	450,000	650,000	July 16, '16	2.00	Granite, g.....	Cal.	100,000	10	17,200	17,200	May 10, '16	.02
Allouez, c.....	Mont.	1,538,829	100	.....	103,444,983	Aug. 30, '15	3.77	Hazel, g.....	Cal.	900,000	1	.....	491,500	Feb. 6, '16	.05
Amalgamated, c.....	U. S.	600,000	100	1,500,000	30,933,333	June 1, '16	1.50	Hecia, s. l.....	Idaho	1,000,000	0.25	890,000	4,555,000	July 3, '16	.15
Am. Sm. & R. com.	U. S.	500,000	100	1,750,000	56,546,386	June 1, '16	1.75	Hercules.....	Idaho	1,000,000	1	1,650,000	12,400,000	July 16, '16	.20
Am. Sm. Sec. A pf.	U. S.	170,000	100	765,000	11,465,000	July 1, '16	1.50	Hidden Treasure, g.	Cal.	30,000	10	.....	457,452	Sept. '00	.10
Am. Sm. Sec. B pf.	U. S.	300,000	100	1,125,000	16,635,000	July 3, '16	1.25	Holy Terror, g....	S. D.	500,000	1	.....	172,000	Jan. '00	.01
Am. Zinc, L. & Sm	Mo.	193,120	25	2,414,000	3,822,822	June 10, '16	12.50	Homestake, g.....	S. D.	251,160	100	1,142,778	36,848,486	July 25, '16	.65
Anaconda, c.....	Mont.	2,331,250	50	6,993,750	171,261,771	May 20, '16	1.50	Hope Dev.....	Cal.	500,000	1	.....	5,000	Dec. 31, '15	.01
Anole Laurie, g....	Utah	25,000	100	.....	498,561	Apr. 22, '05	.60	Horn Silver, l. s. z.	Utah	400,000	1	40,000	5,182,000	June 30, '16	.05
Argonaut, g.....	Cal.	200,000	5	40,000	1,890,000	June 27, '16	.10	Imperial, c.....	Ariz.	600,000	10	.....	300,000	June 24, '02	.20
Arizona, c.....	Ariz.	100,000	25	621,164	30,312,164	Apr. 1, '16	.50	Independence Con., c.	Colo.	2,500,000	1	.....	281,375	Apr. '01	.04
Atlantic, c.....	Mich.	100,000	25	.....	990,000	Feb. 21, '08	.50	Inspiration Con.	Ariz.	920,857	20	3,091,233	3,091,233	July 31, '16	2.00
Bagdad-Chase, g. pl.	Mont.	250,000	1	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, com.	U. S.	1,673,384	25	6,438,498	30,941,338	June 1, '16	2.00
Bald Butte, g. s....	Mich.	100,000	25	.....	1,354,648	Nov. 1, '07	.04	Inter'l Nickel, pf.	U. S.	89,126	10	367,378	5,614,824	May 1, '16	1.60
Baltic, c.....	Mont.	40,000	5	60,000	7,950,000	Dec. 31, '13	2.00	Intern'l Sm. & Ref.	U. S.	100,000	100	.....	4,100,000	May 2, '16	2.00
Barnes-King, g....	Utah	1,000,000	0.10	.....	940,000	Nov. 15, '02	.70	Interstate-Calahan	Idaho	464,990	10	1,394,970	3,932,415	June 30, '16	1.50
Beck Tunnel Con.	Utah	400,000	1	60,000	960,493	Dec. 20, '16	.20	Iowa, g. s. l.....	Colo.	1,686,667	1	.....	270,167	June 31, '15	.00%
Big Four Expl.	Utah	400,000	1	60,000	70,000	July 15, '16	.06	Iowa Tiger, g. s. l.	Colo.	3,000	1	.....	25,179	Jan. 15, '16	.50
Bingham-N. Haven	Utah	228,689	6	.....	960,493	Dec. 20, '16	.20	Iron Blossom, l. s. g.	Utah	1,000,000	1	260,000	2,750,000	July 20, '16	.10
Boon of Trade, z....	Wis.	120,000	1	.....	78,000	Jan. 15, '11	.06	Iron Cap pf. c....	Ariz.	33,481	10	6,422	29,803	July 1, '16	.36
Bonanza Dev	Colo.	300,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Clad, g.....	Colo.	1,000,000	1	.....	50,000	Nov. '06	.06
Booth (Reorganized)	Nev.	349,949	6	349,949	349,949	June 26, '16	.05	Iron Silver.....	Colo.	500,000	20	.....	5,000,000	Dec. 31, '15	.01
Boss, g.....	Nev.	405,000	1	.....	40,850	Oct. 1, '14	.10	Isabella, g. s. c....	Colo.	2,250,000	1	.....	742,500	Mar. '01	.01
Boston & Colo. Sm.	Colo.	100,000	25	.....	63,225,000	May 15, '11	4.00	Isle Royale, c.....	Mich.	150,000	25	150,000	300,000	July 31, '16	1.00
Bost. & Mont. Con.	Colo.	200,000	25	.....	220,000	Dec. 15, '13	.10	Jamison, g.....	Colo.	2,500,000	10	.....	373,000	Jan. '11	.02
Breece, l. s. c....	Cal.	300,000	1	.....	203,315	Sept. 16, '15	.06	Jerry Johnson, g....	Nev.	1,718,020	1	171,802	187,600	Nov. 5, '14	.00%
Brunswick Con., g.	Utah	100,000	10	.....	2,768,400	July 11, '09	.10	Joplin Ore & Spelter	Mo.	400,000	5	62,000	62,000	July 22, '16	.04
Bullion-B. & Champ	Utah	100,000	10	.....	10,000	July 1, '07	.01	Jumbo Ext., g.....	Nev.	1,550,000	1	194,000	694,988	June 30, '16	.05
Bullwhacker, c.....	Cal.	200,000	1	35,000	855,000	July 4, '16	.02%	Kendall, g.....	Mont.	500,000	5	50,000	1,555,000	Apr. 3, '16	.10
Bunker Hill Con. g.	Idaho	327,000	10	991,000	17,754,000	July 4, '16	.40	Keefe Zinc.....	Mo.	200,000	.....	60,000	60,000	June 30, '16	.10
Butte Alex Scott.....	Mont.	75,000	10	814,662	1,064,119	Apr. 10, '16	10.50	Kennecott.....	Alas.	250,000	10	7,000,000	12,000,000	June 30, '16	1.50
Butte-Ballaklava, c.	Mont.	250,000	10	.....	125,000	Aug. 1, '10	.50	Kennedy, g.....	Cal.	100,000	100	.....	1,801,001	June '00	.06
Butte Coalition, c..	Mont.	1,000,000	16	.....	4,700,000	Dec. 1, '11	.25	King of Arizona, g.	Ariz.	200,000	1	.....	396,000	Aug. 2, '09	.12
Butte & Superior, z.	Idaho	2,500,000	10	5,622,992	11,393,017	June 30, '16	10.75	Klar Placer, z. c. c.	Wis.	20,000	1	.....	157,500	Dec. 18, '12	.25
Caledonia, l. s. c....	Ariz.	2,614,923	10	.....	1,429,781	July 1, '16	.03	Knob Hill, g.....	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%
Calumet & Ariz. c..	Ariz.	641,923	10	2,655,676	25,714,001	June 20, '16	2.00	La Fortuna, g.....	Ariz.	250,000	1	.....	1,205,000	Oct. '02	.01%
Calumet & Hecla, c.	Mich.	100,000	25	3,000,000	132,250,000	June 23, '16	15.00	Lake View.....	Utah	500,000	.05	50,000	144,500	June 2, '16	.01
Camp Bird, g.....	Utah	600,000	1	125,000	10,243,964	Jan. 1, '16	.17%	Last Dollar, g.....	Colo.	1,500,000	1	.....	180,000	Feb. 23, '16	.02
Cardiff, l. s. c....	Utah	600,000	1	.....	250,000	June 1, '16	.25	Liberty Bell, g....	Colo.	133,551	5	.....	1,762,795	Jan. 31, '16	.05
Carlisle, g.....	Utah	600,000	1	.....	80,000	Dec. '06	.01	Lightner, g.....	Cal.	102,255	1	.....	331,179	June 30, '16	.06
Central Eureka, g.	Utah	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Linden, z.....	Wis.	1,020	10	.....	11,200	Dec. 31, '15	3.00
Center Creek, l. z..	Mo.	100,000	10	40,000	695,000	July 1, '16	.15	Little Bell, s. l....	Utah	300,000	1	15,000	75,000	Apr. 22, '16	.05
Central Eureka, g..	Cal.	100,000	1	40,000	799,159	Mar. 5, '06	.06	Little Florence....	Nev.	1,000,000	1	.....	430,000	Jan. '00	.03
Century, g. s. l....	Utah	1,000,000	1	44,000	392,087	Feb. 15, '16	.06	Lost Packer.....	Idaho	150,000	1	.....	37,500	Oct. 23, '13	.26
Champion, c.....	Mich.	100,000	25	4,360,000	14,369,000	July 7, '16	6.40	Lower Mammoth...	Utah	1,000,000	1	.....	67,000	Dec. 15, '15	.01
Chile Con.....	Utah	889,950	1	88,175	429,212	May 15, '16	.05	MacNamara, g. s....	Nev.	734,876	1	.....	46,800	Apr. 23, '12	.00
Chino Copper c....	N. M.	889,950	5	3,044,930	9,742,925	June 30, '16	2.25	Magma, c.....	Ariz.	240,000	5.00	240,000	480,000	June 30, '16	.50
C. K. & N. g.....	Colo.	1,431,900	1	.....	171,528	Nov. '04	.01	Mammoth, g. s. c..	Utah	400,000	10	60,000	2,380,000	June 30, '16	.05
Cliff, g.....	Utah	300,000	10	.....	115,000	Feb. 5, '16	.05	Mammoth-Big 4, g.	Nev.	762,400	1	.....	1,169,306	Aug. 15, '11	.02
Cliff, s. l.....	Colo.	1,000	100	.....	90,000	Jan. 1, '13	.10	Mary McKinney, g.	Colo.	1,309,252	1	.....	1,169,306	July 24, '16	.02
Clinton, g. s. l....	Colo.	200,000	10	100,000	60,000	Dec. '03	.30	Mary Day.....	Utah	800,000	0.25	40,000	93,106	May 26, '16	.02
Colo. g. Dredging..	Colo.	200,000	10	100,000	425,000	Feb. 23, '16	1.00	Mary Murphy, g. s. l.	Colo.	370,000	5	25,067	93,106	May 1, '16	.07
Colorado, s. l.....	Utah	1,000,000	0.20	.....	2,600,000	Mar. 15, '13	.03	Mexican, g. s. l....	Nev.	201,600	3	.....	171,360	June 4, '16	.75
Columbus Con. l. s. c.	Utah														

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest		Paid in 1916					Total to Date	Latest			
						Date	Amt.							Date	Amt.		
Petro, g. s.	Utah	500,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success.....	Ida.	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03		
Pharmacist, g.	Colo.	1,500,000	100	5,400,000	91,500	Feb. 1, '10	.00%	Superior & Pitta, c.	Ariz.	1,499,792	10	.....	10,318,568	Dec. 21, '15	.38	
Phelps, Dodge & Co	U. S.	450,000	100	5,400,000	53,771,527	June 30, '16	6.00	Swansea, s. l.	Utah	100,000	6	.....	334,600	Apr. 23, '07	.06	
Pioneer, g.	Alaska	5,000,000	1	.....	2,041,626	Oct. 7, '11	.03	Tamarack, c.	Idaho	2,000,000	1	80,000	80,000	June 1, '16	.02	
Pittsburg, l. z.	Ida.	1,000,000	1	.....	249,104	July 15, '13	.04	Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75	
Pitts Silver Peak ..	Nev.	2,790,000	1	.....	840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100	.....	160,000	Jan. 3, '14	.....	
Platteville, l. z.	Wis.	500	60	.....	179,500	June 15, '07	10.00	Tomboy, g. s.	Colo.	310,000	6	74,400	3,861,655	June 30, '16	.24	
Plumas Eureka, g.	Cal.	150,525	10	.....	2,831,294	Apr. 8, '01	.06	Tom Reed, g.	Ariz.	909,555	1	2,555,934	Sept. 5, '15	.01		
Plymouth Con.	Cal.	240,000	6	85,250	231,050	Apr. 10, '16	.24	Tom-Belmont, g.	Nev.	1,500,000	1	662,500	8,205,527	July 1, '16	.12%		
Portland, g.	Colo.	3,000,000	1	270,000	10,447,080	July 20, '16	.03	Tom-Extension, g. s.	Nev.	1,272,501	1	413,660	1,400,856	July 1, '16	.15		
Prince Con. s. l.	Nev.	1,000,000	2	125,000	250,000	July 1, '16	.05	Tomopah, g. s.	Nev.	1,003,000	1	450,000	13,450,000	July 21, '16	.16		
Quartette, g. s.	Nev.	100,000	10	.....	376,000	July 31, '07	.20	Tomopah Midway, g	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.05%
Quicksilver, pf.	Cal.	43,000	100	.....	1,931,411	Apr. 8, '03	.50	Tremis	Cal.	200,000	2.50	.....	234,000	Apr. 28, '15	.02
Quip, g.	Wash.	1,500,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,100,000	Oct. 30, '12	3.00
Quincy, c.	Mich.	110,000	25	770,000	22,547,500	June 30, '16	4.00	Tuolumne, c.	Mont.	800,000	1	.....	495,625	Apr. 15, '13	.10	
Ray Con., c.	Ariz.	1,671,279	10	1,571,279	6,144,406	June 30, '16	.60	Uncle Sam Con. s.	Utah	500,000	1	.....	470,000	Sept. 20, '11	.06	
Red Bird, g. s. c. l.	Mont.	300,000	6	.....	72,000	Oct. 9, '04	.01	Union, g.	Colo.	1,250,000	1	.....	444,244	Jan. 27, '03	.02
Red Metal, c.	Mont.	100,000	10	.....	1,200,000	Apr. 1, '07	.00	Union Basin, z.	Ariz.	835,350	1	.....	167,070	Nov. 16, '15	.10
Red Top, g.	Nev.	1,000,000	1	.....	128,176	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	.....	1,500,000	Apr. 15, '07	3.00
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	.....	6,125,000	Aug. 6, '07	1.75
Richmond, g. s. l.	Nev.	54,000	1	.....	4,453,797	Dec. 23, '01	.01	United, z. l. pf.	Mo.	15,556	25	.....	2,527	Oct. 15, '07	.50
Rocco-Horne, l. s.	Nev.	300,000	1	.....	162,500	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Rochester Id. & L.	Mo.	4,900	100	.....	190,846	July 1, '12	.60	United (Crip. Ck.)	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev.	899,018	1	.....	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	759,000	3,335,000	June 30, '16	18.00	
Sacramento, g.	Utah	1,000,000	6	.....	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	60,000	100	.....	11,000,000	Sept. 23, '10	6.00
St. Joseph, l.	Mo.	1,464,798	10	704,733	10,972,631	June 20, '16	.25	United Verde, c.	Ariz.	300,000	10	1,620,000	38,047,000	July 9, '16	.75		
St. Mary's M. L.	Mich.	180,000	25	1,763,000	6,560,000	July 28, '16	2.00	U. S. Red & R. com.	Colo.	69,188	100	.....	414,078	Oct. 9, '03	1.00	
Schoenh'r-Wal'n. z. l	Mo.	10,000	10	.....	90,000	Sept. 20, '11	.20	U. S. Red & R. pf.	Colo.	39,458	100	.....	1,775,938	Oct. 1, '07	1.50
Scratch Gravel.	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. R. & M. com.	USMx	351,116	60	965,568	7,590,745	July 15, '16	1.00		
Seven Top. Ch. g. s.	Nev.	1,443,077	1	36,076	252,532	Apr. 1, '15	.02%	U. S. R. & M. pf.	USMx	455,350	60	1,284,668	18,084,366	July 15, '16	.87%		
Shannon, c.	Ariz.	300,000	10	.....	750,000	Jan. 30, '13	.60	Utah, c.	Utah	1,624,490	10	8,934,695	41,668,692	June 30, '16	3.00	
Shattuck-Ariz. c.	Ariz.	350,000	10	1,225,500	4,200,000	July 20, '16	1.26	Utah, s. l. (Fish Spa)	Utah	93,000	10	.....	253,720	Oct. 21, '10	.02%	
Silver Hill, g. s.	Nev.	108,000	1	.....	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	628,200	6	281,100	330,125	July 1, '16	.25	
*Silver King Coal'n	Utah	1,250,000	6	562,500	14,147,485	July 1, '16	.15	Utah Con. c.	Utah	300,000	6	450,000	9,600,000	June 26, '16	.76		
Silver King Con.	Utah	637,682	1	127,516	942,373	July 22, '15	.10	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00		
Silver Mines Expl.	N. Y.	10,000	100	.....	250,000	June 16, '10	2.00	Victoria, g. s. l.	Utah	250,000	1	.....	207,600	Apr. 23, '10	.04
Sioux Cons. l. s. c.	Utah	745,389	1	.....	872,105	July 20, '11	.04	Vindicator Con., g.	Colo.	1,600,000	1	135,000	3,397,600	July 25, '16	.03	
Skidoo, g.	Cal.	1,000,000	5	.....	365,000	Oct. 2, '14	.01	Wasp No. 2, g.	S. D.	500,000	1	100,000	619,466	May 15, '16	.02%	
Smuggler, s. l. x.	Colo.	.....	1	.....	2,235,000	Nov. 22, '06	.03	Wellington, l. z.	Colo.	10,000,000	1	400,000	1,050,000	July 1, '16	.02
Snowstorm, c.	Idaho	1,500,000	1	.....	1,189,610	Oct. 10, '13	.01%	West End Con.	Nev.	1,788,486	1	.....	536,455	Jan. 15, '16	.06
Socorro, g.	N. M.	377,342	6	37,734	177,205	June 1, '16	.05	West Hill	Wis.	20,000	1	8,000	40,000	June 23, '16	.20		
South Eureka, g.	Cal.	299,981	1	146,930	1,388,764	July 15, '16	.07	White Knob, g. pf.	Cal.	200,000	10	40,000	170,000	May 29, '16	.10		
So. Swansea, g. s. l.	Utah	300,000	1	.....	297,500	Apr. 3, '04	.01	Wilbert	Ida.	1,000,000	1	20,000	30,000	May 1, '16	.01	
Spearsfield, g.	S. D.	1,500,000	1	.....	165,500	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	360,000	8,760,000	Apr. 1, '16	6.00	
Standard Con. g. s.	Cal.	178,394	10	.....	6,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,574	15	.....	53,403	.....	.25
Standard, c.	Ariz.	425,000	1	.....	69,600	Sept. 8, '05	.50%	Work, g.	Colo.	1,500,000	1	.....	1,597,655	Apr. 31, '12	.07
Stewart, l. z.	Idaho	1,238,362	1	.....	2,043,297	Dec. 31, '15	.06	Yak.	Colo.	1,000,000	1	120,000	2,127,655	June 30, '16	.07	
Stratton's Crip. Ck.	Colo.	2,000,000	1	.....	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	.....	157,500	Feb. 1, '13	.01
Stratton's Ind.	Colo.	1,000,000	5	.....	6,028,558	Dec. 23, '06	.12	Yellow Aster, g.	Cal.	100,000	10	15,000	1,157,759	July 6, '16	.02	
Str'n's Ind. (new) g.	Colo.	1,000,000	.30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine, g.	Cal.	1,000,000	1	650,000	1,543,008	July 25, '16	.15		
Strong, g.	Colo.	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	.....	102,583	July 15, '14	.10

Corrected to August 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,676.00

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest		Paid in 1916					Total to Date	Latest			
						Date	Amt.							Date	Amt.	Date	Amt.
Ajuchitlan	Mex.	60,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrilas	Mex.	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00		
Amistad y Concordia g s	Mex.	9,600	50	.....	429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25	.....	1,527,320	Dec. 15, '16	\$0.21
Amparo, s. g.	Mex.	2,000,000	1	200,000	2,132,176	May 10, '16	.05	Lucky Tiger	Mex.	715,337	10	264,675	3,528,066	July 20, '16	.09		
Bartolo de Medina Mill	Mex.	2,000	25	.....	103,591	Aug. 1, '07	.60	McKinley-Darragh-Sav.	Ont.	2,247,692	1	202,293	4,610,061	July 1, '16	.03	
Batopilas, s.	Mex.	446,268	20	.....	55,870	Dec. 31, '07	.12%	Mexican, l. pf.	Mex.	12,500	100	.....	1,018,780	May 1, '12	3.50
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex.	240,000	10	.....	660,000	Mar. 10, '08	.25	
Boleo, g.	Mex.	120,000	20	.....	721,571	May 8, '11	6.00	Mexico Mines of El Oro	Mex.	180,000	5	.....	3,473,800	June 26, '14	.96
British Columbia, c.	B. C.	591,709	5	.....	615,399	Jan. 5, '15	.15	Minas Pedrazzini	Mex.	1,000,000	1	.....	497,500	Jan. 23, '11	.06
Buena Tierra	Mex.	330,000	5	.....	160,380	Jan. 30, '15	.24	Mines Co. of Am.	Nev.	900,000	10	.....	4,959,600	July 25, '13	.12%
Buffalo, Ont.	Ont.	1,000,000	1	.....	2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can.	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%	
Canadian Goldfields	Can.	600,000	0.10	.....	237,099	July 15, '14	.01%	Montezuma, l. pf.	Mex.	5,000	100	.....	402,500	Nov. 15, '12	3.50
Cananea Central, c.	Mex.	600,000	10	.....	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex.	500,000	1	.....	100,000	July 20, '09	.04
Cariboo-Cobalt	Ont.	1,000,000	1	.....	295,000	Sept. 1, '16	.09	Mothe Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11	
Cariboo-McKinney, g.	B. C.	1,250,000	1	.....	56,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex.	100	300	.....	3,190,000	Oct. 11, '09	\$253
City of Cobalt	Ont.	500,000	1	.....	138,375	May 16, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	220,000	3,970,000	July 28, '16	.50	
Cobalt Central, s.	Ont.	4,761,500	1	.....	192,845	Aug. 24, '09	.01	Nipissing, s.	Ont.	1,200,000	6	900,000	14,340,000	July 20, '16	.25	
Cobalt Lake, s.	Ont.	3,000,000	1	.....	465,000	May 29, '14	.03%	North Star, s. l.	B. C.	1,800,000	1	.....	533,000	Feb. 1, '10	.02
Cobalt Silver Queen	Ont.	3,000,000	1	.....	310,000	Dec. 1, '08	.24	Paloma, g.	Mex.	30,000	20	.....	7,465,000	Nov. 4, '09	6.00
Cobalt Township, s.	Ont.	193,282	6	.....	1,042,259	Aug. 20, '14	.24	Panuco	Mex.	10,000	.....	.....	7,465,000	Nov. 4, '09	6.00
Coolidge, s.	Ont.	800,000	5	200,000	8,040,000	Feb. 6, '16	.25	Panoles, s. g.	Mex.	120,000	20	.....	6,451,687	Sept. 30, '13	1.25	
Con. Mg. & Sm., g. s. c.	B. C.	58,500	100	420,517	2,740,654	July 1, '16	2.50	Peregrina, pf.	Mex.	10,000	100	.....	328,656	Sept. 1, '10	3.60	
Crown Reserve, s.	Ont.	1,999,957	1	.....	6,102,405	July 15, '16	.03	Peterson Lake	Ont.	2,401,620	1	84,064	340,257	July 1, '16	.01%	
Dolores	Mex.	400,000	5	.....	1,374,865	July 24, '11	.22%	Pingulo, pf.	Mex.	20,000	100	.....	780,000	Apr. 15, '13	3.00
Dome Mines, s.	Ont.	400,000	10	400,000	800,000	June 1, '16	.60	Porcupine Crown	Ont.	2,000,000	1	180,000	600,000	Apr. 1, '16	.03		
Dos Estrellas, (El Oro)	Mex.	300,000	0.50	.....	16,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex.	8,000	15	.....	963,360	Apr. 2, '08	1.00
El Favor	Mex.	3,500,000	1	.....	210,000	Apr. 30, '14	.11	Rambler-Cariboo	B. C.	17,500	100	62,500	472,500	June 15, '16	.05	
El Favor	Mex.	1,147,500	5	.....	9,135,422	July 11, '13	.24	Real Mines Leasing	Ont.	200,000	.....	.....	27,750	Feb. 20, '16	.05
El Rayo, g. s.	Mex.	260,000	2	.....	140,410	Apr. 20, '11	.15	Right of Way	Ont.	1,685,500	1	16,855	660,514	June 15, '16	.00%	
El Triunfo, c.	Mex.	2,000,000	1	.....	20,000	Aug. 28, '11	.01	Rio Plata	Mex.	374,518	5	.....	345,744	Feb. 1, '13	.05
Esperanza, s. g.	Mex.	450,000	5	.....	12,521,250	Dec. 31, '16	1.00	San Francisco Mill	Mex.	6,000	25	.....	445,086	Oct. 15, '08	1.00
Oranby Con. c. g. s.	B. C.	149,985	100	449,956	6,050,341	May 1, '16	1.50	San Rafael	Mex.	2,400	25	.....	6,795,260	Jan. 11, '12	2.00	
Greene-Cananea, c.	Mex.	474,411	100	1,458,627	6,594,432	May 29, '16	2.00	San Toy, s. l.	Mex.	8,000,000	1.00	.....	540,000	July 24, '13	.01	
Greene Con., c.	Mex.	1,000,000	10	2,500,000	12,544,000	July 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex.	1,500,000	5	364,600	2,819,772	Mar. 16, '16	.24		
Greene Gold-Silver, pf.	Mex.	300,000	10	.....	194,871	May 28, '16	1.00	Santa Gertr y Guadalupe, g. s.	Mex.	60,000	.....	.....	3,960,000	Feb. 27, '09	1.00
Guajuanic Con. s.	Mex.	540,000	6	.....	600,000	Oct. 8, '06	.07%	Sta. Maria del Paz	Ont.	9,600	12%	.....	5,606,000	Jan. 2, '13	2.60
Guana y Dev. pf.	Mex.	10,000	100	.....	274,756	Jan. 1, '11	3.00	Seneca-Suprior	Ont.	478,841	.....	478,854	4,400,096	July 15, '16	.00
Ougenhelm Explorat.	Mex.	833,732	25	10,713,456	34,032,360	Apr. 3, '16	11.56	Soledad, s. l.	Mex.	960	20	.....	4,439,840	Oct. 17, '11	8.00	
Haleybury, s.	Ont.	50,000	1	.....	60,000	Apr. 5, '11	.50	Sorpresa, s.	Mex.	19,200	20	.....	3,979,240	Jan. 5, '11	34.00
Hedley	B. C.	120,000	10	120,000	1,943,620	June 30, '16	.60	Standard, s. l.	B. C.	2,000,000	1	350,000	2,160,000	July 10, '16	.02%		
Hinds Con., g. s. l.	Mex.	6,000,000	5	.....	88,000	Feb. 27, '08	.02	Temiskaming & Hud. Bay	Ont.	7,761	1	.....	1,940,250	Nov. 10, '14	3.00
Hollinger	Ont.	600,000	5	920,000	6,130,000	July 14, '16	.20	Temiskaming, s.	Ont.	2,500,000	1	75,000	1,534,156	July 22, '16	.03		
Jimulco, c.	Ont.	10,000	100	.....	975,000	Feb. 27, '11	.10	Tezuitlan, c.	Mex.	8,000	100	.....	1,955,000	Jan. 1, '09	1.50
Kent Lake, s.	Ont.	600,000	6	.....	8,439,000	Feb. 1, '16	.25	Tough-Oakes	Ont.	531,000	6	199,311	265,760	Jan. 1, '16	.52%	
Kent Blanca	Mex.	140,000	20	.....	2,776,700	Mar. 1, '16	.05	Treadwell, s.	Ont.	1,000,000	.....	.....	1,000,985	Jan. 1, '16	.05
La Republica, s.	Mex.	400,000	5	.....	110,000	Aug. 15, '11	.06	Wettlaufer-Lorrain	Ont.	1,416,580	1	.....	656,356	Oct. 20, '13	.05
La Rose Con., s.	Ont.	1,498,827	6	224,793	6,611,913	July 20, '16	.06	Xukon, c.	Y. T.	3,500,000	5	525,000	8,108,110	June 30, '16	.07%		



TAILINGS ON SILVER CREEK, NEAR PARK CITY, NEAR WORKS OF BIG FOUR EXPLORATION CO.

Concentrating Mill Tailings Near Park City, Utah

W. A. SCOTT.

The Big Four Exploration Co., controlled by Kirk & Leavell, Salt Lake City, and associates, is operating a concentrating mill of 750-tons daily capacity, on Silver Creek, 7 miles northeast of Park City, Utah. The material being treated consists of mill tailings deposited there during the early 25-year period of Park City milling operations. They are composed of zinc tailings, with their accompanying lead and silver contents, which ran down the canyons from the Ontario, Daly-West, Daly-Judge, Silver King and other mills, during those early days, when zinc was penalized at the smelters, and, therefore, was deemed an undesirable metal. Operators were willing to lose a fair amount of lead and silver to get rid of the zinc. In the locality where the Big Four is operating, Silver creek bed expands to a width of 200 to 1200 ft., and at the lower end of this wide area the creek enters a narrow canyon. As these tailings were carried down stream during a quarter of a century, they gradually banked up in the lower end of the valley, until their deposition covered an area $3\frac{1}{2}$ miles long, 600 to 800 ft. wide, having an average depth of 30 ins. Toward the lower end of the deposit the maximum depth is 6 to 8 ft. During the last 10 years zinc-laden tailings from those Park City mills have not been allowed to escape.

The accompanying illustrations afford a true conception of these operations. They give a view of the mill, steam shovel, locomotives and ore trains, and the great windrows of tailings banked up by 4-horse scrapers. There are 14 Fresno scrapers, of Western Wheeled Scraper Co. make, being used; also, six single team scrapers for channel work, as well as several plows to use where a sod has formed. The principal windrow of tailings, containing 40,000 to 50,000 tons, is 35 ft. wide at base, 10 ft. high and over 1 mile in length; and this will be extended half a mile farther up stream this season. The scrapers cut to a depth below the deposit, slightly into the original soil. The main windrow extends upstream, and rather to one side; and work is in progress building another, parallel to the first, on the opposite side. The material thus banked up contains but little waste—although originally it was all waste. While banked in windrows, the water drains out, and the material becomes fairly dry. A railroad track of light construction was built from the mill up stream along one side of the main windrow, over which the stuff is hauled to the mill in 4-yd., $6\frac{1}{2}$ -ton, side-dump cars, by two 14-ton Porter locomotives, each engine pulling five to six cars at a trip. The cars are loaded by a Bucyrus steam shovel, having a $1\frac{1}{2}$ -cu. yd. bucket. The material is



BIG FOUR EXPLORATION CO.'S 750-TON CONCENTRATING MILL.

packed to load well and the steam shovel work is rapid and uninterrupted. Close to 1000 tons per day are taken to the mill. The excess of 250 tons per day over the mill's capacity is by-passed on a branch track and dumped in the stock pile for the winter run, when that in windrows will be frozen.

During 1915 a mill of 200 tons capacity was operated several months; and last March the rebuilding of the plant was begun, for the capacity of 750 tons. The new mill was completed and set in operation Aug. 1, and seems to be performing up to the required efficiency. The loaded cars are drawn upon a trestle and dumped into three hoppers; and running across the bottom of each hopper is a pan conveyor, 30 ins. wide, 13 ft. long, by which the tailings are thrown upon a belt conveyor, 30 ins. wide, 58 ft. long, and by this they are delivered to the boot of a continuous bucket elevator, 60 ft. between centers, standing 15 to 20° from the vertical, having 12-gauge steel buckets, 18 ins. wide, 8 ins. deep, the line running at the rate of 340 ft. per minute. At the head of this elevator is a split discharge, dividing the material equally between two trommels. Each trommel is 12 ft. long, 4 ft. dia., and is made of punched steel plate, with 1-in. round holes. Inside is a 2½-in. pipe, about 11 ft. long, which rolls as the trommel revolves, thus keeping the holes from blinding. The trommel oversize, consisting of sod and other substances, passes out by a conveyor to the dump; the undersize is thrown upon a belt conveyor and discharged into a bin 112 ft. long, 12 ft. wide and 15 ft. deep. Thus far the process is without water.

In the top of the mill are two 10x10-ft. steel tanks, holding 9000 gals. of water for the mill processes that follow. The tailings are drawn out of bins by hydraulic feeders, and discharged into two elevators, with 14-in. staggered buckets, and they deliver the material to four trommels, two on each side of elevator. Each trommel is 12 ft. long, 4 ft. dia., divided into two sections of 8 mesh, and one section of 3 mesh. The 3-mesh oversize is waste; the undersize of plus

8 minus 3 mesh is passed to roughing jigs. The minus 8 mesh goes to two Esperanza classifiers for desliming; slimes from the last named go to Dorr thickeners, and the sand to four duplex Callow 16-mesh screens. The Callow oversize, plus 16 mesh, passes to Wilfley No. 9 double-decked tables; the undersize goes through a mechanical divider and is feed for 12 Wilfley double-deck tables. The four Hartz 3-compartment jigs, which handle the plus 8 minus 3 mesh material, make a middling product and a clean tailing; this middling concentrate is pulverized in a 5x4-ft. Allis-Chalmers ball granulator, for concentration. The table equipment consists of 16 double-deck, and 16 single-deck Wilfleys; and 16 Overstrom-Deister tables, made by Deister Concentrator Co. The middling products made on Wilfley tables are passed through trommels, thence to a 6-spigot Kirk & Leavell classifier, the first three spigots discharging upon Wilfley finishing tables, and the other three to Overstrom-Deister fine sand tables. The Dorr thickener pulp is retreated on 10 Deister slime tables; the overflow water is reused as a wash-water in the mill. The ultimate product is recovered on the lower floor by 10 finishing tables—six Wilfley and four Deister. These concentrates discharge from finishing tables into two shaking launders, running parallel to each other, and



BUCYRUS SHOVEL HANDLING TAILINGS.

extending the full length of the mill; one of these carries the zinc concentrate and the other the lead. The launders discharge their concentrates, accompanied by water, into two concrete-lined sumps. Two dewatering drags, acting as elevators, take up the zinc and lead-silver products from sumps and deliver them into separate shipping bins. These drags consist of rubber belts upon which strips of angle iron are fixed like buckets on an elevator. The belt lines run 8 ft. per minute, at an incline of 45° , and by the time the concentrates are discharged they are pretty thoroughly dewatered. The ratio of zinc and lead in the mill output is close to $3\frac{1}{2}$ cars of zinc concentrate to 1 car of lead. All concentrates are sulphides, being rosin zinc and lead, the latter carrying most of the silver.

The mill heads vary from 3.7 to 4.2% zinc, 1.6 to 2.5% lead, and about 3 ozs. silver. The lead concentrate runs 20% iron, 25% lead and 15 to 25 ozs. silver; the zinc product contains $37\frac{1}{2}$ to 44% zinc, together with some iron, silica and low values in silver.

The 10 to 15% of the tailings deposited here, which run about 150 mesh, contains at least one-third of the metals recoverable, hence the importance of an effective treatment for the fine material and slimes. The water supply for mill is drained from the stream into a reservoir and settled; the clear overflow is then drawn by a flume into a sump at the pump station, whence it is forced into tanks at top of the mill by a Gould 6-in. centrifugal pump, which handles 1000 gals. per minute against a 100-ft. head. This pump is operated by a 40-hp. motor. By the opening of winter the company expects to have 100,000 tons of material in its stock pile for the winter run, where the steam shovel will be used in loading.

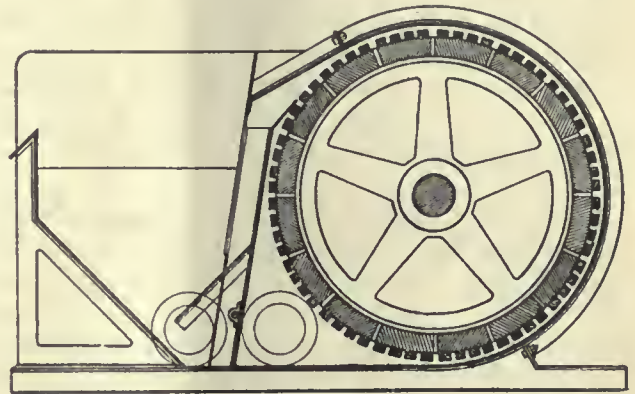
L. R. Davis, manager of the works, states that the extraction being made is between 60 and 70%, and in order to raise materially the percentage of extraction it is announced that Janney flotation machines will be installed this fall, to treat middlings and slimes from the finishing tables. Probably a 6-cell plant will be required. Mr. Davis, who was in charge during the construction period, has the operations well in hand, and is pleased with the work of the entire plant. M. P. Cloonan, who was construction engineer when the plant was being built, is now general mill foreman. Ross Cartee and E. P. Hapgood were engaged in working up the designs for the plant.

All machinery is electrically operated, the transformer, switchboard and motors amounting to a big item. The area of land covered by the deposit is leased on a royalty basis; that occupied as mill site, however, is owned by the company. Strange & Maguire, Salt Lake, being interested in the company with Morris P. Kirk and John H. Leavell, engineers, have in charge the work of delivering the material to the mill.

The surface appearance of an ore vein is apt to be deceptive to the unpracticed eye, as weathering changes the character of the minerals.

The K. & K. Flotation Machine.

The Southwestern Engineering Co., Los Angeles, Cal., is putting in the market a new and novel flotation machine, which consists essentially of a long, hollow, cylindrical drum, mounted on a horizontal shaft. This drum is provided with a series of longitudinal air slots and a larger number of longitudinal riffles running the entire length of the drum. The drum is rotated rapidly inside of a close fitting casing and the whole enclosed in a suitable housing as shown in the accompanying illustration. A discharge lip placed



THE K. & K. FLOTATION MACHINE.

tangentially to the periphery of the drum provides for taking the pulp into the frothing box and a controllable intake passage at the bottom of the frothing box provides for returning the pulp to the aeration chamber for retreatment.

The machine is very simple, having automatic tailings discharge and level control. One man can take care of any number of machines.

It can be run in the ordinary flow sheets in flotation work, or else can be run as an independent unit adding the oil directly to the machine.

Filtered Gas in Carbide Lamp.

To present cool, clean gas, at uniform pressure, to the burner tip is the idea embodied in a type of carbide lamp invented by John B. Anton of Monongahela, Pa., for which he has been granted patent No. 1,187,481. The lamp has the usual water compartment from which the water is fed to the carbide compartment by means of a valve. As the gas is generated it passes from the generator through a filter of felt or other absorbent material into still another compartment which constitutes an expansion chamber. The filter takes out the major portion of the impurities, such as slaked carbide. In the accumulator the gas is allowed to expand, and there being a series of baffle plates at the entrance to this chamber, any remaining impurities are precipitated. In the expansion chamber, the gas is maintained at practically uniform pressure, and when fed to the burner, gives a clear, steady light.

Method of Removing Broken Ore from Flat Stopes.

One of the most, if not the most, inefficient operations connected with mining on dips of 25° to 33° , says M. Weimbren, in the Journal of the Chemical, Metallurgical and Mining Society of South Africa, is the removal of the broken ore from the stopes, for the reason that the work is carried out by unskilled natives whose main object is to get through the shift with as little exertion as possible, and the work is difficult to regulate and supervise when, for instance, ten natives are shovelling near one another in the same part of a stope, it being almost impossible to place them so that they do a maximum amount of work. The result is that instead of each native lifting the rock and throwing it as far as possible, he only scrapes it along the footwall into the shovel of the native immediately below him.

To obviate this a system was introduced whereby a permanent line of chutes was laid down at a safe distance from the faces of the stopes; in many cases one line of chutes being sufficient for both faces. Each line of chutes was given a uniform grade, the same as the dip of the vein, so that the rocks should go from the very top of the stope down to the bottom without choking the chute or jumping out. The chutes were

clearly the system employed, especially in stopes with long backs. After the system was introduced, the number of shovellers was reduced 50%, and yet the stope was kept cleaner than it was before. A water tap at the head of the chute furnished water to assist in making the ore run on this flat incline. The barricades *A* and *B* were to protect the natives, when tipping the cars on their respective tracks, from ore passing down the chute from the tracks above. A half-section of rail (9 ft. long) is kept ready at each track, so that the rails can always be kept close up to the face. As a rule, one native shovels the rock into the track while another loads it and wheels it to the chutes.

Summarizing, the system consists of permanent chutes and tracks running from the face to the chutes, roughly, every 50 ft. on the dip with specially designed trucks to overcome the difficulty of small stopping widths. The advantages claimed for this system are: By having permanent chutes no time is wasted at the beginning and end of the shift in putting them up and taking them down; gravity is made to assist as much as possible in handling the ore; instead of boxes every 20 to 30 ft., they are only necessary every 60 to 70 ft.

Western Nevada Ore Shipments.

Approximate ore shipments to Utah and California smelters through Western Ore Purchasing Co., Reno, are as follows:

Luning, copper ore, averaging 6%, 150 tons per day.

Candalaria, silver ore, averaging \$25 per ton, 500 tons per month.

Marietta, near Candalaria, silver-lead ores, 150 tons per month.

Mason Valley, including Yerington, Mason and other parts, copper ore, 60 cars per month.

Belmont, 4 cars per month of concentrates.

Schurz, including shipments of Yerington Mountain Copper Co., 15 cars per month.

Rawhide, gold and silver ore, 2 cars per month.

Hawthorne, occasional shipments of silver-lead ore.

Goldfield, including shipments of Jumbo Extension, 3000 tons per month.

Seven Troughs and Lovelock, 1 car per month of high-grade gold ore.

Golconda, copper ore, 8 cars per month.

Battle Mountain, copper, lead and silver ore, 8 cars per month.

Mineral-laden waters, whether under subterranean pressure or not, often migrate long distances through all kinds of water channels in the earth's crust—as fissures, fractures, cracks, bedding planes, joint planes, slip planes, planes of unconformity, lines of weakness, and through water channels carved out by themselves along lines of easily soluble material.

Pure metals are usually more malleable than their alloys.

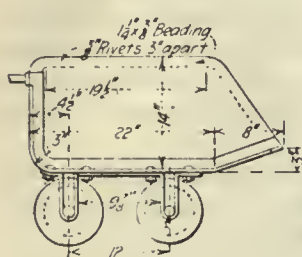


FIG. 1.



FIG. 2.

well anchored by putting in at every fourth or fifth section props made of stout lagging poles, to which the sections were chained.

Tracks of 1-ft. gauge were then put in at approximately every 50 ft. along the dip of the stope and running horizontally from the faces to the chute. It would at first sight appear that it would be difficult to lay down a number of horizontal tracks in a stope dipping at 33° , but this by no means proved to be the case, and it was seldom that the footwall had to be blasted to obtain a horizontal track bed.

A special type of car was designed, which was light and could be easily placed in a position of safety behind some waste pack at the end of the shift, when blasting was to be done. The car has a capacity of 5 cu. ft., and as the total height is only $1\frac{1}{2}$ ft. from the rails, it can be handled very readily in most stopes. It is tipped by pulling the back of the car upward, the front wheels acting as the fulcrum. The details of construction are shown in Fig. 1.

The accompanying sketch of the stope, Fig. 2, shows

Governing the Use of Explosives in Mines

E. M. WESTON.*

A great danger to the miner and a loss to the mining industry is the increased use of poor brands of fuse with a very unreliable burning speed. Managers and buyers often do not realize how easily and how often this causes loss, especially in development work, where six or seven or more holes or pairs of holes have to go off in rotation. With poor, cheap fuse the miner cannot be sure of their going in correct rotation unless he cuts them 4 or 6 ins. different in their lengths. This means that 2 ft. or 3 ft. of fuse have to be cut off the cut holes. This leaves the fuse dangerously short, or it necessitates the use of longer fuse all round, which then costs the same or more money as reliable fuse. One round or bench hung up owing to poor fuse, or a hole misfired due to the same cause (big differences in the length of fuse are sure to cause misfires owing to unburnt fuse lengths being cut off when the other holes explode) will easily waste far more money than any apparent saving made. I must emphasize the fact that the surest way to prevent misfires is to have the lengths of fuses arranged so that all are burnt down nearly to the detonator before the first one explodes. I was once on a mine where owing to a loss of life suspected to be due to fuse, and owing to the better results gained, more expensive fuse was in use, yet the first act of a new manager was to make an apparent saving by buying cheaper fuse. The miner should test the burning speed of different coils and packets of any fuse he is using himself. Another cause of numerous misfires is careless crimping of detonators on fuse. Great care must be used that the inner core of powder is not pinched too much, as otherwise misfires are sure to occur. I have known miners leave this work to their natives. It is always wise to tie the fuse and detonator to the primer.

Regarding the use of tamping with high explosives. The force of the explosion is developed so suddenly that the gases exert their full force on the side of the hole before coming out along the hole. Notwithstanding this, tamping is a great advantage, especially in development work. It keeps the charge, detonator and fuse in their place and prevents them being shaken out by other explosions. Water is not a good tamping. Cut holes especially should be well tamped, but care must be taken in tamping not to cut or injure the fuse. Beware of loading gelatine into a hole recently fired, as it often contains heat enough to explode the charge.

We have now to inquire what are the conditions that affect blasting a hole; that is, what makes a blast a poor one or a good one in breaking rock? There are quite a large number, and until we understand something of their meaning and effect we cannot do intelligent work. They are:

- (1) The effect of the size and number of the free faces of rock around the hole.
- (2) The tenacity or strength of the rock to resist breaking.
- (3) The structure of the rock.
- (4) The strength and nature of the explosive.
- (5) Whether the hole is properly tamped and the explosive properly detonated.
- (6) Whether the hole goes off by itself or at the same instant with several other holes.
- (7) Whether the rock to be broken has to be lifted or falls itself.
- (8) The size and the form of the chamber (hole) in the rock in which the explosive is placed.
- (9) The strength of the burden on the hole. This is represented by what we call the line of resistance to breaking, and it is always measured at right angles (square to) the nearest free face of the rock.

Taking them in order: (1) By a free face we mean a face to which the hole can break out. Suppose we

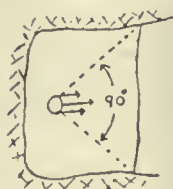


Fig. 1.

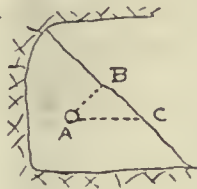


Fig. 2.

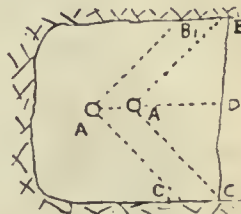


Fig. 3.

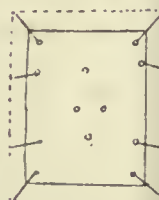


Fig. 4.

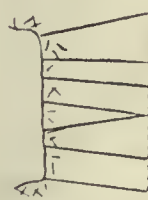


Fig. 6.

have a face at the end of a drive and drill a hole into it. Now, obviously there is only one free face to which the hole can break, and a hole has to be put in a certain way to break any rock at all off such a face, and in any case it cannot be very efficient, that is, it cannot break a lot of rock for the length of the hole and the amount of explosive used. Take, now, a bench in a stope and a hole in the bench. There are now two free faces, one to the bench on which the hole is drilled and the other the face of the bench looking out to the stope. In such a position we can with the same length hole and the same charge break very much more rock than in the face of the drive.

Suppose, again, we have a big slab of hanging wall reef in the face which one bench has undercut, we have now three free faces, in front, on the side, and below, and one hole would break down very much more rock

*Author of "Practical Mining on the Rand."

than that in the stope. Now, it is plain what we mean when we say that the number of free faces affects the work of a hole. The size of the free face also affects it very much. If one had a face of a very large tunnel one hole put in slanting would break more off than one in the face of a small drive. In the same way we know that in a narrow stope we cannot put so large a burden on a hole as in a larger stope, other things being equal. Why this is so we will try and explain later on.

No. (2) Does not take much explanation. We know, of course, that the harder and tougher the rock the less burden we can put on the hole or the more explosive it needs. The rock breaks by shearing, not by bending first, as it is rigid.

No. (3) This means that the presence of slips, heads, faults and bedding planes as well defined foot and hanging walls affect a charge. If we know they are there we should know how much they can be made to help us in making the hole and its charge break the most rock.

No. (4) This we have already discussed and shown that some explosives are more powerful and more suited to different kinds of rock than others.

No. (5) This also we have discussed and shown the need of care and attention to get the best results.

No. (6) With the exception of the cut, this concerns rather the quarryman, who fires a lot of holes together by means of electricity; such holes help one another.

No. (7) This is usually not of much importance in mining.

No. (8) It is most important that we try to understand what this means, for, as will be shown later, neglect to realize what this means lies at the bottom of much bad work. We must remember that when the charge explodes the gas which fills the hole presses equally all over the inside surface of the hole with the same pressure of 117 tons to the square inch. If we had a ton of explosive and it only had one square inch to push the burden out with, it could only give a push of 117 tons. Suppose we have a hole 1 in. in diameter, as shown in Fig. 1, then the pressure acts as the arrows show to break out the burden. The force exerted then depends on the diameter of the hole. That is, if 10 ins. at the bottom of the hole are 1 in. in diameter, the area over which the explosive can give its kick is only 1 in. \times 10 in. = 10 sq. ins. Now, the hole is bigger further up, say, $1\frac{1}{4}$ in. and the next 10 ins. of the charge can give the same kick over $12\frac{1}{2}$ sq. ins., that is, they can give a bigger kick to move the rock in front of them. Let us try and realize what this means in a machine hole $7\frac{1}{2}$ ft. deep, drilled with $2\frac{1}{4}$ -in. starter, 2-in. second, $1\frac{3}{4}$ -in. diamond, and $1\frac{1}{2}$ -in. chisel. The hole will be something like this, supposing the starter drills 18 ins. and the rest of the jumpers 24 ins. each: Allowing for wear of the bits the first part of the hole will be from $2\frac{1}{4}$ in. to $2\frac{1}{8}$ in. diameter, the second 2 in. to $1\frac{7}{8}$ in., the third $1\frac{3}{4}$ in. to $1\frac{5}{8}$ in., and the bottom $1\frac{1}{2}$ in. to $1\frac{1}{4}$ in. Now, suppose we start to

load this hole with eight plugs of $1\frac{1}{4}$ -in. dynamite about 7 ins. long. We will get about two into the last foot or 14 ins. of the hole, and the three will press up into, say, 18 ins. of the second part, and the other three into about 15 ins. of the third part. So that taking the pressures tending to break the hole, the last foot of the hole has an area of $1\frac{1}{4} \times 12 = 15$ sq. ins., the next 12 ins. has about $1\frac{3}{8} \times 12 = 16\frac{1}{2}$ sq. ins., the next 12 ins. has $1\frac{1}{2} \times 12 = 18$ sq. ins., and the last 9 ins. $1\frac{5}{8} \times 9 = 19\frac{3}{8}$. This shows us that the force breaking out the last foot of the hole is 15×117 tons, of the second $16\frac{1}{2} \times 117$, and of the third 18×117 . In other words, the explosive in the last foot or two of any hole cannot do nearly as much work in trying to break out ground as the bulk of the charge which lies further up the hole where it is bigger. The explosion is so sudden that if the rock is not moved from the bottom of the hole instantly it will never break. The explosive further up the hole cannot come and help the explosive further down, though it might perhaps split some burden of it if there were heads. Think what this means when so many holes are drilled. No wonder there are lots of sockets. In some cases it pays to enlarge the bottom of the hole by exploding small charges of gelatine in it before loading up; but under the condition of stoping on the Rand it very seldom pays to do this. However, when working in narrow stopes with two free faces, as on a bench, what are known as extended charges work best, as the rock has to be broken in long slices. If we could get a machine that would groove out the top and bottom of stoping holes so that there would be more area for the gases to kick against, we could use our explosive to better advantage.

No. (9) Is also most important and requires some explanation. The line of resistance is always the shortest distance from the hole square to the free face of the rock.

In the Fig. 2, AB is the line of resistance, not AC. Now, every miner knows that in ground without lines of weakness one cannot put as large a burden on a hole in a narrow stope of 3 ft. as in a wide one of 5 ft., and there must be some reason for this. If we have a hole, Fig. 3, A, in a stope 4 ft. wide, and that hole breaks out, it breaks the rock by shearing (just as a rivet or bolt is sheared through) not by bending or stretching, along two lines AB and AC, and AB and AC are always at 90° (square) with one another; so in a really solid rock AD, which is the line of resistance (the burden) could not be more than about 2 ft. If the hole were placed at A¹, then it would be what miners call "too bound in"; because the force of the explosion could not move the rock between A¹B¹ and AB and A¹C¹ and AC. It would just compress it, because the rock could not move back anywhere. Remember, that we are talking of solid rock like granite. The presence of slips and heads in nearly all rock alters matters to a certain extent. It is plain, then, that if we drew another figure for a stope 6 ft. wide, 3 ft. would be the most burden we could put on. So we say

the effect of a hole depends on the burden given to it for a certain height of free face. It also has something to do with the length of hole, because if we make our hole too long in relation to the burden, unless we spread our charge along the hole, it will "bull ring," that is, the part of hole round the collar will not break. The books give this rule for the right length of hole, that the distance from the center of the charge to the mouth of the hole should be equal to the length of the burden.

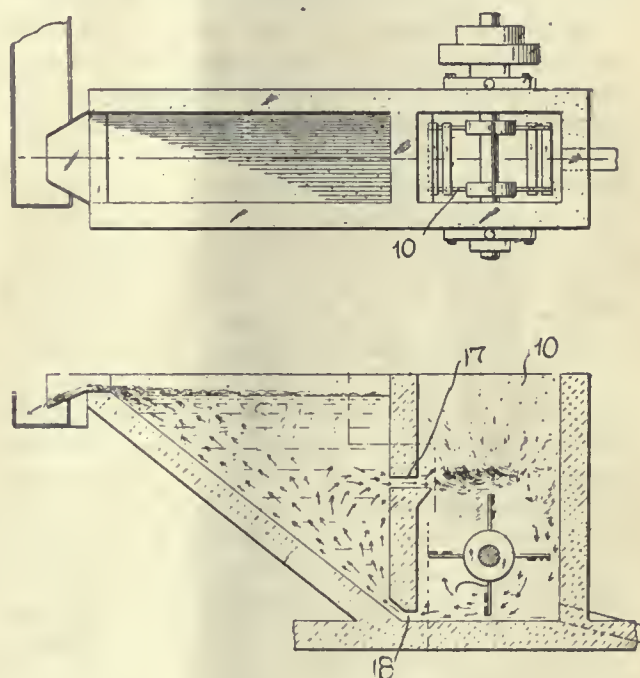
There is another important law with regard to the use of explosives. It is this: The amount of explosive necessary to break a hole increases as the square of the burden on it. What it means is this, if in the face of a stope you have a hole with 1 ft. of burden which we will say can be broken with one cartridge, then if we increase the burden to 2 ft. the charge necessary will be $2 \times 2 = 4$ plugs, and if the burden is 3 ft. the charge will be $3 \times 3 = 9$ plugs. This we know holds pretty true in practice, and is one of the chief reasons why a skillful hammer-man can break more fathoms to a case of explosives than a machine stoper, because he is putting in more holes with a much smaller burden. Now, in breaking ground in very narrow stopes with small machines, if we try to put very big burdens on the holes they are "bound in" by the sides, and anyhow they will require explosive to be used expensively, so that obviously the cheapest way in both drilling and explosives when using piston drills, is to put in long holes with a moderate burden; but, unfortunately, few miners understand how to use long holes. If we could get a small machine that we could move about quickly, or if we could arrange a set up for it from which a number of effective holes could be drilled, rock could be broken very much more cheaply by drilling a number of short holes 4 ft. or 5 ft. deep, because we have to drill out five times the amount of rock to drill one 8-ft. hole as to drill one 4-ft. hole, owing to the larger size of bits we have to use, and the speed of drilling depends on the amount of rock broken; but such a drill is not available yet. Then, also, we would be able to break the ground with much less explosive, as each hole would carry a smaller burden, but would require a very much smaller charge in proportion.

A New Flotation Machine.

In ore concentrating apparatus of the type where the ore is concentrated by gaseous flotation of mineral particles in fluid, the impellor blades, which agitate the liquid, finely ground ore and frothing agent, operate in a horizontal plane. George B. Eberenz and James J. Brown, of Cripple Creek, Colo., have found by careful demonstration that blades so mounted do not bring the finely ground ore into thorough contact with the air and frothing agent. They have consequently sought to improve upon the construction of machines of this character by providing agitating blades which move in a vertical plane. At the same time they provide a spitzkasten so connected with the

agitating chamber, vessel or tank that the finely ground ore and liquid will be driven into the lower end of the spitzkasten and then sucked back into the agitating tank over the top of the agitating blades, whereby more air is beaten into and mixed with the mass in the agitating tank and the whole mass returned again and again to the spitzkasten, where the concentrates rise and pass off, until the separation of the concentrates from the gangue is complete.

As seen in the accompanying plan and sectional view, the impellor is disposed slightly below the opening (17) and its blades in their travel extend down to a point approximately opposite the opening (18). The impeller has several horizontal vanes carrying blades, and there are spaces between the blades. These spaced blades assure the greatest possible amount of agitation, emulsifying and beating of the air and oil into



A NEW FLOTATION MACHINE.

the mass and bringing the finely crushed ore into intimate contact with the air, water and frothing agent. The mass so intermingled and mixed is driven from the cell or chamber (10) into the spitzkasten through the opening (18) and in the spitzkasten the concentrates separate and come to the top in the form of froth. This froth passes off over the apron and is discharged into the launder, while the tailings or gangue in the spitzkasten returns to the cell (10) through the opening (17) and is subjected to further agitation so that the mineral particles which have not been subjected to the action of the oil and froth will then come in contact therewith and will be raised when they once more pass into the spitzkasten.

With this invention it is not necessary to pass the mass from one agitating chamber into the spitzkasten, then into a second agitating chamber and again into a spitzkasten, and so on, but one agitating chamber and one spitzkasten is all that is necessary for the complete separation of the concentrates from the gangue.

Concentration Methods for the Reduction of Quicksilver Ores.

Experimental work, looking to the feasibility and the scope of application of concentrating methods for the reduction of quicksilver ores, is being carried on by the Department of Mining of the University of California, under the direction of Walter W. Bradley, of the staff of the State Mining Bureau.

Sufficient data have been gained, so far, to make a preliminary statement of partial results, pending the issuance of the report in bulletin form later. This is done in the hope that it may assist those who are making inquiries along these lines, and also that it may elicit suggestions from those who are similarly experimenting at various mines.

Aside from the war-begotten flurry of high prices, quicksilver mining in California has become more and more a question of economically handling larger tonnages of lower-grade ores. Since Robert Scott evolved his fine-ore, tile furnace in 1871, there have been no improvements worthy of mention in the metallurgy of quicksilver until the present agitation for concentrating. A very surprising feature of the situation, particularly to one familiar with metallurgical practices in the reduction of gold, silver, copper, etc., is the absolute lack of any systematic sampling and assaying at the quicksilver mines. So far as we have observed there is not a quicksilver mine in California which possesses or utilizes an assay office, at least there was none up to within the last 6 months. The distillation assay with the "Whitten" apparatus is simple, quick and accurate. The old-timers have been complacently saying "the furnace gets it all," and that therefore they did not need to assay. It is doubtful if the Scott fine-ore furnaces in operation in California are averaging 75% extraction. In addition they are notorious for the quicksilver absorbed by the furnace and condenser walls; also soot is formed which has to be re-treated for contained mercury. The products of fuel combustion being mixed with the vaporized mercury, cause condensing troubles.

These experiments have shown that high extraction (above 90%) can be obtained by water concentration on tables, with friable ores in which the cinnabar is distinctly crystalline. Crushing by rolls produces a minimum of slimes. If, however, the pulp contains a cinnabar slime, either from "paint" ores, or by reason of having to crush fine to release the sulphide, the extraction by tables will be low. In such cases, though, it can be improved by classification and treating the different sizes on separate tables. The slimed cinnabar can be recovered by flotation. A high extraction has been obtained by flotation tests in finely ground (80-mesh), fresh ores, utilizing either pine-oil derivatives or eucalyptus oils. We say "fresh" ores, because, contrary to common conception, cinnabar on exposure does oxidize sufficiently to affect flotation re-

sults, as some tests have indicated. Good results were obtained by table concentration on an ore carrying natural quicksilver.

The concentrates being obtained, have yet to be roasted. Retorts are of limited capacity; and the concentrates, because of their high specific gravity, require stirring to prevent packing. A small furnace of the Scott type could be used, with a narrower shaft and narrow shelf-slit; such as in use at the New Idria mine for treating soot. Here again we have the fuel combustion products mixed with the quicksilver vapor and the attendant condensing difficulties. Some form of rotary roaster may be adapted, or a small-size unit of the McDougall or Wedge type of mechanically-rabbled furnace muffle-fired.

The ultimate decision between a straight furnace reduction or concentration and roasting of concentrates, will be a matter of comparative costs coupled with comparative extractions. The initial installation of a Scott fine-ore furnace unit is high (including condensers, etc., \$1000 per ton day capacity. We know of instances where the cost has been materially less than this figure, but they are the exception rather than the rule; the extraction is low (in the majority of cases probably less than 75%); cost of operation is low (50 cts. to 75 cts. per ton for large units, economically managed, though this does not include high cost repairs, interest or depreciation on the high initial installation capital). A concentrating plant of equal capacity will require less than one-tenth the initial capital expenditure, and a correspondingly lower depreciation charge; it will give 25% to 30% higher extraction; but the operating cost, on account of finer crushing, will be 30% to 50% higher. These points will have to be determined for each individual property.

An Automatic Tailings Sampler.

In taking samples of the contents of the launder, the personal equation of the workman commonly employed to do this must be reckoned with. A mechanical method of taking the samples, which would do the work uniformly, automatically and at predetermined intervals, would therefore be desirable as well as economical. An invention of this kind is to be credited to Charles L. Lawton of Hancock, Mich., and his patent (No. 1,188,794) has been recently granted. The sample launder which he employs need not be located lower than the upper level of the main launder, and a fluid pressure jet is employed to lift the samples from the main launder to the sample launder automatically. At the same time the jet moves back and forth across the main launder so that a representative sample is secured. The fluid is automatically cut off from the jet at the termination of each movement, which results in economy of operation. A seal is established over the intake to the jet, whereby the air is prevented from being drawn in, and other means are employed to regulate the frequency of the sample-taking operation.

Mining Possibilities in Colombia, S. A.—VI

MATT. W. ALDERSON.

We travel along a river in Colombia, the Riachon, for instance. The country rock on the sides is gneiss, the bed of the stream is angular broken rock of this character. Suddenly we come to a marked change. For half a mile or more there is gravel in the bed of the stream. The sides are of softer material. This part of the stream bed and hundreds of feet up the hill on one side has been mined for its gold. We go on up stream and we are in gneiss again. After sev-



MR. ALDERSON AT LA VIBORITA MINE.

eral miles we come to another place where placer mining has been, and is still, remunerative.

Why these isolated spots? Why is there no pay gravel between? Can it be said that the angular pieces of gneiss in the bed of the stream would not furnish splendid riffles for holding gravel and gold?

The Pato and the Nechi properties each have their millions. They are on opposite sides of the river from each other. How does it happen that there is not other rich ground up the valley or down the valley, connected with one or both of these splendid properties?

If placer gold was deposited by stream action, how does it happen that in flowing across a valley it left the gold where the bedrock is 75 to 90 ft. below the surface, and a short distance down the valley where the depth is only 10 to 20 ft., and the bedrock forms the finest kind of a natural riffle there is no gold whatever?

If placer gold comes from the milling down of quartz ledges, why is it that only once in 100 times or more are we ever able to detect any kind of a connection? And if that were true of the gulch deposits, where do the cerros of Columbia and the hilos come from?

These are puzzling questions in the light of the theories handed down to us in the books. Let us

follow our own observations and conclusions, seeking only and always the truth.

And first let us see if we can agree on definitions of a few words. What is a "cerro"? A cerro is a mass of fragmentary material, principally clay and sand with some gravel, containing a small amount of gold. What is a "hilo"? A hilo is a gravel deposit on edge, between two enclosing walls of country rock.

Now there are gravel deposits in stream beds in Colombia with hilos and cerros in hillsides close by. Generally it is easy to see that a part of the gravel deposit came from the milling down of these cerros and hilos. The connection between them is intimate. Where did they come from?

On the Viborita property, in Colombia, is a quartz vein called the Alaska. It carried good values and was mined down to as far as it could be drained by a tunnel from the valley level. It stands at an angle of perhaps 40°. Paralleling it on the south, and with perhaps 100 ft. of country rock between, is a hilo. To the west the mountain is cerro. Large parts of this cerro have been ground sluiced down by nature in the past untold centuries, and where this action was greatest a small gulch was formed up which in times of antiquity the natives worked the gravel and took out the gold. Of late years a part of the summit of the mountain was mined by the company at present owning the ground, with resulting clean-ups of several thousand dollars. Is there any connection between the quartz and placer deposits?

We know that quartz is formed on the surface of the earth. We know how it and the accompanying gold are leached from the igneous magma. We know



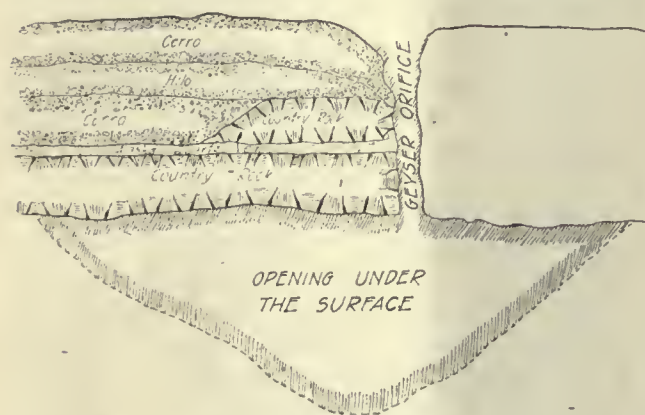
1 AND 2 APEX OF ALASKA VEIN; 3 HILO.

how they are brought to the surface of the earth and spread out over it. We know how, later, the leached material is ejected, and how parallel veins are formed with parallel layers of country rock between. We know how, with this process going on for long periods, an immense cavern is formed in the bowels of the

earth, and the superincumbent mass above eventually falls, setting the quartz deposit on edge.

The accompanying illustration shows a cross section of the ground at the Viborita, wherein lies the Alaska vein and the paralleling hilo. Can we doubt that the hilo takes the place of what in some other parts of the world would be a parallel quartz vein?

We have but to understand that the hilo at the time it was formed was a part of the surface of the earth, the same as were the quartz veins. Then it is easy to understand that a cerro is no more nor less than tailings from nature's leaching vat, ejected as we know fragmentary material to be from geysers.



QUARTZ VEIN AND HILO BEFORE BEING SET ON EDGE.

when they become so choked that the leaching process is not carried on easily.

Does it not become plain to us how much of the bedrock at the foot of the mountain at the Viborita, wherein lies the Alaska vein, and the hilo is from 60 to 90 ft. below the surface, when a short distance down the valley and some distance up the valley it is not one-fourth so deep? Is it hard to understand why the pay part of the mine is directly in front of this mountain?

The Viborita is a much smaller deposit than the Pato, yet the corresponding cerro is much greater. What caused the difference? We do not know. But it is easy to surmise a conclusion that is reasonable. The Viborita was not fed by so much water. The throat of the geyser was smaller and the ejections were thrown higher and landed at a greater distance from the source. The Pato was fed by a much greater quantity of water. Everything was on a larger scale, the leaching was more perfect, and ejections were greater, but not through so narrow an opening. The dissolved silica went down stream instead of being left near the orifice of the geyser to make a quartz vein or deposit of silicious gravel. The ejections were never thrown to great height, so the cerro is insignificant. There was more of a stream for ground-sludging the gravel, and we have a correspondingly richer concentrate.

What do these observations mean to a man who has the intelligence to put two and two together to make four? They mean that the source of placer

ground was not up hill but in the ground beneath, that the gravel was thrown out of an orifice, and later on washed back into it. They mean that as one rides along a valley which has been mined for its placer gold and notices a cerro or a hilo on the side that the bedrock in front of that cerro or that hilo must be deeper than the ordinary bedrock of the channel if washed down by stream action only, and he is ready to drill in such ground with almost positive certainty that the gravel deposit there, and the better part of the pay, were beyond the power of the early day miner to reach. How many such places there are in Colombia I cannot say. I know of several, in my limited observation. How rich they are cannot be told until they are tested. But some day they will be understood and they will be worked, each according to its peculiarities, etc., and the result will be the adding of many, many millions to the wealth of the world.

* * *

My stay in the tropics was somewhat longer than 6 months. I went prepared to face all manner of danger to my health from obnoxious insects, fever producing conditions, etc. I was continually surprised by not having to meet those contingencies. On the Isthmus of Panama and on the rivers of Colombia, the middle of the days were uncomfortably hot; the temperature being in the 90s in the shade, but I was actually annoyed by insects less than I would have been at home in the same period. I experienced no illness of any kind whatever, and there was never a day when I was not ready for such demands as might be made on me.

I know men who were not so fortunate. They were annoyed greatly by insects. I know men who took large quantities of quinine or other drugs as a preventive of fever, who had severe headaches and attacks of what they called malarial fever. I know men who would not even bathe their faces or wash their hands in the morning because they felt feverish.



CROSS-SECTION SHOWING ALASKA VEIN AND PARALLEL HILO.

I was never afraid of water in my interior, and I used a great deal of it on my exterior. I was careful to avoid things that would tend to make my system feverish. I was regular in my habits and ate my three meals a day. If anything was apparently going wrong with me I gave it attention immediately. On one trip

I was stung in perhaps 40 places by small black wasps, hardly larger than gnats or fleas. The stings were very painful and swelled to considerable size. My peon said I would be unable to travel the next day. I happened to have a tube of carbolized vaseline with me. I applied this freely and in an hour I was as comfortable as if nothing had happened.

I believe the stings of insects are more poisonous in the tropics than in the north. And I would advise travelers there to go with such aids as they have learned by experience will best neutralize the effects of such stings. The natives violate all the essential rules laid down for us by sanitariums and thrive. In their villages they have no sewers. The tropical sun is a great destroyer of germs, and if the people only leave their waste products out as far from the house as not to be under the eaves, nature will do the rest. Her sewerage system is perfect. A tropical shower is all that is needed to leave everything sweet and clean.

Most of my time was spent in the mountains at an elevation of nearly 5000 ft. The coldest morning during my stay the thermometer registered 60. In the middle of the day the temperature, not in the direct rays of the sun, was 68 to 72, never higher. The climate was as near perfect as can be imagined. The water was good, the people were good and the country is good. It is a country rich in all kinds of undeveloped possibilities, particularly in an agricultural way and as a section for placer mining.

Double-Chamber Acetylene Lamp.

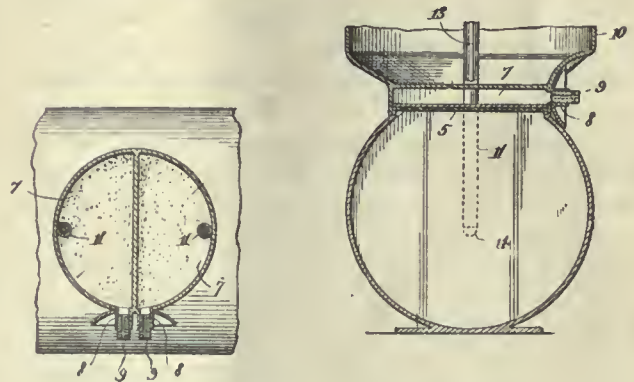
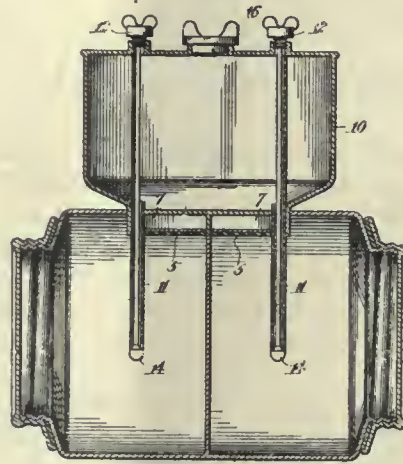
The lamp here illustrated has two carbide chambers for the generation of gas, one being used at a time. While the carbide in one chamber is being used, the other chamber may be refilled or replenished; no necessity for extinguishing the light. Furthermore, the carbide chambers are provided with compartments into which the gas is delivered and burners communicate with these compartments, the burners being in such close proximity with relation to each other that the gas emanating from one burner may be ignited by the flame at the other burner, and vice versa.

The lamp has a cylindrical body closed at its ends by means of detachable screw threads caps. A partition divides the body into two carbide chambers or compartments. A foraminous plate (5) is located in each of the compartments at the upper part and filtering material such as felt or blotting paper is mounted upon the plates. The plates serve as the bottoms of gas chambers (7). Nipples (8) communicate with the chambers and are located one at each side of the partition. Burners (9) are provided at the outer ends of the nipples.

A water tank (10) is fixedly mounted upon the body midway between the ends and tubes, extend down into compartments in the main body. The upper portions of the tubes (11) open into the tank (10)

so that water may flow from the tank through the tubes into the body of the lamp.

In operation the caps are removed and carbide is placed at the opposite sides of the partition. The cap (16) is swung from over the opening and the tank (10) is filled with water. While this is being done, the heads (14) are brought to closed positions against the lower ends of the tubes. When it is desired to generate gas in the lamp, one or the other of the caps is turned whereby the rod connected with the cap is moved longitudinally and the head (14) is moved away



DOUBLE CHAMBER ACETYLENE LAMP.

from the lower end of the tube (11), through which the rod passes. Thus, the water may flow from the tank (10) down through the tube (11) into the carbide at one side of the partition. When the carbide in the compartment becomes exhausted or inefficient for the purpose of generating gas, the other cap (12) is turned whereby the water is permitted to enter the other carbide compartment.

Mica has physical properties which render it of value or indispensable in several industries, such as the manufacture of electrical machinery and apparatus, the glazing and decorative trade.

Zinc silicate can be assayed by the Lowe method or a modified form of this process, but the formation of gelatinous silica both retards the assay and renders the result unreliable.

Production of Primary Spelter First Half of 1916

C. E. SIEBENTHAL.*

Reports submitted by all zinc smelters operating during the first 6 months of 1916 show that the production of spelter from domestic ore in that period was 267,696 short tons and from foreign ore 48,756 short tons, a total production of 316,452 tons, compared with 272,987 tons for the last half of 1915 and 216,532 tons for the first half.

The output of spelter by Illinois smelters increased over 5,000 tons for the 6-month period, and that of Kansas over 8000 tons, but the gain in Oklahoma was the greatest of all—over 15,000 tons—a result of the completion of a part of the large contemplated increase in smelter capacity announced early in the year. The remaining spelter-producing states also made a large gain, principally in Pennsylvania, where the new smelter at Donora was put into complete operation. The output of primary electrolytic spelter, amounting to 1697 tons, is also included in the production of these states.

The stocks of spelter held at smelters on June 30, 1916, amounted to 23,817 tons, against 14,253 tons at the beginning of the year and 5884 tons at the middle of 1915. This shows a gain over stocks at the close of the year, part of which was doubtless due to the accumulation of working stocks at new smelters which started during the period.

From the foregoing figures and the records of the Bureau of Foreign and Domestic Commerce it is calculated that the apparent consumption for the period was 229,086 tons, which compares favorably with 203,588 tons for the last half of 1915 and 160,906 tons for the first half. This consumption was not altogether domestic, however, for it must include the zinc content of the exports of brass and brass articles, which, as will be seen from the table of exports by classes, were largely increased during the first half of the present year.

In addition to that produced from ore, 15,800 of spelter was distilled or recovered electrochemically from zinc ashes, skimmings, and drosses. Probably one-fourth of this output of secondary spelter, including the considerable quantity of electrolytic secondary spelter, was of high grade. No statistics were obtained of the spelter produced by remelting skimmings, drosses, etc., but it was probably not less than 12,000 tons. The total output of spelter from both ore and skimmings was therefore about 344,000 tons, or at the rate of 688,000 tons a year.

Imports and Exports.

The imports of spelter were 464 short tons, compared with 415 tons during the last half of 1915 and 489 tons during the first half. The exports of spelter

of domestic origin were 58,007 tons, against 54,235 tons in the last half of 1915 and 64,368 tons in the first half. The exports of spelter of foreign origin, including spelter exported from bonded warehouse, as well as articles manufactured from spelter of foreign origin and exported with benefit of drawback, were 20,197 tons, compared with 8016 tons in the last half of 1915 and 5959 tons in the first half.

The imports of zinc ore were 231,845 short tons, containing 93,907 tons of zinc, and valued at \$7,449,068, compared with 92,169 tons of ore, containing 33,672 tons of zinc, in the last half of 1915, and 66,683 tons of ore, containing 23,997 tons of zinc, in the first half. The exports of domestic zinc ore were 34 tons, compared with 154 tons in the last half of 1915 and 678 tons in the first half.

The source of the foreign zinc ore imported into the United States during the first half of 1916 is shown in the following table:

From—	Quantity (short tons).	Zinc content ¹ (short tons).	Value.
Canada	12,863	5,187	\$ 314,524
Mexico	79,663	25,471	3,254,004
Spain	38,239	16,006	1,051,315
Italy	7,525	3,283	213,275
Australia	53,775	38,133	2,225,790
Other countries ¹	9,750	5,827	390,160
	231,845	93,907	\$7,449,068

¹Including China and Japan.

Prices and Value.

The price of spelter at St. Louis started at 17.3 cts. a pound, but a sharp rise in the latter half of February carried it to 21 cts. The price broke sharply to 17.1 cts. a pound by the middle of March, but a partial recovery brought spelter to 19 cts. by the middle of April, after which a long decline continued until the midyear, the half years closing with spelter at 12.1 cts. The average price of a pound of spelter for the first 6 months of 1916 was 17 cts.

The price of spelter at London followed a parallel course to that at St. Louis, but averaged about 2½ cts. a pound higher. The opening price was £90 a long ton (19.48 cts. a pound). The rise in February carried spelter to £111 a long ton (24.02 cts. a pound) by March 1, after which came the decline that, except for the partial recovery in April, brought the price down to £61 a long ton (13.20 cts. a pound) at the midyear. The average for the half year was £90 8s 7d a long ton (19.6 cts. a pound).

The foregoing prices are for the ordinary commercial grades of spelter. High-grade spelter suitable for cartridge spinning has been in such great demand that it has commanded a good premium.

At the average price for immediate delivery at St. Louis the value of the spelter produced from domestic ores during the 6 months was \$91,016,640, and that

*Excerpts from semi-annual report of U. S. G. S.

of the spelter produced from foreign ores \$16,577,040, a total of \$107,593,680.

As most of the spelter sold during the 6 months was sold under contract for future delivery at considerably lower prices than those quoted for immediate delivery, it is certain that the foregoing values are in excess of the real sales values.

It does not seem likely that the grade of ore smelted in 1915 and 1916 was materially lower than in previous years. Practically all zinc sulphide ores are concentrated before being smelted. If the average grade of zinc concentrates was in fact lower it would, of course, lower the average capacity per retort. But zinc smelters, forced by the lack of smelting capacity in 1915, paid a premium for higher grade concentrates and refused to buy the lower grade. It is improbable that the grade of concentrates from Franklin Furnace or from the East Tennessee zinc mines during 1915-1916 was lower. The grade of the small output of Wisconsin carbonates in 1915 was $2\frac{1}{2}$ points lower than in 1914, and that of the green sulphide concentrates was $1\frac{1}{2}$ points higher, but sphalerite concentrates from Wisconsin are mostly re-treated by roasting and magnetic separation, and the average grade as delivered to the smelter is not definitely known, but was higher than in 1914, because a larger part of the ore was roasted and magnetically concentrated before being smelted. In the Joplin district as a whole the average grade of sphalerite concentrates was 0.6 of a point higher, and the grade of carbonates and silicates more than 0.9 of a point higher in 1915 than in 1914.

Zinc sulphide concentrates from the Butte & Superior mill assayed on the average half a point higher in 1915 than in 1914. The spread of flotation treatment during 1915 must have operated to raise the grade of zinc sulphide concentrates in other western states. In fact, so far as domestic zinc concentrates are concerned, the grade must have been raised instead of lowered in 1915. But large quantities of zinc concentrates from Australia have been received and treated in 1915-1916. If these were sufficiently lower than the average grade of domestic concentrates to overcome the increase in grade of domestic concentrates, then the average grade of all concentrates may have been lowered. Assuming 40% as the average zinc content of the carbonates, 58% as the zinc content of the Joplin sulphides, and 50% as the average zinc content of all other sulphides, we get an average zinc content of 49% for all zinc ores smelted. Ingalls estimates it at 50%. As the Australian concentrates have for several years averaged a little over 47%, and as probably the higher grade concentrates only were brought to the United States in 1915, it does not appear that the Australian imports have materially lowered the general grade of concentrates smelted.

Exports.

The following tables of exports, taken from the records of the Bureau of Foreign and Domestic Com-

merce, show the exports, both domestic and foreign, by classes and destination for the 6-months' period:

Destination—	January-June.	
	Domestic.	Foreign.
Canada	4,634	638
Great Britain	19,188	6,481
Netherlands	6	.....
France	18,804	11,177
Italy	5,897	1,901
Germany .....	.....	.....
Russia	3,219	.....
Japan	610	.....
Other countries	5,739	.....
	58,007	20,197

In the following table is given the exports of lead and zinc from the United States during the 6 months of 1916:

Domestic—	January-June, 1916.	
	Quantity (lbs.)	Value.
Zinc ore	67,200	\$ 1,792
Spelter and sheets	116,014,559	20,575,060
Zinc dross	56,025	3,080
Zinc manufactures .....	.....	304,452
Brass, old, for remanufacturing	2,568,092	527,884
Brass, bars, plates and sheets	103,085,355	28,917,034
Brass, articles made from .....	.....	98,110,795
Cartridges .....	.....	24,713,907
Lead, pigs and bars	93,283,401	6,198,514
Lead manufactures .....	.....	1,080,821
Foreign—		
Zinc ore, contents .....	.....	.....
Zinc, blocks, pigs and old	40,394,341	4,154,127
Zinc dust	157,671	29,357
Zinc manufactures .....	.....	1,072
Brass, old, for remanufacturing .....	.....	.....
Lead ore contents .....	.....	.....
Bullion, contents .....	.....	.....
Lead, pigs and bars	9,487,481	419,065
Lead manufactures .....	.....	516
Lead used in articles exported with benefit of drawback	9,489,870	4645,311
Zinc used in articles exported with benefit of drawback .....	.....	.....
		\$185,687,787

Represents the value of the metal used in making the articles exported with benefit of drawback.

Inflammability of Illinois Coal Dusts.

A bulletin recently issued by the U. S. Bureau of Mines on "The Inflammability of Illinois Coal Dusts," with J. K. Clement and L. A. Scholl, Jr., as authors, gives the results of a detailed study of the dusts of Illinois coal mines, conducted in co-operation with the Illinois State Geological Survey and the Department of Mining Engineering of the University of Illinois.

The purpose of the investigation was to obtain accurate information concerning the quantity and character of the dusts produced in the mines of the state in order that proper methods might be devised for preventing dust explosions.

It was found that the coals of Illinois when ground to a sufficient degree of fineness yield highly inflammable dusts which when suspended in air may give rise to violent explosions.

In the majority of the mines of the state the dusts adhering to the ribs were found inflammable. In about one-fourth of the mines the quantity of rib dusts present in the entries were found to be sufficient to form an explosive mixture with air.

As an element, vanadium is very widely distributed, it being contained in greater or less quantities in a number of pottery clays, in granite, iron and other ores at home and abroad.

ZINC SMELTING CAPACITY IN THE UNITED STATES, AUG. 1, 1916.

[Compiled from reports made to Mining and Engineering World.]

Operating Company.	Number of Retorts building or in operation.
ARKANSAS:	
Arkansas Zinc & Smelting Corp.....	Van Buren 2400
Fort Smith Spelter Co.....	Fort Smith 2560
COLORADO:	
United States Zinc Co.....	Pueblo (Blende) 2208
ILLINOIS:	
American Zinc Co. of Illinois.....	Hillsboro 4864
Collinsville Zinc Smelter Co.....	Collinsville 2304
Granby Mining & Smelting Co.....	East St. Louis 5620
Hegeler Zinc Co.....	Danville 5400
Illinois Zinc Co.....	Peru 5440
Mathiessen & Hegeler Zinc Co.....	La Salle 6168
Mineral Point Zinc Co.....	Depue 9068
Missouri Zinc Co.....	Beckemeyer 352
National Zinc Co.....	Springfield 4480
Robert Lanyon Zinc & Acid Co.....	Hillsboro 3200
Sandoval Zinc Co.....	Sandoval 672
KANSAS:	
American Spelter Co.....	Pittsburg 992
American Zinc, Lead & Smelting Co.....	Caney 6080
American Zinc, Lead & Smelting Co.....	Dearing 4480
Chanute Spelter Co.....	Chanute 1280
Cherokee Smelting Co.....	Cherokee (Bruce) 896
Edgar Zinc Co.....	Cherryvale 4800
Granby Mining & Smelting Co.....	Neodesha 3760
Iola Zinc Co.....	Concreto (Iola) 1320
Joplin Ore & Spelter Co.....	Pittsburg 1780
Lanyon Smelting Co.....	Pittsburg 448
Owen Zinc Co.*.....	Caney 1920
Pittsburg Zinc Co.....	Pittsburg 910
Prime Western Spelter Co.....	Gas (Iola) 5048
U. S. Smelting Co.....	Altoona 5048
U. S. Smelting Co.....	Iola 3440
U. S. Smelting Co.....	La Harpe 1924
Weir City Smelting Co.....	Weir City 448
MISSOURI:	
Edgar Zinc Co., Carondelet Works.....	St. Louis 2000
Missouri Zinc Smelting Co.....	Rich Hill 448
Nevada Smelting Co.....	Nevada 672
OKLAHOMA:	
American Spelter Corporation.....	Kusa 200
Bartlesville Zinc Co.....	Bartlesville 6336
Bartlesville Zinc Co.....	Collinsville 13,440
Bartlesville Zinc Co.....	Blackwell 1640
Bartlesville Zinc Co. (L-S. Plant).....	Bartlesville 3456
Henryetta Spelter Co.....	Henryetta 3000
Kirk Gas & Smelting Co.....	Checotah 2560
Kusa Spelter Co.....	Kusa 4000
La Harpe Smelter Co.....	Kusa 4000
National Zinc Co.....	Bartlesville 4970
Oklahoma Spelter Co.....	Kusa 1600
Quinton Spelter Co.†.....	Quinton
Tulsa Fuel & Mfg. Co.....	Collinsville 6232
Tulsa Spelter Co.‡.....	Sand Springs 8000
PENNSYLVANIA:	
American Zinc & Chemical Co.....	Langleloth 6384
American Steel & Wire Co.....	Donora 9120
New Jersey Zinc Co. of Pennsylvania.....	Palmerton 6960
WEST VIRGINIA:	
Clarksburg Zinc Co.....	Clarksburg 3648
Grasselli Chemical Co.....	Clarksburg 5760
Grasselli Chemical Co.....	Meadowbrook 8592
United Zinc Smelting Corp.‡.....	Moundsville
Total	201,900

*Under lease to Am. Zinc, L. & S. Co.

†Owned by United States Zinc Co.

‡Projected.

Comparisons Between Steam and Water Power

H. W. BUCK.

There is probably no branch of engineering quite so confused and misunderstood at present by the general public and even by technical men as that connected with the development of water-powers. The mental chaos existing has brought this important industry to a standstill, with great economic loss to this country.

The advocates of the steam turbine plant proclaim loudly that the evolution of the steam turbine has put the water-power permanently out of business. On the other hand, the ill-informed and over-zealous legislators and so-called conservationists preach that water-power plants hold such a monopoly of the power supply of the country that this economic grip must be broken by force. Between these two adverse influences the legitimate development of water-power is being crushed.

As in most engineering problems of a complex nature, there are so many variables involved that it is not easy to write equations to which any general solution can be given. Every instance has its individual points which must be carefully analyzed. It is true that steam turbine plants equipped with very large units in localities where cheap coal is available, together with abundant low temperature condensing water, are able to produce power at a cost lower in some instances than water-power can be generated and transmitted over a long line to the same point. It is not fair, however, to make the comparison in this way. The question of load factor is a controlling one, and must be thoroughly reckoned with before a correct conclusion can be reached. In each case the cost of the water-power should be figured at the power station busbars, and the steam power cost estimated on the same basis. Then the cost of transmission should be added to both steam and water-power costs to obtain the final comparison. The severe condenser water requirements for the modern steam plant often require its location to be at such a point that considerable transmission expense is necessary for it as well as for the water-power.

Another common error lies in comparing the theoretical cost of steam-power with the selling price of the water-power, which includes a profit. No steam central station is likely to sell power at cost. Furthermore, the "costs" frequently quoted for steam-power are switchboard costs only, and do not properly include fixed charges and other general items of expense.

Steam-Power Situation at Buffalo.

There has been much discussion of late, regarding the status of a large steam turbine station being constructed at present near Buffalo, N. Y., to be operated in conjunction with Niagara power. Loose and incor-

rect conclusions have been drawn from this fact as showing that steam-power has now surpassed Niagara power in economy. The situation at Buffalo is a special case. In the first place, Niagara power is limited by law in extent and cannot be supplied to meet further demands in the growth of the Buffalo load. The matter of load factor also enters as an essential factor.

Niagara power, like all water-powers operating on a definite constant stream flow without storage, must be sold on the basis of maximum demand at a yearly rate. Niagara power, as is well known, is sold at a price which includes a profit of from $2\frac{1}{2}$ mills to 3 mills per kilowatt-hour on the basis of 100% load factor use. The Buffalo system, like any other general power system without an electrochemical load, cannot utilize power at 100% load factor. If its load factor is, say, 60%, then the 3-mill rate on the 100% load factor basis becomes 5 mills at 60% load factor, and a cost is reached where the large steam turbine shows an advantage over water-power. Here again, however, the cost of steam-power is being compared to the selling price of water-power, which latter figure contains a profit. No steam-power station could afford to sell power on a 100% load factor basis in competition with water-power from Niagara Falls.

In spite of the active competition between steam and water-power, which is in many instances unquestionably in favor of the steam plant, there are still a number of situations where a water-power development can be legitimately and profitably made. Furthermore, many new water-power developments will be made if rational legislation is passed by Congress which will give to such enterprises the required security. Public opinion is apparently swinging around toward a more sensible point of view with respect to water-powers, and the recent action by the Conservation Congress in Washington, in which extreme hostile views in the matter were repudiated, confirms this belief.

Electrochemical Industry as a Factor in Water-Power Development.

The electrochemical use of water-power is becoming the greatest factor in the situation. The electrochemical business has been brought up on Niagara power and on the powers connected with the Great Lakes system, which are the only ones in this country that can deliver power at a constant rate throughout the year. There are, however, many large rivers in the country which can be developed at low cost for a power supply varying with the seasons, but with an enormous annual output in the aggregate at a cost per kilowatt-hour at least as low as from Niagara. It is to be hoped that the electrochemical industries can so

adjust the commercial operation of their processes for variations in production with the seasons that such water-powers will become available.

Where public utilities are to be served requiring a constant power supply throughout the year, the low-water season can be taken care of by combinations of steam and water-power, which in almost every case figure cheaper than either steam or water-power alone. The low capital cost of the modern steam turbine plant makes it financially possible to construct a steam plant as a part of a water-power system and shut it down for a considerable portion of the year without an excessive interest charge against the combined cost per kilowatt-hour.

An element inseparable from water-power development is the high-tension transmission line. During the past 20 years the limit of transmission has been extended at an average rate of about 10 miles per annum, and might now be placed at 200 miles. For the present the limit has undoubtedly been reached for the art as it stands today. Lines with respect to insulators, lightning and surge protection, etc., cannot be considered as satisfactory. This situation has caused hesitation in the use of hydroelectric power.

Reasons for Water-Power Development Stagnation.

In brief, then, the stagnation existing today in the development of water-power is due to several definite causes.

1. Congress refuses to pass the necessary legislation for the use of water-powers on public lands or on navigable streams.
2. The development of the steam turbine has under certain conditions resulted in power costs lower than the equivalent water-power, which has led to the false doctrine that all steam-power is now cheaper than water-power.
3. The evolution of the high-tension transmission line has been so rapid that the troubles which have quite naturally arisen, some of a serious nature, have tended to discredit transmitted power.

There is no proposition so economically sound and which deserves encouragement from all sources in this country as the development of water-power. All of the above difficulties can and will be overcome in due time. The country needs water-power development, and it is going to have it, but will not take it on oppressive terms. Engineers can clear up the steam-hydraulic controversy by proper analysis of the facts and by the elimination of boasting as to economies on either side. The difficulties with the transmission line will be met and overcome, as other difficulties in electrical engineering have been eliminated by experience and ingenuity.

We need to preserve all of the coal we have in the country for use in heating processes where it can be utilized at an efficiency of 85%. The use of coal for the production of power at an efficiency of 20% or less, which is now about the maximum, should be dis-

couraged, and this can only be done by the encouragement of water-power development.

Power Haulage in Death Valley.

The twenty-mule teams, with their picturesque drivers and long, snakelike 50-ft. cracker whips, that have made Death Valley and the mines of the Pacific Coast Borax Co. in California famous for more than a quarter of a century, and around which romance and tragedy has been weaved by the versatile publicity agent, are giving way to the more prosaic haulage system of modern times. Within the past year chugging gasoline industrial locomotives, with their trains of from 10 to 15 loaded cars, have wound their way up and around Black mountains and over Death Valley and the dry bed of Salt Lake, and the famous mule teams are passing into history. This change has been brought about by the cost data expert, who, with his charts and figures and the experiences of others behind him, decreed that, while the 20 mules were picturesque and afforded good material for literary essays, they proved too expensive in the production of borax. The gasoline industrial locomotive, he said, would not only cut down the haulage costs about one-half, but speed up the mines and cut down manufacturing and mining costs. His promise has proven true since the installation of the first two Plymouth gasoline locomotives more than a year ago, according to General Superintendent A. W. Sheean of the Pacific Coast Borax Co., and the change was more than warranted by the results received.

The full story of this interesting experience, as well as that of other mine owners in different fields, is contained in a 96-page book, "Cutting Haulage Costs in Half," copies of which can be secured by the Mining and Engineering World for any of its readers who may have a practical interest in the subject.

New Oklahoma Oil and Gas Possibilities.

Within the last few months numerous shallow gas sands have been encountered in several wells being drilled a few miles east and southeast of Billings, Okla. That these wells deserve a close watch by the oil and gas industry is the opinion of government geologists, because of the presence in this region of a large anticlinal fold, a type of rock structure which should be favorable for the accumulation of oil and gas. Should these wells discover any highly productive oil and gas sands, there is a good possibility for the opening of an oil and gas field of considerable extent near Billings. A description of the rock fold and a discussion of its possibilities are contained in Bulletin 641-E, recently issued by the Survey.

Rutile is the principal source of titanium, from which the latter is recovered in the electric furnace.

What the Mining Companies are Doing

Butte & Superior.

The quarterly report of the Butte & Superior Co. for the period ending June 30, shows net operating profits of \$2,062,029, compared with \$2,107,152 in the previous quarter. The last three quarters showed the following:

	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.	Sept. 30, 1915.
Net value zinc concentrates.....	\$2,879,568	\$4,337,412	\$3,614,570	\$2,997,128
Net value lead concentrates.....	246,341	264,303	240,053	228,110
Miscellaneous Income.....	22,772	21,427	18,265	14,715
Total	\$3,148,682	\$4,623,143	\$3,872,888	\$3,239,954
Operating costs.....	1,086,653	1,068,203	1,112,849	679,625
Net operating profits...	\$2,062,029	\$3,554,940	\$2,760,039	\$2,560,329

The company now has 290,197 shares outstanding, 17,500 having recently been issued for 35,000 shares of American Zinc, Lead & Smelting Co. common.

President MacKelvie says: Active development work was commenced on 1700 and 1800-ft. levels and while work is not great as yet, the size, character and grade of the ore bodies disclosed are fully as favorable as those of the levels above. Most of the work on these lower levels was confined to drifting, but even with the limited amount of cross cutting that was done the addition to ore reserves was substantial, and taken together with the additional reserves blocked out on the 1600-ft. level and above, constitute a total addition to reserves for the quarter about 30 per cent in excess of the tonnage mined for the quarter.

After the payment of the regular quarterly dividend of 7½ cts. per share and an extra dividend of \$10 per share payable to stockholders on June 30, the company had net quick assets of approximately \$3,900,000.

Sales of spelter have been made for future delivery covering a substantial portion of our production for the balance of this year. These sales have been made at a lower price than that applying to the second quarter.

Average price of spelter used in determining profits for quarter is 11.41 cts. per pound.

Utah Copper Co.

Net profits totaling \$9,895,316 were realized by the Utah Copper Co. during the quarter ended June 30, 1916. In the corresponding quarter a year ago net profits were \$4,412,298, cost 6.57 cts. per pound. Production was 48,384,929 lbs. copper, compared with 36,564,533 in previous quarter. After making allowances for smelter deductions and crediting miscellaneous income, including Bingham & Garfield railway earnings, average cost per pound was 6.726 cts., compared with 7.19 cts. for previous quarter.

The income account compares as follows:

	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.	Sept. 30, 1915.
Net profit from operations.....	\$8,675,432	\$6,186,414	\$5,771,281	\$3,663,708
Other Income.....	132,509	68,165	240,273	25,668
Nevada Cons. dividend...	750,375	509,250	509,250	375,188
Bingham & Garfield Rv. dividend	400,000	325,000	407,397	350,000
Total net profit.....	\$9,558,316	\$7,079,830	\$6,919,203	\$4,414,564
Dividends	4,873,470	4,061,225	2,436,735	1,624,490
Surplus	\$5,084,846	\$3,018,605	\$4,482,468	\$2,790,074

Earnings are computed on basis of 26.758 cts. per pound for copper, compared with 26.131 cts. per pound for previous quarter.

Copper production for the past five quarters follows:

	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.	Sept. 30, 1915.	June 30, 1915.
First month....	14,557,282	11,993,910	16,004,607	14,641,009	12,015,148
Second month....	15,950,215	11,849,972	13,722,723	15,966,543	14,053,765
Third month....	17,877,432	12,714,651	14,497,385	14,159,289	14,730,912
Total	48,384,929	36,564,533	44,221,715	44,766,841	40,799,825

Average monthly production was 16,128,309 lbs., compared with 12,188,177 lbs. in previous quarter.

President MacNeill says: Designs were completed to an extent sufficient to permit of actual construction work being started upon the addition of equipment in the mills at Garfield for the purpose not alone of greatly improving recoveries in connection with such large tonnages as are now being treated, but at the same time of materially increasing the tonnage capacity of the plants. The first work in this direction is being done at the Arthur plant and it is expected to have three of the 13 sections of that plant completed in the new arrangement before the end of the year. In the meantime work on other sections will be started and carried to completion as rapidly as material can be secured. The execution of these improvements will not interfere to any serious extent with the regular operation of the plants. Work will be started on similar improvements at the Magna plant as soon as the first three sections of the Arthur plants are completed and provided material and machinery can be secured more rapidly than it is required at the Arthur plant. The plans for extending these plants are practically identical as to each.

At the end of the quarter grading was in progress for the new leaching plant, the initial units of which as now being constructed will have a capacity estimated at about 2500 tons per day. The plant upon which construction is now being undertaken should be ready for use in the spring or summer of next year, depending largely upon how rapidly construction material can be secured. The site and designs for the leaching plant have been so selected and arranged that it can readily be increased to a capacity of 10,000 tons per day, or any intermediate capacity, if operating results of the initial plant justify such increase.

Chino Copper Co.

The report of the Chino Copper Co. for the second quarter of 1916 shows net earnings of \$3,221,969. Production of copper amounted to 18,099,182 lbs., compared with 16,267,450 in previous quarter. The cost per pound of net copper produced, after allowing for smelter deductions and crediting all miscellaneous income, was 8.89 cts., as against 8.95 cts. for previous quarter.

The income account compares, as follows:

	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.	Sept. 30, 1915.
Net profit from copper.....	\$3,136,278	\$2,667,416	\$2,407,919	\$1,503,946
Miscellaneous income, rents, etc.....	85,690	79,570	53,797	51,568
Total	\$3,221,969	\$2,746,986	\$2,461,716	\$1,555,414
Dividends paid.....	1,957,455	1,087,475	869,980	652,455
Surplus	\$1,264,514	\$1,659,511	\$1,591,736	\$ 902,959

Earnings are based on 27.19 cts. per pound for copper, as against 26.566 cts. per pound for previous quarter. There was no unsold copper on hand at the end of the quarter.

Copper production for past five quarters follows:

	1916. June 30,	1916. March 31,	1915. Dec. 31,	1915. Sept. 30,	1915. June 30,
First month....	4,496,270	5,316,975	6,319,194	6,650,429	5,027,548
Second month....	6,359,294	4,617,220	6,339,006	6,640,323	6,442,977
Third month....	7,243,618	6,333,255	6,302,045	5,254,286	6,984,977
Total	18,099,182	16,267,450	19,560,245	18,545,638	18,455,502

President Mac Neill says: Plans have been completed for increasing tonnage and production of mill. The proposed improvements will consist:

1st. Of a new section of the mill to be used for the treatment of oxidized and partially oxidized ores which are not amenable to the metallurgical processes now employed, and of which character of ores approximately 1,000,000 tons have already been mined and stored in stock piles, leaving a large quantity yet unmined. The proposed section will have a capacity of about 1000 tons per day.

2nd. Installation of additional fine grinding machinery as an adjunct to the present five section mill. This will not only result in an increase of tonnage as applying to the

ordinary classes of concentrating ores, but will result in higher recoveries on those ores.

3rd. Installation of a plant for the retreatment of tailings from past operations. The initial plant will be to a large extent experimental, but it is believed that several million tons of these tailings can, by improved methods, be retreated at a substantial profit.

It is expected that some of these improvements can be put in operation before the end of this year, but it will take at least 12 months to complete all of them.

Copper Range Co.

In the first 6 months of 1916 the Copper Range Co. earned over \$3,000,000 net, or approximately \$8 per share on 400,000 shares. By a wide margin it was the most prosperous half-year the company ever had, but the current half of the year promises better, provided, of course, that copper now unsold brings as good prices as anticipated. The company has sold practically all of its September copper, and it is believed that sales for the last three months will be at prices which will insure earnings for the full year of from \$18 to \$20 per share.

Copper Range thus far in 1916 has paid \$4 per share in dividends, or \$1,600,000, and yet the treasury never was so strong in cash. The company does not owe a dollar and has \$3,000,000 in cash in Boston banks. It also has copper sold, but not paid for, which runs over \$750,000 in value.

Production this year will easily make a high record. It should be not less than 55,000,000 lbs. and may possibly run nearer to 60,000,000 lbs. This includes, of course, all of Champion's output in which Copper Range owns but a half interest; but Copper Range's own production should be close to 40,000,000 lbs., against 37,000,000 in 1915.

This unprecedented prosperity for Copper Range raises the question as to whether or not the stockholders are not in line for an increase in dividends in the near future. As the company has no need of further accumulating cash, the answer is that they undoubtedly are.

Magma Copper Co.

The Magma Copper Co. reports for the second quarter of 1916 as follows:

	Quarter ending June 30.	Quarter ending March 31.
Copper product, lbs.....	2,232,936	2,043,784
Cost copper per lb.....	10.47c	9.13c
Average price copper.....	24.16	22.39
Operating profits.....	\$305,025	\$270,201
Average monthly profit.....	101,675	90,067

Chief Con.

A report by Supt. Cecil Fitch says that 9692 ft. of work were accomplished in the 6 months ending June 30, that 42,144 tons of ore, yielding net after the payments of transportation, smelting and sampling charges, \$742,-057.65, were produced. He says in part:

Metal Contents—	
Gold, ozs.	5,225
Silver, ozs.	843,535
Lead, lbs.	7,450,932
Copper, lbs.	1,795
Zinc, lbs.	519,798
Assay Values—	
Gold, ozs. per ton.....	124
Silver, ozs. per ton.....	20.02
Lead (on lead ore), per cent per ton.....	11.79
Copper (on copper ore), per cent per ton.....	1.95
Zinc (on zinc ore), per cent per ton.....	30.36
Average gross value per ton.....	\$30.08
Smelting, freight, sampling, etc.....	12.47
Average net value per ton.....	17.61

"The net profit after the payments of all charges is \$355,701.85. A general description of the development work is as follows: The 1000 ore system has been extended in flat deposits between the 600 and 800 levels. A considerable part of the product has and now is being derived from these. Stopping is also being carried on to a small extent, in the system, at the 900, 1000, 1200 and 1400 levels. A small but good grade zinc deposit was found at and below the 1000 level. The 1400 ore system continues to produce a moderate amount of ore, this system has been extended north considerably between the 1550 and 1800 levels.

"To the north of the last mentioned system a new system has been discovered (and a stope opened up) which is known as the 1800 ore system. This ore was developed at the 1800 and has been partially proved up to the 1600 level. It has also been followed down to the permanent water level at 1820, the values there are the same as above that point. This system is now contributing about one-third of the mine's products. During the first part of this semi-annual period the mine was operated at full capacity, but during the last two months the product has been reduced owing to the inability of the smelters to take all of the ore, on account of the increased production arising from the different districts; resulting from the stimulus of the high metal prices. This congestion will probably continue as long as these prices continue."

The financial statement is as follows:

Receipts—	
January 1, 1916, on hand.....	\$210,034.03
Ore sales, 6 months.....	631,967.58
Interest, 6 months.....	2,100.00
Eureka City Mining Co.....	71,173.49
	\$915,275.10
Disbursements—	
Operating costs, 6 months.....	\$276,265.73
Machinery and equipment.....	14,995.63
Construction.....	8,320.48
Mining claims.....	144,286.99
Foughton expense, 6 months.....	1,634.86
February 7, dividend No. 7.....	44,033.80
May 15, dividend No. 8.....	44,148.15
	\$533,685.64
July 1, 1916, balance on hand.....	\$381,589.46

Miscellaneous Company Notes.

It is understood that suits are to be started in several states by independent shareholders of Tamarack against Godfrey M. Hyams. Main allegations will be that Mr. Hyams has caused large losses to shareholders by litigation he instituted which prevented the sales of the Tamarack property to Calumet & Hecla.

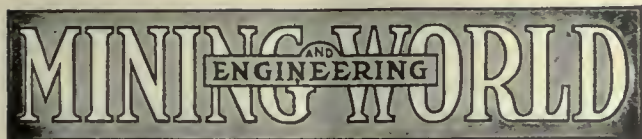
Braden Copper Co.'s production in July was about 50 per cent normal. Heavy snows and inclement weather followed by a break in the tailing dam, resulted in low, muddy water, consequently mill closed down on June 15 and did not start again until July 10. Properties of company suffered little damage from accident at the tailing dam.

The American Smelting & Refining Co. has none of its Mexican plants in operation, notwithstanding that the Greene Co.'s works at Cananea and the Moctezuma Copper Co. at Nacozari have been able to operate close to normal. The smelters of the American Smelting & Refining Co. in Mexico are located farther south of the international boundary than either the Phelps, Dodge & Co. or Greene plants, making it more difficult for a "get-away" in the event of serious trouble.

At a special meeting of the Batopilas Mining Co. stockholders, the proposed amendment to the charter, authorizing the management to conduct mining operations outside of Mexico, was approved. No action was taken on the other proposed amendment to extend the company's charter, owing to lack of sufficient proxies. Authorization of the former required approval of 270,000 shares, while 300,000 shares were needed to carry the other. Stock represented at meeting totaled about 275,000 shares out of outstanding 450,000 shares.

The properties owned outright by the Kennecott Copper Corporation produced 98,000,000 lbs. of copper in the 7 months ended July 31, placing the company well up among the leaders in the copper industry of the United States. Kennecott has a 25 per cent interest in the Utah Copper Co., and through it a one-eighth ownership in Nevada Con., and was therefore financially interested in the production of over 130,000,000 lbs. of copper in the period mention, as per the following table:

	Production, lbs.
Alaska Mines.....	72,150,000
Braden Copper Co.....	25,870,000
Utah Copper Co. (25%).....	26,000,000
Nevada Cons. (12½%).....	6,600,000
Total	130,620,000



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*Illustrated.

Copper Production and Sales at a High Figure.

Negotiations begun by the European belligerent nations to cover their prospective needs of copper for this year and part of next have resulted in a great stimulation for the red metal. The high record of sales established last April, when the total booking of all agencies was close to 400,000,000 lbs., will be broken this month, according to the prediction of producers.

The prices being realized are entirely satisfactory to the producers and mean prosperity for them for many months to come. It is interesting to note in connection herewith that the largest contracts closed thus far, in point of tonnage, are with domestic manufacturers. It was natural the producers should have given to their regular customers, who are to be with them after the European war is closed, the first chance to cover their needs. It is notable that foreign buyers who have closed contracts since have paid top prices.

Practically all of the copper available to the end of the third quarter of the year has been placed, while that for the fourth quarter has been put in a strong position by extensive contracts which go far toward absorbing the prospective output. Contracts also have been begun for early 1917 deliveries and negotiations are on which will extend over all of next year. Much of the domestic copper will go into the manufacture of munitions, besides providing the wants of regular manufacturers of ordinary trade products.

October copper sold at 27 cts., the highest price received for several months. November contracts have been made at 26½ cts. Inquiries have come into the market from American manufacturers for copper to be delivered through next February, and the price has advanced from the 25-ct. level of a few days ago.

In reviewing the production of the larger producers during the first 6 months of 1916, Anaconda ranks at the head in point of increase, producing as it did 164,500,000 lbs., or 46% more than in the 6 months of 1915. Phelps, Dodge & Co. rank second with 85,000,000 lbs., as compared with 65,000,000 lbs. in the same period in 1915. Utah Copper outproduced 84,949,000 lbs., a 26% increase over the half year of 1915.

Survey's Report on Public-Land Oil Matters.

Most people engaged in the oil business in the states containing public lands believe that the policy of withdrawing oil lands from entry began in 1909, and that the first withdrawals were based on a desire to conserve the country's natural resources. As a matter of fact, the first oil-land withdrawals of any consequence were made in 1900 and were based on petitions from oil operators who wished to be protected against the filing of agricultural entries covering the lands they were prospecting. The "oil placer" act

had been in operation about 3 years, the oil industry of the west was just entering on the remarkable activity which it still maintains, and demands came from practically every new field for the withdrawal of lands from agricultural filing so that drilling might be carried on unhampered. In 1900, 1901, and 1902 more than 20 withdrawal orders were issued by the General Land Office covering large areas in California, Oregon, and Wyoming.

After this withdrawal fever came a reaction. The withdrawn area was large and included much agricultural land, and intending entrymen and selectors called for restoration. As a result there were 3 restorations in 1902, 13 in 1903, and 12 in 1904. Then there was a quiescent period, followed by 1 restoration in 1906 and 6 in 1907. One of the early withdrawal orders was not canceled until 1910, and another, involving several townships, was left outstanding until 1912. Both were in territory which has not proved to be oil bearing.

Meanwhile, members of the Survey, working in the California fields, became impressed with the need of the oil operators for protection against agricultural filings during the drilling period, and in 1907 a large area in California was withdrawn on their recommendation. Similar withdrawals were made in 1908 and 1909, including lands in Oregon and Louisiana, as well as California. These withdrawals, although essentially similar to the early Land Office orders, were more closely confined to prospective oil territory; they probably included less agricultural land; the number of oil operators benefited had greatly increased; large withdrawals of coal and phosphate lands had accustomed the public to the withdrawal idea; and, perhaps most important, field examinations with a view to classification were carried on as rapidly as the funds available would permit. The lands shown by geologic surveys to be barren of oil were promptly restored; those offering possibilities of oil were retained in withdrawal.

Ultimate Profit vs. a Low Cost Sheet.

A great many reputations have been made and unmade by a cost sheet. There seems to be an idea among certain mining people that an engineer's ability can be gauged by this means. To a certain extent it can, but there are divers factors entering into its make-up that unless these be given consideration a correct judgment is impossible.

There are companies that will spend \$100,000 for new equipment in order to effect a saving of a few cents per ton in treatment charges; but there are other companies that would prefer to distribute the \$100,000 in dividends and incur the extra cost of treatment. Without knowing the facts of the case, it would be impossible to say which company shows the best judgment. If the saving would amount to \$15,000, annually, and there were several years of ore reserves assured, the expenditure would be warranted. Unfor-

tunately the question of ultimate profit is not always given as serious consideration as the more alluring one of a low cost sheet.

Every engineer, when he takes hold of an important mining project, has a more or less vague desire to make a reputation for himself for cheap mining and milling. Such ambition is laudable and tends to bring out the best that is in an engineer, but when the man loses sight of company profit in an effort to add to his own reputation it is time to call a halt.

Low costs do not always mean big profits. Very often in order to reduce costs it is necessary to build a plant of such dimensions that the payment of its original cost to the stockholders represents pretty near the full amount of the dividends paid.

Comparison of the cost sheet of different mines is usually unfair to one of the parties, unless the mines are in the immediate vicinity of one another and operate under practically the same conditions as regards wages, cost of power, size of plant, etc. There are, however, mines remotely situated that operate under very similar conditions, and in such cases comparisons are interesting and instructive.

There are two basic industries—mining and agriculture. Both are necessary to our present civilization. Ages ago, when humans were little better than animals, both mining and agriculture had no existence. Men ate fruits and the flesh of animals, birds and fish caught and killed by their hands or with clubs and stones. But as his intelligence increased man learned to grow his own grains and other vegetable foodstuffs. He also sought better means for cracking the heads of his neighbors and for preventing them from cracking his. He found metals and found them well suited to the fabrication of weapons, so he dug ores from the ground and smelted them in a crude sort of fashion. From these small beginnings present day agriculture and mining have been evolved. As civilization spread the demands on both industries grew more numerous and their development still continues. Agriculture must persist as long as men inhabit the earth, but what of mining? Can mining go on forever, or will man in time completely exhaust the earth's store of useful minerals? When we stop to consider the dependence of our present civilization on coal, petroleum, metals, and the other mineral products we wonder what is in store for far-distant future generations.

Silver has again shown a disposition for price advancement. Tuesday's quotation of 66 cts. represents an advance of 6 cts. per ounce since July 10, when silver dropped to 60 cts., the lowest since its spectacular rise this spring. The recent slump was attributed to selling from southern China. Liquidation from this quarter has now apparently run its course and the market is developing a decidedly stronger tone. It would cause no surprise if an additional advance was made in the next few weeks.

PERSONAL.

Julius Fohs, consulting oil geologist, has opened offices in Tulsa, Okla.

J. V. Bowman is now chief chemist for the Andes Copper Co., Chanaral, Chile.

E. L. Estabrook is now geologist for the Wisconsin Zinc Co., Platteville, Wis.

Palmer S. Gray, mining engineer of Houghton, Mich., has gone to Garfield, Utah.

S. A. Crandall is now with the Bunker Hill & Sullivan Co., at its smelter, Kellogg, Ida.

R. B. King and D. D. Fraser, mining engineers, have left Houghton, Mich., for Butte, Mont.

N. O. Lawton, conducting exploration work at Hancock, Tenn., has left for South Strafford, Vermont.

Arthur Notman, mining geologist for the Copper Queen, Bisbee, Ariz., has returned from a trip to New York.

Corey C. Brayton has opened consulting mining and metallurgical engineering offices in San Francisco, Cal.

T. R. Hunt, London, E. C., has accepted the position of manager of the San Juan Mines, Ltd., San Juan, Argentina.

W. F. Jones, recently returned from Honduras, is now superintendent of the Tough-Oakes mill, Kirkland Lake, Ont.

Kenyon Burch, engineer in charge of design and construction at the Inspiration Con. property, Miami, Ariz., is on a trip east.

A. G. Gullberg, Calumet, Mich., superintendent of motive power for the Calumet & Hecla Copper Co., has returned from a trip to Europe.

N. C. Whitten, Great Falls, Mont., has resigned as flotation foreman for the Anaconda Copper Co., and will leave for Cerro de Pasco, Peru.

Carl J. Trauerman, mining engineer, has resigned as mill superintendent for the August Mining Co., but will retain his headquarters at Butte, Mont.

C. A. E. Blanchet, Ottawa, Ont., is investigating conditions for the Canadian government at the asbestos mines around Thetford Mines, Quebec.

Henry M. Howe, professor of metallurgy, Columbia university, has been made honorary vice-president of the Iron and Steel Institute of Great Britain.

William B. Phillips, former president of the Colorado School of Mines, will resume a consulting mining and metallurgical practice at Austin, Texas.

A. B. Shepherd, Pittsburgh, Pa., general manager of mines for the Jones & Laughlin interests, is touring the iron districts of Lake Superior inspecting company property.

J. C. Devine has resigned as assistant superintendent of the Ray Con. Copper Co. to devote his attention to prospects of the Pinal Development Co., of which he is president.

E. Thornton, Twin Buttes, Ariz., with the American Smelting & Refining Co., has changed his headquarters to Silverbell, Ariz., where he will have charge of the Imperial mine.

Capt. J. P. Hodgson, formerly mine superintendent at the Copper Queen mine, Bisbee, Ariz., has been promoted to the mine department of Phelps, Dodge & Co., in a consulting capacity.

Howard C. Parmelec has been elected president of the Colorado School of Mines at Golden, Colo., succeeding William B. Phillips, recently resigned. He is president of the Colorado Scientific Society and is well known for his ac-

tivities in scientific research work. He has also been connected as chemist with a number of mining companies and with various publications as an editorial contributor.

Assistant Professor T. G. Chapman, of the metallurgical department of the Michigan College of Mines, has resigned to take charge of the same department in the University of Arizona at Tucson.

Robert Livermore will resign as manager of the Kerr Lake mines, Cobalt, Ont., to become consulting engineer for the company with offices in New York. The resignation will take effect Sept. 1 and the vacancy will be filled by Harry E. Kee.

F. B. Close, who developed the White Pine Extension and the Algonac, and Prof. A. E. Seaman, head of the geological department at the Michigan College of Mines, have gone to the Golconda silver district of Canada to examine some properties.

OBITUARY.

James Mason, a pioneer prospector and discoverer of the Klondike district, recently passed away near Carcross, Alaska.

Robert S. Towne, connected with many Mexican mining enterprises passed away at the Engineer's Club, New York, on August 3, at the age of 58 years.

C. J. Daman, a 1913 graduate from the Colorado School of Mines, recently passed away in Butte, Mont., from the effects of an attack of pneumonia. At the time he was in the engineering department of the Anaconda Copper Co.

Robert Strain, a 1914 graduate from the University of Princeton, was accidentally killed at the flotation plant of the Burro Mountain Copper Co., Tyrone, N. M., on August 13. The accident occurred when he spilled a quantity of cresylic acid, the fumes, rather than burns, having been determined as the cause of death.

SCHOOLS AND SOCIETIES.

American Institute of Mining Engineers.—The institute makes announcement of its absorption of the Mexican Institute of Mining and Metallurgy, which will hereafter be known as the Mexican section of the American organization. The Mexican institute was founded in 1909 by its present president, Victor M. Braschi of Mexico City. Its decision to merge with the American organization is due to difficulty in financing its affairs owing to national troubles in Mexico, and as a result of the merger the Mexican institute will now be financed by the combined organizations. The American institute thus gains to its membership more than 200 of the mining experts of Mexico, increasing its total membership to 3800.

Lake Superior Mining Institute.—Secretary Yungbluth has announced that the twenty-first annual meeting will be held in Birmingham, Ala., March 13 to 17, 1917. Action was taken by the council after the members of the institute in Birmingham had extended an invitation to hold the next meeting in the great iron and steel center of the south. The institute members will assemble in Chicago and will travel in a special train over the Queen and Crescent route to Birmingham and return. It is proposed to spend a day at Chattanooga for sight seeing, with probably some other stops. The institute council has voted the sum of \$1000 to assist in defraying the expenses of the trip. It is estimated that the round trip from Chicago, including sleeping car accommodations and meals, can be made for about \$70, less the amount which the institute has contributed. Arrangements will be

made so that those who desire to stay in the south until a later date will be able to do so.

American Institute of Mining Engineers.—For the first time in its history of 45 years the American Institute of Mining Engineers will next month meet in the state of Arizona. Sessions of the meeting will extend over the entire week of September 18 and will be held in the principal mining centers of the state, the members traveling between the various points by special train and automobile. Principles of mining and metallurgy of the greatest interest will be presented at the technical sessions.

The principal towns in which the Institute sessions or visits of inspection will be held are Santa Rita and Hurley, N. Mex., and Douglas, Bisbee, Globe and Phoenix, Arizona. The inspections will include the Roosevelt Dam and the mines and works of practically all the leading metal-producing companies of the state. At Douglas, in the technical sessions, the Institute will discuss the special subject of "Smelting." At Bisbee papers will be read on "Mining and Geology," and at Globe the first day will be given over to "Mining and Smelting" and "Leaching." During the second day at Globe time has been set aside for what is regarded as an important discussion of "Concentration and Flotation."

The company plants that will be visited are as follows: At Hurley, the mines and works of the Chino Copper Co.; at Bisbee and Douglas, the mines and works of Copper Queen Consolidated Mining Co., Calumet & Arizona Copper Co., and Shattuck Copper Co.; at the Globe district, mines and works of Inspiration Con. Copper Co., Miami Copper Co., Old Dominion Copper Mining & Smelting Co., together with the new works of the International Smelting Co.

An elaborate entertainment program is being planned by the Arizona committee, comprising Gerald F. G. Sherman, chairman, Arthur Notman, secretary, Norman Carmichael, W. G. McBride, John C. Greenway, W. L. Clark, B. Britton Gottsberger and Forest Rutherford. The committee on transportation is composed of Walter Douglas, chairman, Cleveland E. Dodge, secretary, Arthur S. Dwight, John C. Greenway and Julius Kruttschnitt, Jr.

COMMUNICATIONS.

[This department is for the exchange of ideas bearing on all branches of the mining and metallurgical industries. Mining and Engineering World will not be responsible for the statements made nor opinions expressed by correspondents.—Ed.]

The Webb Bill.

The Editor—The President directs me to acknowledge the receipt of your letter of August 17th, and to say to you that he not only has this matter very much at heart, but has taken an active part in attempting to find the right solution for it. He feels confident that legislation of this sort can be accomplished, if not at this session of Congress, at any rate in time to meet the necessities of the case.

Sincerely yours,

J. V. TUMULTY,
Secretary to the President.

Death of Sir William Ramsay.

The Editor—The news of the passing away of Sir William Ramsay reminds me of my short association with the distinguished chemist in 1896, when his name came into great prominence on the confirmation of the composite nature of atmospheric nitrogen and on the separation by Lord Rayleigh and Sir William Ramsay of argon, and of the other elements found in minor quantities in atmospheric nitrogen.

This separation of the elements associated with atmospheric nitrogen, came like the isolation of fluorine by Moissan, at a time when the progress of chemical technics rendered this operation possible. Long ago, Cavendish concluded that nitrogen in the atmosphere was associated with other elements in minor quantities, which did differ from the nitrogen

by not being reduced to nitrous acid. At a later date, Professors Fremy and Leduc, in France, in 1882, expressed their doubts that atmospheric nitrogen was not a simple element; and J. J. Thompson and Threefall published certain experiments (R. Soc. Proceed., 40) on the contraction undergone by nitrogen on electrolysis at low pressure, attributing this fact to an allotropic modification of nitrogen.

At this stage, Lord Rayleigh and Sir W. Ramsay, observing that the density of atmospheric nitrogen was different from that of chemically prepared nitrogen, came to the conclusion of the composite nature of the former, and separated from atmospheric nitrogen the new element argon, of higher density and even more inert than nitrogen, thus confirming the general anticipation of Cavendish in 1781 and achieving one of the most brilliant chemical discoveries of the 19th century.

Mendeleeff's classification guided Sir William Ramsay continually in his study of atmospheric gases. The extension of this investigation lead, later on, Ramsay and Travers to the discovery of crypton, neon, xenon, and of helium, utilizing the methods discovered by Dewar and Linde in the fractionate distillation of liquid air and of argon.

Besides his important work in the domain of pure chemistry, Sir William Ramsay did considerable work in many of the branches related with metallurgical research, and was consulting chemist of several industrial concerns. In 1896, he conducted, together with the writer, a series of tests on the application of the halogen compounds of cyanogen for the extraction of gold and silver from refractory gold and silver ores—successively on the bromine treatment of Transvaal and Natal gold ores; on extraction of gold from sea water, and on hydro-metallurgical treatment of Welsh zinc ores; in the interest of various mining companies.

In recent biographies, this part of the scientific activity of the gifted scientist has been overlooked and I am glad to take it from the oblivion of which it has suffered, eclipsed by his more brilliant achievement in connection with the separation and obtention of the elements of the air, of helium; and with this extensive work on radium and radio activity.

BAXERES DE ALZUGARAY.

NEW PUBLICATIONS.

Spirit Leveling in Maine, 1899 to 1915. By R. B. Marshall. Washington, D. C., U. S. Geological Survey. Bulletin 633; pp. 64; illustrated. For sale by Mining World Co. 15c.

All U. S. G. S. bench-marks are given with their elevation and a brief on their location.

The Strength and Stiffness of Steel Under Biaxial Loading. By Albert J. Becker. Urbana, Ill., University of Illinois. Bulletin No. 85; pp. 65; illustrated.

The results of the many tests made are plotted into curves and tabulated. The tests were made to determine the laws governing the strength of mild steel when subjected to two tension stresses at right angles to each other or by compression and tension stresses at right angles to each other.

Gas Analysis as an Aid in Fighting Mine Fires. By George A. Burrell and Frank M. Seibert. Washington, D. C., U. S. Bureau of Mines. Technical Paper 13; pp. 16; illustrated.

In briefly describing methods of analyzing and sampling mine gases in different parts of the mine, it has been the intention of the Bureau to enlighten the factors related to the starting and spread of mine fires and one of the large factors affiliated therewith is the nature of the gases. Methods of controlling these gases by relief pipes, etc., are described and the changes in mine air during fires are reviewed.

Possibilities of Oil and Gas in North-Central Montana. By Eugene Stebinger. Washington, D. C., U. S. Geological Survey. Bulletin 641-C; pp. 43; illustrated.

With the occurrence of oil and gas in nearby areas and the possibilities of furnishing fuel for the western states as

coal is so conveniently furnished in our eastern states this subject is of considerable importance. The geology of the district is taken up in the best possible manner, considering that most of it was not obtained from an original investigation of the field with respect to the possibilities of oil and gas occurrences, but rather from various U. S. G. S. reports. Only information tending to show the probability of oil in the district is gone into, the number of operating companies as yet being small.

Silver City, New Mexico, Folio. By Sidney Paige. Washington, D. C., U. S. Geological Survey. Folio No. 199; pp. 19; illustrated.

The geology of the formation and topography of the Silver City quadrangle are gone into in detail. The area covered includes many of the large deposits of the state. The formation, in being described, are taken up according to the different geologic areas in which they belong. Following this information is an account of the geologic history of the country and a review of the nature and genesis of the ore deposits and formation related thereto. Many large, separate topographic and geologic maps of the quadrangle are reproduced.

TRADE PUBLICATIONS.

Sydnro-Static Indicators. Scientific Material Co., Pittsburgh, Pa. Bulletin No. 4; illustrated.

These draft-indicators and recorders are constructed similar to a U-tube manometer and the construction and operation of the same is gone into at some length. Views and tables listing the different sizes made are shown.

Oxy-Acetylene Apparatus. Searchlight Co., Chicago. Folder; illustrated.

Attention is called to the applicability of this method of repairing in different industries. The different welding and cutting apparatus which can be supplied is shown and brief descriptions of the equipment furnished therewith are given.

Portable, Direct Reading, Slide Wire Ohmmeters. Roller-Smith Co., New York. Bulletin No. 300; pp. 4; illustrated.

For the determining of resistance in the transmission of electricity this type of portable meter has been found of considerable use in practice as well as the laboratory. A description and drawing of the same are reproduced with a table giving price and ranges for different sizes.

Boiler Tube Cleaners. The William B. Pierce Co., Buffalo, N. Y. Booklet; pp. 20; illustrated.

The booklet is titled "The Logic of the Dean" and illustrates and describes the Dean boiler tube cleaner besides discussing the problem of scale accumulation. It is intended primarily for the management though considerable information of value to the chief engineer and his assistant is given.

Chain Belt and Sprockets. Chain Belt Co., Milwaukee, Wis. Price List No. 65; pp. 15; illustrated.

The prices given in this list took effect July 15, 1916, and supersedes all previous lists. Descriptions, drawing, tables of details and prices, and illustrations of each article are given. Iron elevator buckets, chain belts for transmitting or driving with sprockets and sprocket wheels are among the principal things considered.

Jaw Rock Crushers. Traylor Engineering & Mfg. Co., Allentown, Pa. Bulletin J 1; pp. 21; illustrated.

As a foreword it is stated that the capacity of the company's shops has been trebled and they are now in position to make deliveries without delay. Crushers for a large variety of uses are considered. The all-steel jaw crushers are first described as regards their design and operation in general. Here several types of this class are spoken of and good illustrations of the same are given with complete

tables of data in each case. Jaw crushers capable of being taken down into sections are then described in a similar manner. These have a 3000-lb. limit and have been designed for use where the crusher must be taken in by sections on mule back over mountain trails. The Dodge type of jaw crushers are taken up, as also are revolving screens, rolls and gyratory crushers. In each case the adaptability of the particular type is suggested and information of general use in rock crushing is given with information on the company's own products.

Computing and Payroll Machine. International Money Machine Co., Terre Haute, Ind. Catalog; illustrated.

The machine gives directly the total of the payroll and number of coins or bills necessary to complete the payroll. The machine also delivers the correct amount into the pay envelope in the smallest number of coins and bills. A list of companies using the machine is given and mention is made of an adding and listing machine recently designed by the company.

Insuluminum Pipe. Diamond Power Specialty Co., Detroit, Mich. Bulletin 118; illustrated.

This new material it is stated will withstand a temperature of 1800 deg. F. instead of 1200 deg. which is the customary figure for iron and steel. Photo-micrographs of the material are shown and its properties are discussed. Description is given of comparative costs with other metals and the concluding pages deal with the application of the material in the construction of a mechanical soot-blower system.

Metallurgical and Assaying Furnaces. The Denver Fire Clay Co., Denver, Colo. Catalog D; pp. 96; illustrated.

Case metallurgical furnaces are dealt with entirely. Many types and installations are illustrated and each is accompanied with a brief description. Accessories, such as burners, crucibles, etc., are included and the furnaces described include types using oil, gasoline, gas, coal, coke or wood. Designs for the following purposes are described: Melting, refining, assaying, tempering, annealing, enameling, forges and rivet heaters.

Motor Trucks. Federal Motor Truck Co., Detroit, Mich. Pamphlet; pp. 64; illustrated.

Deals with worm-driven motor trucks and in bringing out the practical application of the trucks a number of views are shown of the truck being put to some of its many uses in the field. The handling of numerous classes are illustrated. General description of the driving and other mechanism is given and followed by engravings of the different styles and sizes of trucks. Brief specifications of the different trucks are given in connection with illustrations of different styles of bodies.

INDUSTRIAL AND TRADE NOTES.

The Frontenac mill at Black Hawk, Colo., has been purchased by the Morse Bros. Machinery & Supply Co., of Denver, who will dismantle it and move the material to Denver. The plant was a 250-ton concentrating mill consisting of crushers, rolls, tube mill, Traylor jigs, Card and Diester tables, all electrically operated. The plant was built in 1912 and operated about 9 months.

The Stimpson Equipment Co., Salt Lake, lately sold to the Cardiff Mining Co., a Laidlaw-Dunn-Gordon air-compressor, 850 cu. ft. capacity, which is being installed at the Cardiff mine, in Big Cottonwood canyon, Utah. This is the second compressor of that type sold and installed at Cardiff mine. C. W. Stimpson, president of the company, who recently made a trip east, returned last week via Denver. While in the east he placed equipment for a complete oil flotation plant in northern Michigan, in which Janny machines are to be used.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Anchorage.

Supt. H. C. Emory states that a record year will be made by the Martin mine in the Willow Creek district. The mill will be run until late in the season and probably all winter.

The Number Nine Mining Co., on Fairbanks creek, had a clean-up recently. Four men were working on the ground and the clean-up showed close to \$2,000 for each man.

C. J. Wall and C. Pope Hawatt, eastern capitalists, are inspecting the W. W. Woodard placer claims on Kichatna creek, a tributary of Yentna river. They have gone in with a complete power drilling outfit and a large supply of provisions and accessories to thoroughly prospect the claims for dredging possibilities. The claims extend 8 miles up the Kichatna from Gold Hill and are located in a neighborhood that has been producing for many years. If the property proves as expected Wall and Hawatt will close their deal and install a complete dredging plant next spring.

Hopes are being held that a smelter will be constructed here to treat the gold and copper ores from the Broad Pass district. With depth the Willow Creek mines may find basic instead of free-milling ores and these too could then be treated at Anchorage. Anchorage is well located with respect to both water and railroad transportation.

Iditarod.

It is rumored in the Kuskokwim and Innoko countries that there will be a dredge installed on Candle creek at an early date. The machinery will be received at McGrath or some other point on the upper Kuskokwim this summer ready for freighting to Candle creek during the coming fall and winter.

The Flume Dredging Co. is securing options on large tracts of ground in the Innoko district with the object of installing a dredge. It has purchased a half interest in the Mayflower association and has taken options on several claims on the lower end of Yankee creek. The ground is low-grade and a gasoline drill is due in September.

A wagon road is being built from Big creek to Ganes creek by Thorns & Higgins, and the new road will reduce the cost of hauling from the Kuskokwim river to the Innoko mines. Launches are able to bring loads of considerable size from the Kuskokwim up Big creek, and then it is hauled by wagon to Ganes creek.

Ruby.

At present little is being done in the Tolstoy camps. In reviewing the work being done however it is stated that good prospects have been found on 4 above on Esperanto creek by Henry Madison. The only other work being done on that creek is a hole being sunk by Charley Armour, Alex. Holmberg and Orlof Stenbock.

Seward.

P. F. Cummings has purchased the placer mining properties on Bear creek from Herron, Cassidy and Sullivan. He is on his way outside to secure a hydraulic plant with which to operate the new property.

Another large dredge has been constructed and is now operating on Cache creek.

Skagway.

Activities at the Venus mine have been resumed after a number of dormant years. A moderate crew is reopening the Col. Conrad properties on Windy Arm. A considerable amount of ore has been broken and sacked for shipment to the smelter. An assay office has been opened to permit ex-

tensive assaying of the ore taken from that and other properties being developed by the company which has taken over the Conrad properties. Indications point to a successful career for the Windy Arm property.

ARIZONA.

Prescott.

Among the properties which bid fair to add to the output of copper from the Jerome field—now so generously sustained by the United Verde, United Verde Extension and Copper Chief mines—is the Pittsburg-Jerome. In early August announcement was made of a strike of copper ore. Recent information is to the effect that the vein, while narrow at present, is widening as the drift is extended. The discovery was made in a drift from the west crosscut on the 500 level about 70 ft. from the shaft. The first samples taken gave returns of 11% copper and some gold. Samples taken after drifting a short distance gave returns of 22.28% copper and values in gold. The vein pitches away from the shaft and gives indications of becoming an ore body of size. A winze has been started in the vein and to its present depth has carried good values in copper and some gold.

The directorate of the Venture Hill Co., owner of valuable acreage in the Jerome copper belt, has authorized the purchase of mine machinery and the sinking of a 3-compartment shaft to a depth of 1500 ft. This action is in line with the recommendations of John S. Riley, the engineer who has been in charge of development since reorganization of the company was perfected about three months ago. Pending the installation of machinery work will be continued in the tunnel. As the latter penetrates further into the hill mineral indications continue to be favorable. Assays made on ore mined in an old shaft on the property gave returns of \$27 copper and \$1.44 silver. The tunnel is being driven in the dike from which these values were obtained and through it determinations for the deep shaft will be made.

Fairview.

Gold values of \$83.51 and silver values of \$7.08 per ton are being obtained at shallow depth in the new shaft being sunk at the mouth of the tunnel on the Fairview group of claims in the Crown King country. Sulphide ore is also exposed there. The objective of the shaft is a depth of 200 ft., where the ore body will be crosscut and developed. Montana mining men are backing the venture. They express themselves as being well satisfied with the showing and with the property's future prospects. The Crown King field has for years been notable for its output of high grade gold-silver ore, values running from \$250 to as high as \$1000 in fair tonnage.

The Wildflower group is being developed by men headed by F. S. Viele, Le Roy Anderson and David B. Gemmell of Prescott. The new operators are unwatering the old workings, retimbering the shaft and otherwise placing the mine in shape for resumption of ore production. As the ore bodies are developed shipments will be made to the Randolph-Gemmell Reduction plant at Crown King. Messrs. Viele, Gemmell and Randolph dominate the affairs of the latter.

Jerome.

Mining men of the Jerome field are manifesting more than ordinary interest in the future of the Jerome Victor Extension property, formerly owned by the Haynes Copper Co. The acreage lies in the center of the area represented by the United Verde and United Verde Ext. mine. Developments in both of the latter have a bearing upon the explora-

tion work that will be started in the Jerome Victor at the 1200 level as soon as the shaft has been unwatered and repairs made. Superintendent Salisbury hopes to begin underground operations within a few weeks. On the 1200 level the short crosscut run by the Haynes Co. is to be extended to the United Verde line with the object of tapping the continuation of the ore body that has been stoped in the last mentioned mine on the 1400 level to within a short distance of Jerome Victor acreage. The topography of the intervening country is such that the 1400 level of the United Verde corresponds closely with the 1200 level of the Jerome Victor.

Mineral conditions continue to improve as development progresses on the property of the Great Southern Mining Company. Recent assays gave returns of 1.6 ozs. gold and 4 ozs. silver. As the drift on the lower level is extended the ore body is widening and appears to be entering the area in which it makes juncture with a cross-fissure. The property is located in the McCabe section and is adjacent to mines that have added millions to the mineral wealth of Yavapai county.

Quartzsite.

The work on the plants of the Yuma Con. and the Plomosa Cos. is progressing as fast as delays allow. The Plomosa Co. expect to begin operations no later than September. This company had expected to have plant completed by July 1, but warm summer, with the delay of machinery, has delayed work.

The Yuma Co. will have a 2000-yd. and the Plomosa Co. a 1000-yd. plant. At present great interest is centering upon a deep hole on the Yuma Co.'s ground, the first of its kind in that section, intended to be an experiment. This hole which is 140 ft. deep has been a revelation. At the surface the gold was rather fine, at various depths rich seams were cut that averaged in width from 1 ft. to 20 ins. in width and ran as high as \$12 per yd. A hard strata of cement was then penetrated, which also carried finer gold values and then the layer of bedrock gravel was encountered, which was found to be very thick, of this seam 15 ft. above bedrock averaged better than \$6.65 per yd., while the whole bed of gravel and cement to the surface gave better than \$2 per yd., thus proving that for work in a large way the deeper ground of the district may be found to be even better than the partly worked and shallower ground; the later areas still producing ground that will go better than \$12 per yd. The test plant that was erected at an approximate cost of \$65,000 embodies the Stebbins dry concentrator.

Oatman.

East and west drifts in the Telluride on the 475 level are in vein matter which resembles the vein matter in the United Eastern, Tom Reed and Big Jim, and the operators expect to break into pay ore with any round of shots. This is a property of Long & McIver, who developed the United Eastern.

Official confirmation of the deal whereby Seely W. Mudd, Frank A. Keith, Phillip Wiseman, D. C. Jackling and R. I. Rogers, associates in the United Eastern, have taken a controlling interest in the Sunnyside, adjoining the Telluride on the south, has now been made. The price involved is about \$100,000. The Telluride sidelines the Lucky Boy on the north and the Sunnyside endlines it on the southeast. The Lucky Boy is now arranging to resume operations.

Oatman Combination has started crosscutting on the 500 level, and will drive north and south to cut the two veins between which the shaft was sunk.

United Northern shaft is now down a little over 400 ft. and engineer Goldsworthy reports stringers of rich ore which indicate to him that the vein will contain pay ore when encountered.

The Chicago Syndicate Co. has started crosscutting at 250-ft. depth.

The Fessenden Co. has suspended operations until about Sept. 15th. The property is a "hot" mine, and during the hot weather the temperature in the workings has increased to 125 degrees, with little relief for the miners when they come above ground in the day time. At the same time

negotiations are being concluded with Pittsburg financial interests which desire to take control of the company. Semi-official information is to the effect that the deal will probably be consummated.

The shaft of the Tipperary has attained a depth of 200 ft. and will be carried to 300 ft. before lateral work is started.

Arrangements are being made to start work on the Arizona-Comstock and Dardanelles properties, south of the Times.

The Wrigley Exploration Co. is asking for bids on driving 600 ft. of its big cross-cut tunnel, which is now in about 100 ft.

The Gold Road, Gold Ore and Tom Reed companies continue their usual steady production, the Gold Ore milling some 30 tons per day in the Gold Road plant.

CALIFORNIA.

Bishop.

The 300-ton mill of the Tungsten Mines Co. is operating on ore from the Little Sister and Jackrabbit mines, with sufficient profitable ore exposed to insure 8 years of activity, according to company officials. It is claimed tungsten can be produced at \$3.25 per unit, and that at present price of the metal gross daily earnings will approximate \$5250. The company has expended fully \$100,000 in development and equipment of its holdings. L. E. Porter is superintendent.

Shipments of silver-lead ore are being made from the Santa Rosa, in the Keeler district, at the rate of 30 tons daily. The product is high-grade and late developments have uncovered wide bodies of ore. On the dumps a large tonnage of milling ore is stored.

The Troeger tunnel of the Buena Vista Co. is in nearly 7000 ft. and is apparently nearing the last series of veins it was designed to intersect. Several excellent ledges have been already cut and preparations are being completed for extensive lateral developments.

Carrville.

The lower tunnel in the Golden Jubilee mine has intersected an 11-ft. ledge of promising ore below the main workings. Preparations are being made to drift on the ore and determine its value and extent. Arrangements were recently made to reconstruct the mill and install a new process for treatment of the refractory ores.

The last lot of equipment for the new dredge of the Trinity Development Co. has been delivered, and is being installed. Within a short time the big boat will go into commission, and steps have already been taken for the construction of 2 more dredges in the spring of 1917.

Copperopolis.

The Calaveras Copper Co. is installing a Hardinge 8-ft. conical mill, Dorr thickener, 11 pneumatic flotation cells, and an Oliver filter. This will increase the capacity of the flotation plant to about 600 tons per day. The new 3-compartment shaft has been completed to the 6th level, and extensive lateral work is proceeding from numerous points. A rock-crushing plant with a capacity of 1500 tons per 24 hours has been installed. Sufficient ore is exposed to insure a long run of the plant. S. M. Levy is manager.

Taylorville.

Preliminary work is proceeding on the railroad from the Engels copper mine to Keddle, and the contractors expect to have the line in operation before winter. Additional equipment is being installed at flotation plant and its capacity will be eventually increased to about 2000 tons daily. This will make the company the largest copper producer in California. Driving of the new 4000-ft. tunnel is progressing rapidly.

Enterprise.

Work has been resumed at the Southern Cross, with A. E. Eagle in charge. The company has decided on the building of a flotation plant, and has ordered a tube mill and 40-hp. gasoline engine. At a depth of 70 ft. a 7-ft. ledge of good ore is exposed and arrangements have been made to

send the shaft to a depth of 300 ft. and extend drifts to tap the vein.

Nashville.

Sinking of the shaft of the Montezuma mine has been completed to a depth of 1000 ft. and drifting from this level to intersect the vein has begun. Ore of excellent character is exposed on the 300, 500 and 800 levels. It is planned to provide reduction facilities as soon as developments on the 1000 level have become satisfactory, and it is likely the plant will resemble the mill at the Plymouth Con. Roy Le Fountain is superintendent.

Magalia.

The Mineral Slide drift mine has been taken under bond and option by John Cowan and associates of Salt Lake, and work started with a force of 12 men. The ditch and flume line is being repaired and preparations made for the driving of a 1500-ft. bedrock tunnel. This is expected to intersect the rich channel which has yielded millions in gold. The Mineral Slide is credited with an output of \$1,000,000 and contains large areas of promising virgin ground. C. E. Hand is in charge of the work.

Sutter Creek.

Unwatering of the Old Eureka has been completed to a point beyond the 600 level and a 4th pump has been installed, the latter machine being in position at the 600 level. The timbers continue to be found in excellent condition and the management expects to start active mining at an early date.

Nevada City.

The St. Louis Mining Co. has been formed with a capitalization of \$200,000 to operate the St. Louis mine in Willow Valley. H. H. Estee is president; John T. Hennessey, secretary; W. H. Martin, treasurer; William Reynolds, W. B. Celio and C. F. Van Duzer, directors.

Work will probably be resumed in the Murchie group in the near future according to advices from New York. An option was taken on the property several months ago by New York people, and it is said definite arrangements have been practically completed for vigorous developments. The mine formerly ranked among the leading producers of this district.

COLORADO.

Georgetown.

The Onondaga Mines Co. is pressing work in the Kane tunnel. A compressor and various other supplies have been delivered at the adit and the foundation for the machinery is being put in. A hoist, motor and pipe will shortly be there, and when the installation is completed, work will be commenced on sinking 250 ft. to connect with the raise from the Capital tunnel. On the 450 level going west there is a large body of ore in ground now belonging to the company, as also is in the Capital Co.'s ground. From this it may be taken that when the air connection has been made with the Kane adit and the drill hole from the summit of the mountain, both companies will have good ore bodies to work on. The only block of ground which has been stoped out by Onondaga is that which lies between Nos. 1 and 2 raises from the main tunnel, and from the 100 level up to the 150. This ground produced \$12,000, and a good body of ore is showing above the 150 level. At No. 3 raise the ore body is 40 ft. wide. Water pours down this raise in a large amount.

Oscar Wing and W. E. Swanton, operating the Birthday group of four lode claims on Griffith mountain, under lease and bond have been cleaning out and getting the upper level 60 ft. from surface in shape. A blacksmith shop and sorting house have been erected and other preliminary work completed. The level crosscuts for 75 ft., at which point the Birthday lode was encountered and drifted on 80 ft. each way, showing a continuous vein of ore varying from 4 to 16 ins. wide, and carrying values in gold and silver up to \$80. The work now under way is being done in the west drift, and the character of the ore is changing, showing more copper and lead. The Birthday is a continuation of the Alaska

and Cass County vein from which considerable iron pyrites was mined, running high in gold and silver. There is a lower tunnel driven to develop the group as a whole, which enters the mountain 80 ft. above the level of the Capital tunnel, and is in a distance of 300 ft. It would open up the Birthday at 700 ft. previous to encountering the other veins of the group. The Birthday can also be worked at depth through the upper tunnel of the Capital mine, where it was encountered at 700 ft. from the portal.

Boulder.

The Red Sign mill in Boulder canyon has been completed and tests have been run showing all is satisfactory. The mill was put up by the Colorado Iron Works Co., Denver, for the Tungsten Metals Corporation. A crew of mill men headed by Thos. McSherry, and extra men for work in the mines, have been employed to keep the mill going.

Sugarloaf.

The roasters at the U. S. mill and smelter have been cleaned after 9 months of continuous operation. During this time oxidized ore was treated at the mill and the high grade ores that have to be roasted were sent to the bins. This put the bins about 2 weeks ahead of the roasters. A new dust collecting system was also installed. A screw conveyor will carry the dust, which formerly had been kept down but not saved, into the lower grates of the furnace where it will be treated for metal that it carries. Because of the intense heat in the lower grates the dust must be conveyed there by machinery. It is estimated by officials of the company that the saving made by treating the dust will amount to \$10 a day. Operations were resumed about Aug. 17.

The Nyanza winze in the Livingston property is showing up well. Work is now being done at the edge of an ore shoot that gives indication of being better than anything yet encountered. A recent 500-lb. shipment of this ore was sold to the Chamberlain sampler which ran \$165 a pound or \$32,700 a ton in gold and silver.

Cripple Creek.

The breccia-schist contact has been cut at the 750 level of the Jerry Johnson mine. Assays indicate a shipping value for the first shipment of \$20 to \$30. A rich streak several inches wide is now exposed in the breast of the drift that returns gold values of \$125 a ton. Returns have been received from lot No. 44 sent out by the Cripple Creek Deep Leasing Co. operating below the 650 level of the main shaft, and mined from the 850 level. The lot carried a gross bullion value of \$1063.80, and average value per ton of \$37.20. It is now planned to crosscut to the contact from the 950 level of the Jerry Johnson shaft. Should values hold at this depth, a winze sunk below the 850 level, having returned from \$20 to \$35, the Deep Leasing Co. will commence this work and may resume sinking. The company has two lots of ore, Nos. 45 and 46, awaiting settlement and will be loading out other shipments including the lot from the 650 level this week. Since last October when shipments commenced, this lease was produced in excess of \$30,000.

The Smith, Moffat Mines Co. has taken over the Victor mine, with the Little Joe, Panther and Victor No. 2 mining claims, originally owned by the Victor Gold Mining Co., incorporated in 1893, but now defunct. The production from the Victor mine is estimated at \$2,500,000, the last official figures on the mine output made public gave the production to Jan. 1, 1900, at \$2,216,671, with dividends paid to that date of \$1,155,000. The last dividend paid by the Victor Co. having been paid in 1898. The main shaft is 1000 ft. deep, with 14 levels, and 3 miles of tunneling. Eight levels were made in the first 450 ft.

IDAHO.

Cataldo.

Five teams have been found unable to haul the ore from the Hypotheek mine to the railroad. Only one round trip a day can be made and each team hauls 4 tons. Concentrates are piled up at the mill on improvised platforms and in all spare space in the mill. Most of the ore that is being milled is taken from stopes on the 900 level. The showing of ore

on the 1100 is not so good as expected. However, in other mines of the district lean spots have been found and succeeded by large bodies of ore on the next level. It is believed that this will be the case when the 1300 level is reached on the Hypotheek. The company is employing 40 men.

Wallace.

Lead ore from the Chicago-Boston has been found unyielding to the H. E. & M. mill's process and both mine and mill have been shut down for the time being. A good body of silver-lead ore has been opened and there is now in the face of the drift and has been for a considerable distance 14 ft. of good milling ore, containing streaks of high-grade that is sorted for shipment direct. With this showing there was nothing to be gained in taking out the ore and piling it on the dump, making it necessary to handle it again when the milling facilities are provided. Plans of the management in this respect have not been announced, but it is probable arrangements to resume will be effected within the next week or 10 days.

The Big Creek Mining Co. has started a lower crosscut, which will explore the vein 500 ft. below the present lower tunnel, the ground above which is being operated under lease. A trail 5 ft. wide has been completed from the creek to the tunnel site, and is built on a wagon road grade which can be easily transformed into a wagon road if desired. A special iron truck has been made to haul over the trail which will carry a load almost equal to a wagon, and the width of the trail will permit utilizing two horses in drawing it. Boarding house and other buildings have been completed and everything is in readiness for the installation of the compressor, which will be placed at the portal of the tunnel, within 100 ft. of the electric power line. The silver ore that is being mined in the leased ground fully justifies the expectation that a large body of equally good ore will be exposed by the new crosscut.

Kellogg.

Transfer of the control of the Highland-Surprise Co. is being rumored. The stockholders of the company have under consideration a proposition for the sale of the controlling interest or the entire capital stock to G. A. Lauzier of Butte. The proposition is on a basis of 20 cts. per share, payable on the following terms: First payment on Nov. 1 of 5 cts. per share; Feb. 1, 1917, 5 cts. per share; Aug. 1, 1917, 10 cts. per share. Stockholders are requested to deliver their stock to the First State Bank of Kellogg to be delivered to the purchaser upon making the payments as above set forth. Failure to comply with the terms will result in canceling the agreement and forfeiture of all payments made. In a circular letter, issued under date of Aug. 12, W. W. Papesh, president of the Highland-Surprise, submits the proposition and urges its acceptance.

Idaho Falls.

McCoy creek gold placers, controlled by H. L. Rasmason and others, Salt Lake, are under bond to persons who are testing the ground thoroughly, with a view to organizing a company to take over the property. In case they so decide, they will build two dredges to operate there. McCoy creek flows into the south fork of the Snake river at a point due east of Blackfoot. The ground under control extends 18 miles along the creek, and includes old placer diggings of early days. The camp is 72 miles southeast of this city.

LAKE SUPERIOR.

COPPER.

Houghton.

Franklin's cost for July was down to 15 cts. and for the present month the yield has been nearly up to 15 lbs. a ton; and the smelter returns were 275,000 lbs. of refined copper. This noteworthy increase in the yield is due to the drifting and stoping that is being done in the ground to the south of the shaft where the whole area is better than that so far opened to the north. A point about 400 ft. south of the shaft has many stretches of very rich ground which are continuing in all of the drifts. The tonnage owing to the scarcity of men over the whole district is hardly averaging

1000 tons daily. When the men begin to come back for the winter the drifts will be pushed on the northern side out into a rich shoot that has been found on the levels above. There are some good stopes being worked on this side and a very few on the Pewabic amygdaloid. Mechanical haulage by means of the system of a rope operated by a compressed air engine of small size will be installed soon on the 29th level as an experiment, but as it is practically the same as used at the Tamarack, Osceola and Allouez, there is not much doubt of its success. At No. 2 shaft the retimbering and the clearing out of the shaft has been carried down about 130 ft. below the concrete collar. This work has been delayed by the lack of men, but it will be pushed as soon as possible to increase the tonnage and reduce costs.

One-half of Calumet & Hecla's leaching plant is working, the other half not being ready. It is running smoothly and fulfilling expectations of C. H. Benedict, the mill metallurgist of the company and all of its subsidiaries. He designed not only this plant but also the two regrinding mills and has materially bettered the milling system of all the subsidiaries. An idea in mining that was tried as an experiment on the conglomerate a year ago, and which proved successful, has been adopted in all the stoping there. There is a small crew of men called riggers who in one shift take down and set up all the drills for the next shift, so that the miner when he comes down to work, having his drill made ready for him, begins at once to drill and does nothing but drilling in his shift.

Michigan has 14 ft. of good copper at the Ogimah lode, which was encountered 180 ft. from the Butler by the crosscut, that is to open up all the lodes of the Knowlton and Evergreen series. It is thought to be 7 ft. in a longitudinal fissure paralleling the lode, then 5 ft. or trap, 7 ft. of amygdaloid with 9 ft., carrying but little of the metal, in the lode itself. The nuggets of copper running as high as 16 lbs. in the fissure and the high grade of amygdaloid abounding in ideal stamp rock on the stock pile elicited the most favorable comment and quite an amount of stock has been purchased from Rocklund, Ontonagon and vicinity in the past week. After the crosscut has been carried farther, on its way to the lodes beyond, enough not to interfere with the drifting the latter will be commenced. The ground on the western side of the shaft on the Butler lode has not been so good for the past fortnight, but now there are marked indications of a favorable change. On the eastern side the drift has been carried up into the parallel longitudinal fissure just over the lode and its rich copper is being followed and then the drift will be bent back into the course of the lode. Work was stopped on the mill at Keweenaw Bay, 15 miles south of Houghton and one mile north of the Mass mill, when it was almost completed in 1907, after \$175,000 had been expended on it; and it will not at the most take over \$15,000 more to complete it. President J. R. Stanton and Superintendent Brady are consulting concerning it now and it is likely that it will be ready as soon as it is needed.

Mayflower is using its diamond drill in testing the ground just north on the Old Colony boundary line and is finding good values. In this property the northwestern part of the lode does not by any means compare with the southwestern part where the values are better and quite uniform. In the Old Colony the ground averages better for the whole extent of the drilled area, and the latest drilled holes, located near the southern line, are equally good if not better than the average. The two directorates seem to be no nearer to an agreement, as regards a consolidation, but it is thought that the disclosures are sufficiently good to warrant the Old Colony to go it alone. It is well known that before any new work can be begun, that additional money will have to be raised either by borrowing or assessment, probably by the latter method.

New Baltic has arranged with S. L. Lawton, the legal representative of the Johnson heirs, through its attorney, A. F. Rees, that the trial of its men for trespass, when about three weeks ago they began breaking ground for the new shaft, will be indefinitely postponed, and a civil suit commenced for determination of the company's rights as to mining operations on the surface. The details have not yet

been arranged but will be announced later. The outcome of this case will be most interesting to our mining men as it will bring to notice new data, perhaps establish a precedent, and make clear some mooted points.

Houghton though getting some copper all the time in the West vein has only found so far one stretch, which was about 20 ft. long, of paying copper, but the vein may prove richer when the drill is shifted to the southern side of the shaft towards the Superior mine. The Superior lode has been entered on the 4th level about 185 ft. from the shaft and in the one cut made so far has found only a little copper, but it will be recalled that the best copper on this vein is nearer the hanging-wall. On the 12th level the good revelations of copper are still appearing at the distance of 80 ft. from the winze.

Winona has very good rock at King Philip No. 1 shaft and at No. 4 Winona. It is hoped later to sink at these two shafts and also at No. 3 Winona. As Lake Superior copper mines average, this mine is very shallow, since No. 3 is only down to the 13th level and in fact is not being worked below the 11th level—No. 4 to the 15th and No. 1 King Philip to the 14th. It would certainly be well to give this mine a thorough test by sinking either No. 4 or No. 1 King Philip down to at least 3000 ft., since there have been quite a number of high grade stretches in the ground already opened. It does seem to the outsider that the Slater leaching process, which has been successfully worked out at this mine experimentally, should be adopted on the scale proposed when copper is high and likely to be so for at least a year.

Hancock, notwithstanding the difficulty in getting new men, is gradually gaining in the amount of stoping being done and is also maintaining the gain in yield from its own shaft, No. 2; it is also maintaining at Quincy No. 7 the high grades encountered there. As soon as the harvest days are past and winter approaches, the men who desire a good, comfortable job during the cold and stormy season will come to the mines. The number of the men, especially trammers, who forsake the mines in the spring for the open air vocations is much larger than would be supposed; of course, when men are plenty this exodus is hardly noticed, but this year it has been very severely felt. This mine was never in so good a condition as it has a great area of ground that is known to be good and that will be mined as soon as the men can be obtained.

Onondaga's diamond drill is now to the depth of 2030 ft. in the formations that should produce the red metal, but so far it has not been found. Prof. A. C. Lane, of Tufts College, formerly state geologist for Michigan, who made a study of this property last year, revisited this year with Superintendent H. W. Fesing, and went thoroughly over the cores taken out since his last visit. The hole that is now being drilled is No. 10 of the series on the northern part of the property. This work, though quite extensive, is not conclusive, as many of our lodes as for instance the Calumet conglomerate extend for 40 to 50 miles, but have only a mile or so materialized; and it is possible that a close geological study of the cores may reveal some favorable indications.

Copper Range is now running all the electric lights and all the machinery at the rock-houses of the three mines, crushers, rock-hammers for clearing off the waste from the masses, etc., except the hoists and compressors with the electricity generated by the turbines actuated by the exhaust steam at the Champion and Baltic mills, with quite a considerable saving and much greater convenience than by the steam engines in each rock-house. The electricity is conveyed 14 miles on a pole and wire system erected by the company; and it includes the Atlantic mine which is owned by this company and which will be reopened up when the surplus and earnings will permit.

Calumet & Hecla's general manager, James MacNaughton, it has been erroneously reported, is going to move to New York. It can be reliably stated, however, that Mr. MacNaughton has taken a house in Boston for the winter, and will divide his time during that season between that city and Calumet. There will be no change in the official staff at the mine, and as General Superintendent John Knox, Jr., will as previously act in Manager MacNaughton's absence.

IRON.

Iron Mountain.

Hoose & Person Co. has shipped its stripping equipment from the Holmes mine on Marquette range to the Munro mine near here. The territory to be stripped is several hundred feet wide and 500 ft. long. The ground has been proven up by a large number of test pits and trenches. The overburden will average from 2 to 20 ft. deep. Hoose & Person has also contracted to mine the ore. It is expected to make a considerable shipment before the close of navigation, the probable output being estimated at 30,000 to 50,000 tons. The ore while of a rather low grade contains ingredients that make it desirable in furnace work. When stripped the property will be in position to make a large production and it is understood, if market conditions warrant the production, the property will send to the docks another year considerably more than 100,000 tons.

Crystal Falls.

Cole & McDonald Exploration Co. has struck maniferous ore by drilling. The land on which it is being done is the S. E. $\frac{1}{4}$ of N. E. $\frac{1}{4}$, 29-43-32, and the fee is owned by the Pfister Land Co., of Milwaukee, Wis. In the first hole 28 ft. of surface was penetrated and the drill passed into a body of ore in which the manganese runs to 35.50%. The material yields 27% iron and phosphorus is something over 0.30%. The drill passed through 5 ft. of this material when a broken, gravelly ground was encountered, but a large quantity of "float" of the same nature as that above was found. Whether the 5 ft. of rich material is a huge piece of "float" or an obstruction of ledge in place remains to be proven.

Palmer.

M. A. Hanna Co. has renewed its lease on the Richmond Mine from the Oliver Iron Mining Co. The mine is this season being operated by electric power furnished by the Marquette County Gas & Electric Co. It is an open pit and operated only during the shipping seasons. The mine produces a hard ore averaging 40%. Last season 188,000 tons of ore were shipped. It expects to ship over 200,000 tons this season. The company is cutting for the largest tonnage it has ever produced, but there is a shortage of miners. The number of men now working is 120, and the mine is being operated two shifts. The South Shore railroad has completed a line from the Cascade mine to the Richmond so that both this railroad and the Northwestern can now be used.

The shortage of labor is due to a shortage of houses. Four mines, the Cascade, Richmond, Volunteer and Empire, are operating. If living quarters could be found some 200 more men could easily be employed. To this end the Kirkpatrick interests are contemplating a new town site and Fred Gibbs, engineer at the Cascade mine, is laying out a prospective town site plat.

MISSOURI-KANSAS.

Joplin.

In spite of the better ore prices that prevailed this week, a large number of mines closed down. This movement was a forced one due for the most part to a lack of water for milling purposes. For over two months there has been no rainfall, and those camps whose underground water supply is insufficient for milling purposes have been compelled to await the breaking of the drouth. This has especially affected the West Joplin field, the Prosperity and Duenweg camps.

Theurer & Dixon of Joplin have just completed an 800-ton tailing mill on the Old Bull Frog lease at Smelter Hill. The plant is one of the largest tailing mills ever erected in the district. The jigs consists of 2 rougher jigs, one being a 4-cell 48x48 in. in size, another 5-cell 36x42 in., and a 5-cell feeder jig. In addition to the jigs there will be five sludge tables and complete sizing system. In addition to running the tailings at the old Bull Frog the company is also unwatering the old mine with the intention of operating the

ground once more. An 8-in. Texas pump has been pumping now for some time, and it is expected that the company will be able to start ground work within another fortnight. The Bull Frog at one time was one of the most productive in the Joplin field, and shut down a few years ago when the price of zinc ore reached a low level.

At Central City, J. W. Hardwick and associates have undertaken the draining of a shaft on the Hornaday land. The ground has been developed and shows a rich run of ore at the 65 level in soft ground. A face 8 ft. high has been opened up which is believed will run 10% lead and zinc.

The Gibson mine west of Joplin recently installed larger hoppers and made every effort to increase the capacity of their mill to its maximum. A heavy tram was built connecting the north shaft with the mill, and first motion hoists were installed. The plant is now able to get sufficient ore for operating three shifts.

The P. & J. Mining Co. has started to develop a 10-acre lease adjoining the German-American Silicate Co., about 4 miles southeast of Joplin. The new company expects to open up the same kind of ore deposit now being worked by the German-American Co.

C. Cox, A. J. Poynor, Wm. Gregory and Ashley Williams have opened up a good prospect in a new shaft on the Scotia land southwest of Joplin, the operators struck a rich run of ore at the 60-ft. level in soft ground. The ore occurs as chunk lead and blende, and can be cleaned from hand jigs which are being installed this week.

Webb City.

The Champion Mining Co., consisting of Bert Chism, James Bronson and associates of Joplin is now producing a high grade silicate ore which is assaying around 42% after being milled. The ore is being taken out at the 75-ft. level and sufficient development has now been done to keep the mill running two shifts. The ore is milling out 8% zinc silicate, and the manager asserts that he has now enough ore in sight to keep the mill running all the time.

Duenweg.

On the Carick land northeast of Duenweg on a sub-lease from James Morgan the Woodson Bros. are sinking a new shaft to open up an ore deposit known to exist at the 85-ft. level. The ore which has been developed by drilling is principally lead, although some silicate has been found at the same level, and at a lower level zinc blende is shown.

Amos Freeman has reopened the old Frerer Mine, east of here. This mine made handsome profits for its owners a few months ago when at the 95-ft. level a very large deposit of free lead ore was mined out. Freeman & Co. having taken over the lease did some new prospecting and declare that they have opened up a richer deposit than the one which made the ground famous. The mine has already begun production.

Just across the road from the Frerher mine the One Spot Mining Co., made up principally of Joplin men, have taken over a lease of Josiah Bennett. This lease was drilled out and showed lead ore from 95 to 110 ft. In the prospecting operations drifting has been undertaken at a depth of 100 ft., and so far the ore has been chunk lead, much like the Frerher mine across the road. The company is pushing work energetically and expects to be producing within another fortnight.

Louis and Johnson have entered an old shaft east of the Crown Point Mine and after considerable prospecting believe that they have opened up enough ore to justify the erection of a mill. The ore was encountered at the 140 level and both lead and jack are reported in good quantities. The new mill is now under construction and is designed to handle 150 tons per shift.

MONTANA.

Butte.

Grading is well under way for the shaft houses at the Calumet shaft of the Great Butte Co. and the collar has

been cribbed and filled. Two boilers each of 150-hp. are on the ground, while a third has been ordered. The steam pump is at hand and two electrical pumps have been ordered. The new gallows frame will be 70 ft. high, and constructed of 18-in. timbers. The company has secured the hoisting plant of the old Reins Co. The engine with cylinders of 16x32 ins., is good for a depth of 2000 ft. Sinking of the Calumet shaft from the 1000 level to the 1500 level will start soon. The ledge outcrops 500 ft. east of the Calumet shaft. Shipments have been made from a trench there. The ore returned 3 to 4% copper. It has not been decided whether to crosscut for this ledge from the 1000 level or drive for it from the 1500.

Butte & Superior has again started operations. The mill was started by the night shift Aug. 17 and the day shift at the Black Rock mine went to work on the same date. The accident which caused the shut down was on Aug. 6 and considerable of the shaft-timbering was torn out. As a result operations ceased for nearly 2 weeks.

Butte & London has encountered some promising leads in both the north and south crosscuts. The real veins have not yet been encountered. The north crosscut has been run 175 ft. from the station on the 1600 level and the south crosscut about 225 ft. The Granite gives every evidence of mineralization and small stringers have been encountered. Work will be pushed in both directions. No work is being done at the Rainbow Development property at present, as crosscutting there is completed for the present.

Hilger.

Fergus county has commenced to ship its first copper ore, though gold and silver have been produced for many years. The Sutler mine at the head of Annells creeks has made its first 40-ton shipment of high-grade to the Washoe sampler at Butte. Ore will be hauled from the mine to Hilger and from there will be carried by rail. They now have a 12-ft. face of solid shipping ore and expect to make regular shipments, following this initial lot, sending out from two to three cars a month. It has taken three months to open up the present face. Teaming at present costs \$4 per ton, but it is hoped if the ore runs like the sample lot, \$90, that motor trucks will be used in the future.

Superintendent Gow announces that mining operations on the 2600 level of the Tuolumne will begin this week and, as a result, the production will be increased 25%. The raise between the 2400 and 2600 levels has just been finished, and work is started on the winze that is to be sunk from the 2600 level for the development of the ore below that level. The completion of the raise makes it necessary to put a force of men to work immediately taking out ore on the west level. The assays made there show ore of better grade than on the 2200 and 2400 levels. The mine has been producing about 60 tons per day and, with the additional hoisting to be done from the 2600, this amount will be increased to 75 tons.

The Sinbad shaft on the Butte Main Range property is nearly completed with respect to retimbering and mining on the 500 level will start almost immediately. There are 500 ft. of timbering to be done between the 600 and 700 levels. The work will be finished by Sept. 1, and development of the 700 level will begin. This will consist of crosscutting the entire property on that level to the south line. The crosscut there is now in 400 ft. and there is a distance of 1200 ft. more to be crosscut. This will cut the leads. Orders were sent recently for the new hoist at the Colusa-Leonard Extension property. The management was fortunate in being able to purchase the old Butte-Milwaukee hoist. It is a Nordberg first-motion hoist. It is planned to have it installed for operation by Oct. 1. A new head frame is to be erected and when this equipment is ready sinking will begin. The mine is unwatered now to the 600 level. The pumps have been overhauled and put into good condition.

Maxwell.

The Northwestern Mines Co. mine is sinking a double compartment shaft 8 by 6 ft. at the end of their 700 level, 700 ft. from the portal of the tunnel, and at 40 ft. depth have cut through a vein of copper sulphide ore, 8 ft. wide, carrying values in copper from 6% to 10%, 4.03 ozs. of silver and

a trace of gold. They have shipped 6 cars of concentrates and low-grade ore during July to Anaconda smelter, that netted \$3000. Owing to a cloudburst the Granite County Electric Power Co.'s dam was damaged, necessitating the shutting off of power from the Northwestern Con. mill, the repair to the dam will be finished by Aug. 15, when its mill of 100 tons daily capacity will be running on full time. G. W. Dickinson of Spokane is general manager for the company.

C. F. Spaulding, superintendent Brooklyn mine, states that they cut 4 ft. of shipping ore in an old winze of copper carbonates carrying 60 ozs. silver and 2.6% copper. They shipped the first car of concentrates this week to Anaconda.

NEVADA.

Goldfield.

Streaks of rich ore are showing in the big vein at a depth of 420 ft. in the Kewanas, about 700 ft. north of the main winze. The main ore body lies further to the west, on the shale contact and crosscuts and raises will be driven from the 840 level to open the ore at this point. The ore conditions at the 420-ft. level are considered the most favorable in the history of the mine.

The 1000-ton mill of the Goldfield Con. has been shut down a few days pending the change of treatment from cyanide to flotation. Hereafter all ores will be subjected to flotation and the cyanide plant discontinued. The first 500-ton unit has proven its ability to treat all kinds of mine ore and effect an extraction of 92% gold and 99% copper. The management expects to better the gold recovery as soon as the plant has been in operation a few weeks. High-grade copper-gold ore is being opened on the 600 and deeper levels of the Mohawk and Red Top-Laguna, and considerable work is about to start in other mines composing the group.

At a depth of 530 ft. in the Florence a strong vein has been intersected in the hanging wall of the old Rodgers Syndicate stopes. It averages 4 to 5 ft. wide and assays \$35 per ton in gold, silver and copper. On the 250 and 650 levels large bodies of gold-copper ore are exposed. The flotation plant is now handling upward of 200 tons per day and its capacity is being gradually increased.

Net profits of the Jumbo Extension in July were \$28,400. Mine developments are reported satisfactory, with a large tonnage of medium-grade ore being opened in the north-eastern part of the Velvet claim, at a depth of 770 ft. A series of raises is being extended from the 1017 level of the old shaft to develop the vein to advantage.

Mina.

An examination of the Dunlap property, 12 miles east of Mina, is being made on behalf of S. A. Knapp of Berkeley, Cal., who has taken an option on the mine. The property is owned by the Nevada Copper Co., controlled by officials of the Tonopah Mining Co., and has been extensively developed. The lower adit is in 100 ft. and good ore has been opened by numerous drifts, tunnels and shafts. It is reported the deal involves \$150,000.

Luning.

The Wedge Copper Co. has shipped a 50-ton lot of ore averaging around 8% copper. A 7000-ft. pipe line is under construction from a group of springs to the camp, and considerable equipment is being provided. Three veins are being opened in a monzonite-lime formation. M. H. Welser has been appointed superintendent.

Reno.

The Nixon-Nevada Mining Co. is shipping high-grade ore from its Granite Hill property 14 miles northwest of Reno. Shipments are averaging 10 to 40% copper, with gold and silver also present. It is stated recent shipments have netted the company \$90 to \$100 per ton. The rich ore is coming from No. 1 vein, which ranges from 8 in. to 2 ft. in width. Fred H. Miliken is resident engineer.

National.

The National Mines Co. has arranged to sink the shaft to a depth of 500 ft. below No. 5 level, and will follow this

work by comprehensive deep developments. Good ore has been opened in the tunnel, with the veins showing a persistent tendency.

Good progress is being made with construction of the 20-stamp mill being built at the Buckskin National by the Hatch Leasing Co. Most of the machinery is on the ground and the management expects to start operations in the early fall. A large tonnage of excellent quartz is exposed. N. P. R. Hatch is manager.

Goodsprings.

The Boss mine is shipping gold-platinum ore to an eastern refinery at the rate of \$12,000 per month. The engineers have developed a process for local treatment of the ores, and it is likely a small plant will be built at an early date.

The Bullion mine has been taken over by the Bullion Mining Co., composed of Salt Lake interests, and is maintaining a heavy tonnage of lead and lead-zinc ores. The 60-ton concentrator is operating at full capacity and a hoist is being installed to replace the smaller hoisting engine. Sixty men are employed.

The Christmas Con. Mines Co. has arranged to start building of a 50-ton dry concentrator in September. Shipments are being made at the rate of 200 tons per month.

Seven Troughs.

Thirty days will see the unwatering of the Seven Troughs Coalition mine, which was flooded up to the 1500 level a week ago, according to hydraulic engineers now on the ground. A flow of water was struck last week, while after some exceptionally rich ore below the 1700 level. Within 48 hours the mine was flooded up to the 1500 level. Two special sinking pumps are now installed and rapidly taking out the water. Although disastrous, the flow in the lower levels has dried up the flow on the 1100 level, so that when unwatered, the mine will be kept in working shape with no more pumping than required before the flood. Officials of the company had looked forward to a banner production record in August, but flooding has delayed the rich harvest.

Rochester.

Actual construction of the addition to the Rochester Mines Co.'s mill, in Humboldt County, was commenced this week, and will be rushed to completion. When finished, the improvement will practically double the output of the mill, and bring the daily average up to 200 tons, according to an estimate made by L. A. Friedman, president and general manager. Native silver, in large quantities, is being taken from the bottom of 301, or the Codd, winze, which is now within 130 ft. of connecting with the Friedman tunnel.

Pioche.

Uvada Copper Co., M. M. Johnson, consulting engineer, Salt Lake, is shipping 60 tons per day running 5% copper and 6 to 8 ozs. silver. The ore carries an excess of iron and lime.

NEW MEXICO.

Mogollon.

Socorro Mining & Milling Co. shipped 1700 lbs. of gold and silver bullion to the mint and several tons of concentrates to the smelter from operations covering last half of July.

With good mill ore on the Eberle and also two different locations on the Clifton mine yielding profitable rock, the Oaks Co. is steadily proving the value of the Queen Vein or Mother Lode of the district, in which the management has always had great faith. The Queen is known to carry values for over 10 miles in length and in places to have a width of 50 ft. Its possibilities under extensive and systematic development are good.

The new 3-compartment, 6 by 6-ft. shaft of the Mogollon Mines Co. has reached a depth of 830 ft. Stations and levels are run at regular intervals. This company has started work on a board flume to keep tailings out of creek, the intention being to extend it to present tailings storage

dams on Mineral creek some 4 miles below and permanently keep mill discharge out of streams. The different companies have spent several thousand dollars in recent years and now have the tailings situation well under control.

The companies of Mogollon have completed the survey of the proposed new road to the Arizona line to connect with the route to Clifton and early action on this matter is looked for.

SOUTH DAKOTA.

Rockford.

The main tunnel at the property of the New Golden West Mines Co. is being driven into the hill to tap the main ledge of ore. It has now reached 460 ft. and has just broken through the footwall of the vein. For much of the distance the tunnel has been driven through heavily mineralized slate, all carrying gold values. The main body of ore will be tapped at a depth of 300 ft. and the ore struck will be below the oxidized zone. On surface the ore averages across the 60-ft. vein better than \$4.50 a ton. After the footwall has been broken through a station will be cut and a raise made to surface. From the station a 3-compartment shaft will be started and sunk several hundred feet. Beginning with the first of the month three shifts will be employed. Sinking and raising will be carried on simultaneously.

Lead.

F. W. Bird now has entire control of the Golden Crest mine in the Two Bit district and has a small crew at the property. He plans on opening old stopes and ground only at present. The ultimate plans for development of the ground will be undertaken when sufficient funds are on hand to proceed with the development below the quartzite in the main shaft, now down 300 ft. It is estimated that a capital of at least \$50,000 should be on hand. If successful it would result in opening up vertical veins of quartz ore, lying in the slates. No. 6 shaft down 210 ft. and located east of the main shaft is being retimbered. At several levels in this shaft, considerable quantities of good grade ore were encountered. Some of it was milled in the 10-stamp cyanide plant built in 1902, and the remainder, that of higher grade, was shipped to the Deadwood smelter. There is confidence that much similar ore will be uncovered in the old workings and it is possible that enough will be produced to make advisable starting up the 40-stamp modern cyanide plant, which was completed in every detail, but has never operated.

TEXAS.

Burnet.

The Texas Graphite Co. has a force of about 75 men employed in developing a graphite deposit near here. It is claimed that the deposit is 4000 ft. long, 200 ft. wide and 100 ft. deep, so far as proved, and that indications point to it being larger. Construction of a 200-ton mill, each of the four units being of 50-ton capacity, is now underway. A good amount of the graphite ore has already been moved. It runs from 8 to 12% flake graphite. The milling will be done by the flotation method. The company has already expended a considerable sum of money in erecting residences for its employes and making other preliminary improvements. The milled graphite will be shipped to a refining plant in New Jersey.

Boquillas.

Henry Bordnet and associates are preparing to develop a cinnabar claim which was discovered a few months ago about 30 miles northwest of here. The outcropping is situated some distance from the Terlingua quicksilver district. It is stated that a 20-ton furnace and other equipment will be installed and the new prospect opened on a large scale. Outcroppings of cinnabar are found in many localities of the Big Bend district but up to this time the actual development operations have been confined to Terlingua and the immediate vicinity.

UTAH.

Eureka.

Eagle & Blue Bell has sunk its 2-compartment shaft to the 1875 level and is cutting a station there. An ore body was encountered at the 1832 level and the shaft was sunk further to prove it, but on going down values began to grow smaller. In the progress of this station cutting the past week, when it came to putting in a 15 to 20-ft. sump beneath, again the good values were encountered. This shows a vertical depth of 63 ft. so far on ore. However, the station was so far along that it was decided to finish it up, although the desire was to cut it in the permanent wall formation instead of in this looser material. In a few days the prospecting of the new ore body will be taken up. The ore coming from the shaft discovery ranges from 15 to 40% lead and from 12 to 20 ozs. silver. One lot showed 28% lead and 12 ozs. silver; another 40% lead and 20 ozs. silver, while a third showed values of 15% lead and 15 ozs. silver. It so resembles the ore in the adjacent workings that it is the opinion that it will prove to be an extension. Judging from the water level in adjacent mines, where greater depth has been attained, it is the opinion that this interfering agency will not be met in the Eagle short of the 2060 to 2075 level.

Park City.

Superintendent E. L. Talbot reports conditions at the Daly West as satisfactory with underground conditions better than they have been for a long time. The output for July was bigger than any time since the big fire.

Within the next week it is expected that the work of sinking the shaft at the Keystone will be commenced and work prosecuted with three shifts. It is only a question of getting to the ore, as a large body is known to exist at depth. It is only a matter of a few months at the outside before the Keystone will be in the producing list. For the past 3 months, things have been moving slow at this property because of the nature of the work of putting up new buildings, installing new machinery, stringing electric wires, etc. This work is finished, and now the active work of development will commence.

Superintendent Dave Scott at the Reed's Peak reports conditions favorable. Streaks of iron are coming in the face of the tunnel, and the general impression is that the ore body is near. A meeting of the directors was held at which W. D. Lewis tendered his resignation as president, and Frank Andrews was named as his successor. R. T. Kimball was also named as Lewis' successor on the executive committee with H. Welsh and Mr. Andrews.

At the Daly Judge Extension conditions are satisfactory. The new hoist recently installed is doing good work. The new shaft is down about 90 ft. and in the bottom is some lively looking rock which carries lead and silver values. Three men are at work at the Iowa-Copper-Apex. Development on the incline is opening up a good body of ore. Some 60 tons are on the dump, and the body is increasing in size as depth is obtained.

American Fork.

Ten properties are now active in the district. The Silver Flat, being worked by Clyde Parker and Sam Huggard, is following a lime-quartz contact to get under a showing on the surface. The owners say that there is a cross-fissure running under this depression and they hope to get ore when this point is reached.

The next shipper to be opened up will be the Wasatch Range, on which a deep tunnel is being driven to cut a 3-ft. vein of shipping ore showing near the surface. The men are due to cut this fissure any shot and when it is cut the men who are working under lease say it will be a shipper.

The Alpine-Empire has run its drift 70 ft. into the lime bedding away from the main tunnel, since being taken over by the new management. The ore is improving.

A. Holman and A. E. Holman of Pleasant Grove, H. M. Olmstead and Ernest Woolley of Salt Lake and L. A. Olmstead of Lehi have recently acquired some ground east of the

Milkmaid and have opened a vein of molybdenum which they expect to develop in the near future, as soon as they have perfected the organization of a corporation for this purpose.

H. W. Owens and son are working two properties, one on the North Star and the other one lying to the southwest on the Wasatch range fissure, under the Silver Lake. They are taking out some good rock in the latter property and are expecting to strike a body.

The Stewart-Mercer, under the supervision of Ammon Mercer, continues and the molybdenum strike, reported there 3 weeks ago, continues to improve and a body is being opened up that may soon make a mill profitable.

The Gold Hill, north of Silver Lake and next the Earl Eagle, has 5 men under Theodore Nicholes pushing 2 tunnels into the mountain. No. 1 tunnel is on an east-west fissure in the lime, dipping toward a quartzite contact. It is now in 40 ft. and is showing some silver-lead-copper ore, which is improving with every shift. Tunnel No. 2 is in 30 ft. and is being run to cut the lime quartzite contact that shows good ore on the surface. The property has mineral showings in six different places in four different fissures. The company has a 150-ft. tunnel that will cut these fissures at depth.

Salt Lake.

Grand Gulch Mining Co., managed by W. P. Jennings, Salt Lake, is operating the Grand Gulch copper mine, located in Arizona, on the north side of Grand canyon. It is 80 miles south of St. George, Utah, and 46 miles east of St. Thomas, Nevada, the latter a station on Salt Lake-Los Angeles railroad. The ore, consisting of copper carbonate, is hauled to St. Thomas and shipped to Salt Lake smelters. The shipments, amounting to 300 to 400 tons per month, are of 3 grades: the bulk of it, 11 to 12% copper, a small tonnage running 15 to 17%, and other lots running about 35%. Mining has reached a depth of 300 ft., the ore occurring in limestone and silica, is found in concentric rims around a central core of brecciated material. The Bronzel mine, having similar ore, situated 8 miles south of the Grand Gulch, is shipping 50 tons a month.

WASHINGTON.

Clayton.

The Spokane Belle, idle for 20 years, has again become active. E. H. Belden, Spokane, sole owner, has put 2 men to work cleaning out one of the old shafts and stripping veins. Later, he intends to deepen the main shaft, now down 100 ft., to the 300 level, where a crosscut will be run to tap showings exposed on surface. Samples from the old dumps run as high as 65 ozs. silver. He contemplates forming a syndicate to finance development and later, if conditions justify, a company.

Danville.

The Lucile Dreyfus mine has started to be active again after being idle for 7 years. Arthur Dunphy, Spokane, has bonded the property, the consideration being between \$50,000 and \$60,000. The fixing up of the living quarters and preparations for operations are now in progress. The Lucile is one of the properties on La Fleur mountain, which was the objective point of men who raced from Marcus when the word came that the north half of the Colville Indian reservation had been opened for mineral exploration in 1896.

Northport.

Harry W. Newton has completed plans for the new mill of the Norman Mines Co. and grading will commence immediately. The Traylor fine crusher, four Hartz jigs and a Butchart table have been ordered from Traylor Machinery Co. under a 3-week delivery guarantee. Other equipment, including 50-hp. gasoline engine, belting and other small machinery will be purchased as required in this market. The mill building will be designed to house several more tables, a set of fine rolls and flotation system. The final process will be determined by experiments to be conducted by Newton. Meanwhile the jigging equipment will save approximately 400 lbs. of 30% zinc carbonate from Great Western

finer now unsalable, besides recovering practically all the lead content. It is believed that the south end of the Empire shoot, toward which Great Western tunnel has been extended for some months, has just been entered and a raise is now being put up to determine its extent at that point. Stopping is again under way from below the main level and shipments of zinc carbonate ore will be resumed at once. At the Last Chance three exposures of from 2 to 3 ft. of lead-zinc ore are being developed and about a carload every third day is being forwarded to Ozark Smelting & Mining Co., at Coffeyville, Kansas. Stope fillings and dumps of the Last Chance have been tested and have been found to contain excellent milling material in large quantities. The intermediate dump is being sorted and the hand-picked sulphide ore will be shipped under the Ozark contract. Accommodations for mill crew will be supplied immediately at the terminal tramway.

WISCONSIN-ILLINOIS.

Highland.

The New Jersey Zinc Co. shipped 5 cars of carbonate zinc ore to furnaces at Mineral Point, 120 tons. Webbing Mining Co. sold 100 tons of carbonate zinc ore to a new buyer representing new eastern smelter interests. Great activity prevails in this district of late and demand for at least 100 miners has been announced at three new producers.

Linden.

Shipments last week showed improved conditions, the Linden Zinc Co. shipping 2 cars high grade to LaSalle, 80 tons, and 2 cars to Lanyon Zinc Co., 80 tons. Milwaukee-Linden Development Co. to Cuba, under optional contract with present operators, 5 cars, 200 tons.; Ross Bros. to Mineral Point, 2 cars, 57 tons; Saxe-Pollard Co. to Mineral Point, 2 cars, 74 tons; Optimo No. 2 to Cuba, 2 cars, 86 tons.

Eastern interests exercising option on the Milwaukee-Linden Development Co.'s mines have 7 drills at work proving ground and will supply a magnetic zinc ore separating plant of 60 tons raw ore capacity daily.

Mineral Point.

Forty-four cars of crude zinc ore reached the refining plants of the Mineral Point Zinc Co. last week, 1687 tons. All but 9 cars came from company owned mines. High-grade product to smelter at DePue, 13 cars, 564 tons. Locals delivered small lots to furnaces, 16 tons.

Platteville.

Returns for the entire field for week of Aug. 19 show delivery of 166 cars of ore to track, 6893 tons. This record has been exceeded but once and by one car only. One car of lead ore cleared 76,000 lbs. Shipments of pyrites came from the National Separators, 706,400 lbs.; Mineral Point refineries, 673,900 lbs. The gross recovery of raw ore from mines for the week totaled 5057 tons, a record-breaking output. Net deliveries to smelter, 3004 tons, also high.

Klar-Piquette and East End mines each shipped 3 cars raw ore to Galena. Hodge mine of the Vinegar Hill string, 3 cars to Cuba. A considerable quantity of both high-grade separator ore and crude concentrate was carried over.

Prices held stationary, the base on standard and top grades holding at \$56 per ton-down to \$50 base for medium grades. One outstanding feature of this week's business is exceptionally heavy buying by the Eagle Picher Lead Co. from the Wisconsin Zinc Co., 750 tons being bid in for prompt delivery.

Mifflin.

Shipments last week were practically nil, nearly all independent operating concerns failing to report. The Coker mines of the New Jersey string shipped 9 cars to Mineral Point, 355 tons.

Established and operating for 30 years or more, the Coker mine is today regarded one of the greatest single zinc ore producers in the entire field. Six hundred tons of mill-rock are handled on double shift, one 30 to 40-ton car of ore being loaded and shipped daily. Grunow Mining Co. is engaged in ore production, making 8 tons daily on single shift.

Drills are engaged for the company on the Clayton farm. Peacock Mining Co. is operating with newly installed Lawson aerial-tram. Rapid ore handling has been facilitated. Drills continue on the lease, but without any marked result. Royal Mining Co., operating the Peni lease, continues operation, making 58% wet concentrate, the best raw ore of the field. The mine has been carried into the old Grunow lease on the Miller farm. Lucky Six Mining Co. is making 14 tons of 48 to 54% zinc ore daily on single shift. A crosscut is being driven to the body struck in drilling. Exploration work with drills on the lease of late has been rewarded with rich strikes. The B. M. & B. Mining Co., operating the Squirrel mine, is driving a big crosscut toward a range newly drilled out ahead of the Lucky Six mine. Drills are employed in drilling out the property and a new shaft is being sunk on the Squirrel range. Flat sheet formations of zinc ore 6 ins. solid have been stripped. The Biddick mine is making 20 tons of 30% zinc ore daily on single shift. Drills are engaged west of the main range. Superintendent Hempfield has been placed in charge of the Big Tom mine and equipment. Extension of the main transmission line of the Mineral Point Electric Power Co. to Livingston now insures power for the Big Tom, where a new 200-ton plant is not quite ready to begin service. Vinegar Hill Co. is removing the Rundell plant to the Yewdall strikes. Drills are at work on the Yewdall lease.

Cuba City.

Receipts of raw ore for last week at National Separators totaled 20 cars, 856 tons. High-grade finished blende to Illinois Zinc Co., 39 tons; to Granby Con., 8 cars, 323 tons; Utt-Thorne Mining Co. to Benton Roasters, 4 cars, 176 tons.

Benton.

All previous records for a single week's delivery of ore to track were exceeded last week with a turnin of 73 cars, 6,224,000 lbs. The Grand View Mining Co., a new incorporation, reported its initial shipment, 2 cars to Cuba, 53 tons. Other new shippers were the Wilkinson, 2 cars to Cuba, 83 tons; Sally Mining Co. to Cuba, 1 car, 28 tons; the Frontier string shipped 11 cars, 465 tons; New Jersey Zinc Co., 15 cars, 621 tons; Vinegar Hill string, 8 cars, 369 tons; Wisconsin Zinc Co., from Skinner Magnetic Separating plant to Grasselli Chemical Co., 41 tons; American Zinc Co., 6 cars, 260 tons; Lanyon Zinc Co., 3 cars, 130 tons; Eagle Picher Lead Co., 4 cars, 180 tons; Champion mine to Wisconsin Zinc Roasters at Galena, 12 cars, 570 tons; Fields Mining & Milling Co. to Galena Refining Co., 5 cars, 205 tons; Longhenry Mining Co. to Cuba, 39 tons; Indian Mound to Mineral Point, 46 tons; Benton Roaster Co., high-grade to LaSalle, 44 tons. More new producers are rapidly nearing the shipping stage and it is claimed by experts familiar with the situation in this district that in another 60 days the camp will be able to lay on track 100 cars of crude zinc ore weekly.

Shullsburg.

The Winskill mine maintains its reputation as a splendid zinc ore producer, last week sending 7 cars to refineries at Galena, 286 tons; Rodhams Mining Co. to Lanyon Zinc Co., 1 car, 41 tons.

Galena.

Twenty-five cars of ore to track last week is merely a forerunner of what is coming in this district following a protracted period of mine exploitation and development. Shippers were Black-Jack mine to Mineral Point, 5 cars, 196 tons; North Unity to Cuba, 4 cars, 183 tons; Galena Refinery Co. to LaSalle, 1 car, 40 tons; to Lanyon Zinc Co., 6 cars, 258 tons; Wisconsin Zinc Co. refinery to LaSalle, 4 cars, 160 tons; to Edgar Zinc Co., 3 cars, 120 tons. The Birkbeck mine, with bran new rig, reported its initial shipment to refinery, 1 car, 44 tons; Federal mine to Wisconsin Zinc Co., 1 car, 40 tons. Little Corporal, Graham, and others, all with new equipment, are producing and ready to report zinc ore shipments.

Potosi.

The Tiffany Zinc Co. has been rewarded with rich zinc ore discoveries through drifting. The main drift is 32 ft. high and 110 ft. wide. Crosscuts have been completed for 250 ft. on the main deposit. Underground development was suspended on Aug. 19 and all attention is now being given

to the construction of a 200-ton power and milling plant. Ore assays made recently show a recovery by wet concentration alone of 58% zinc content. W. N. Tiffany of Platteville is in active charge of the entire project, which is being financed by Chicago Board of Trade operators.

The Chicago Zinc Co., a new mining corporation, has control of 800 acres of mineral lands in this region, with option covering the fee. The total capitalization has been placed at \$250,000; the sum of \$25,000 has been set aside for prospect and development work. Two new Keystone drills are prospecting the ranges.

The Wilson Mining Co. has completed drift to forehead 20 ft. high and 80 ft. wide and is now in shape to secure consistent output. Superintendent A. G. Grannis, in charge the past 2 years, has been succeeded by Superintendent Fox from the Benton district.

Hazel Green.

The Kennedy mine continues shipments, 2 cars going to Mineral Point last week, 80 tons; Monmouth Zinc Mining Co. to Galena, 2 cars, 53 tons; Lawrence mine to Galena, 3 cars, 123 tons.

WYOMING.

Lander.

On Aug. 15 the Wyoming Petroleum Co. brought in another light oil well at its lease on the reservation 9 miles north of Lander. The Hall Oil Co. also brought in a well in the first sand in the Pilot district. As yet the second sand formation has not been touched though many companies are drilling for it at present.

M. Morgan, H. W. McIntyre and W. D. Clair, representing a London and New York syndicate, have purchased 60,000 acres of oil land. The tract lies in what is known as the Rattlesnake and Dutton basins between Casper and Lander. The Wyoming & Northern railway parallels the land for 12 miles. The tract was sold by J. Evray, National City, Cal., and George S. Smith, Casper, Wyo., for \$5,000,000, the largest price ever paid for a single tract of oil land in Wyoming. The purchasers said they have drilled 400 test holes in the land and oil was struck at each hole at depths ranging from 300 to 1000 ft.

Upton.

A new oil district has been inaugurated near here and is known as the Thirnton district. To date little is known of the field. The deepest well has reached a depth of 1200 ft., but has not been shot. The well is in a characteristic oil sand from which has been pumped a quantity of the product, said to be decidedly high grade. Samples tested have shown 60%. Those interested are awaiting the shooting of the 1200-ft. well and the result will have much to do with the immediate future of the district.

CANADA.

BRITISH COLUMBIA.

Grand Forks.

The Seattle and Loyal Canadian mineral groups, 8 miles north of here have been bonded for \$125,000 by Robert Clark and associates to interests backed by E. E. Martin, San Francisco. The property is one of which little has been heard for more than a decade, though considerable money was expended in development work some 15 years ago and a small tonnage shipped. It is located close to the track of the Kettle Valley railway on the North Fork. The bond calls for shipment of 50 tons of ore daily. The owners are to receive a royalty of 50 cts. a ton. This will be applied on the purchase price. A payment of \$5000 is to be made in 6 months, \$10,000 in 12 months, and the balance in 2 years. Eight men are at work on the property, which is in charge of John McKay. Shipments are being made from surface ore three times a week. Arrangements are under way for the installing of a 5-drill compressor plant in October, and

then the force will be increased to 30. The ore will be shipped to Granby, arrangements having been made with the Kettle Valley railway for service.

Kaslo.

A strike has been made on the St. Patrick group by J. J. Brochier. The claims are located north of Argenta on the Hammill Creek road. The ledge is 30 ft. wide and well mineralized all the way. It contains a shoot from 28 to 40 ins. wide, of good concentrating ore, with a streak of solid galena 8 ins. wide in the middle. The property has been inspected in the last few days by F. R. Wolfe, president of the Florence Co. at Ainsworth. He has spent \$2000 on the property without including his own time and labor.

Trail.

Ore received by the Canadian Con. Co. at its smelter here for the week ended Aug. 15 totaled 10,888 tons, as compared with 10,111 tons during the preceding week, making the aggregate for the year to date 307,077 tons. Notable among the receipts for the week were large tonnages from the United Copper and Electric Point mines, and an initial shipment of 4 tons from the Deer Trail mine in Cedar canyon, Stevens county. A curiosity of the returns is a shipment of 1 ton from the Reco mine at Sandon, an old producer of high-grade silver ore. Mines having a special interest to Spokane, with the tonnage of their shipment last week and for the month of August so far, are as follows:

	Week.	Half month.
Slocan Star, Sandon.....	85	201
Wonderful, Sandon.....	41	41
Rambler-Cariboo, Slocan.....	75	75
Galena Farm, Silverton.....	44	88
Standard, Silverton.....	75	515
Utica, Kaslo.....	49	94
Keystone, Bayview, Idaho.....	36	36
Deer Trail, Davenport.....	4	4
Columbia-Turk, Davenport.....	22	22
United Copper, Chewelah.....	313	494
Knob Hill, Republic.....	30	30
Electric Point, Boundary.....	421	609
Florence, Ainsworth.....	81	81

The following table gives the names and locations of the mines which delivered ore during the second week of August:

	Week.	Year.
Center Star, Rossland.....	3,914	117,091
Le Roi, Rossland.....	1,697	82,820
Le Roi No. 2, Rossland.....	459	10,139
Sullivan, East Kootenay.....	2,876	45,001
Slocan Star, Sandon.....	85	4,734
No. 1, Sandon.....	29	55
Iuth, Sandon.....	68	562
Reco, Sandon.....	1	71
Wonderful, Sandon.....	41	239
Rambler-Cariboo, Slocan.....	75	1,203
Galena Farm, Silverton.....	44	933
Standard, Silverton.....	75	4,809
Hewitt, Silverton.....	33	291
Utica, Kaslo.....	49	524
Keystone, Bayview, Idaho.....	36	198
Deer Trail, Davenport, Wn.....	4	4
Colum.-Turk, Davenport, Wn.....	22	48
United Copper, Chewelah, Wn.....	313	6,625
Knob Hill, Republic, Wn.....	30	1,729
Emma, Sholt.....	336	910
Electric Pt., Boundary, Wn.....	421	833
Howitson, Olive, Ont.....	36	77
Silver Stand., New Hazelton.....	31	417
Eureka, Nelson.....	54	995
Highland, Ainsworth.....	78	1,394
Florence, Ainsworth.....	81	778
Other mines.....	.....	24,597
Totals.....	10,888	307,077

ONTARIO.

Cobalt.

Larose Con. has discontinued work in the tunnel under the bluff on the Larose Extension claim, which adjoins the original Larose. The tunnel was started last winter. The work could be done cheaply, but the results have not proved encouraging. Ore from the dump is still going to the Northern Customs and operations are being continued in the old workings of the original property.

Developments are most promising for the opening up of an entirely new mine at the McKinley-Darragh. The management has always believed, previous to about a year ago, that when the veins were worked through the conglomerate to keewatin, that further research in keewatin, or along the contact would be a waste of money. Research work undertaken about a year ago, demonstrated possibilities and since that time exploration has been pushed along fault lines to

the north and east. Quite recently a crosscut from the winze at 400 ft., before the conglomerate was struck, picked up a vein in the Keewatin—barren, as is usually the case. Immediately the face of the drift entered the conglomerate the character of the vein changed and within a few rounds there was silver showing. This development is the more promising since the vein was discovered by a system of working out various faults in this part of the ground, at exactly the point where it was expected. There is, therefore, no reason to believe that the extensions of further ore bodies worked in the upper levels of the conglomerate should not be discovered in this section of the ground to the north and east of the present workings. The Savage mine is still shipping, but the supply is running short and unless more discoveries are made this auxiliary of the McKinley-Darragh-Savage will have to be closed down.

The Temiskaming main shaft should be down to the contact between the bottom of the diabase sill and the keewatin by the end of the year. The shaft was started some time after that of the Beaver. The delay in sinking of the former was on account of the time required to install the new Nordberg hoist. The Temiskaming shaft is now down 1250 ft. Between 350 and 400 ft. of additional sinking is still required to reach the contact. The company is in a strong financial condition, with a surplus of \$170,210.02 in cash on hand.

Timmins.

The first monthly report of the Hollinger Con. for the month ended July 14 shows the gross profits for the month to be \$215,165.16. The total quantity of ore hoisted was 46,018 tons and the greatest depth from which ore was hoisted was the 1250 level. Only 83 tons came from that level and 20 tons from the 1100 level. The greatest tonnage from development came from the 425 level, from which point 3414 tons were hoisted. In ore taken from stopes the greatest tonnage came from the 200 level, from which depth 16,750 tons were hoisted. No ore from stopes came from below the 550 level. Including 1849 tons of rock hoisted in development a total of 47,867 tons were hoisted during the period. The mill ran 93.8% of the possible time, and the average value of the ore treated was \$9.15 per ton, the milling costs were \$0.969 per ton and the total working costs, \$3.990 per ton of rock milled. From the above figures it is seen that the ore treated for this last period is higher than the average for the first 6 months of the year. During the 6 months the average grade of ore treated was \$8.80 per ton, against \$9.15 for the period between June 16 and July 14. The costs for the 24 weeks, however, were lower, averaging \$3.36, against \$3.74 for the last period.

MEXICO.

Monterey.

In the Concepcion del Oro, the Cerralvo and a number of other mining districts of this part of the country foreign-owned properties are again being operated after a shut-down of several weeks on account of the acute situation that existed between Mexico and the United States. In some instances these mines are still in charge of trustworthy Mexican employees who were left behind to look after and protect them to the best of their ability.

The Minerales & Metales Co., which owns extensive mines at Guadalupe, about 50 miles north of here, recently resumed operations on a larger scale than at any time since the revolution. It is owned by Germans. Recently large shipments of machinery for the mines and smelter of the company were brought in and the development work is to be further enlarged. The company has also imported steel rails and other material for building a spur track from its mines to a connection with the Monterey-Laredo division of the National Railways of Mexico.

It is reported here that the A. S. & R. Co. will make another effort to operate its plants at Chihuahua, Monterey, Asarco and Aguas Calientes as soon as the necessary supplies of coke for fuel can be obtained. Comparatively few Americans have returned to the Guanajuato mining district.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Barton, Donald C.—*The Geological Significance and Genetic Classification of Arkose Deposits*.—Jnl. of Geol. Aug. 1916; p 417; pp 33*; 75c.

Burrows, A. G.; Hopkins, P. E.—*Boston Creek Gold Area and Goodfish Lake Gold Area*. [The geology, mines and prospects and economic minerals of each area are considered separately].—Ont. Bur. of Mines Bull. No. 29; pp 24*.

Hewett, D. F.—*Some Manganese Mines in Virginia and Maryland*. [On the geology, mineralogy and occurrence of the ores and methods of milling and mining at several mines].—U. S. G. S. Bull. 610-C; pp 35*.

Hopkins, P. E.—*Iron Pyrite Deposits in Southeastern Ontario, Canada*. [An economic geological treatise on the subject].—Bull. A. I. M. E. Aug. 1916; p 1361; pp 9*; 35c.

* Robinson, Heath M.—*Ozokerite in Central Utah*. [Treats on the geology, genesis and tests for determining the mineral with descriptions of properties and methods used].—U. S. G. S. Bull. 641-A; pp 16*.

Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico*. [A complete detailed description with drawings].—Bull. A. I. M. E. Aug. 1916; p 1295; pp 38*; 35c.

Scott, W. A.—*Nevada Douglas Mines and Mill*. [Describes the geology, mine and workings and equipment, with more details on the crushing and leaching plants].—Mg. World Aug. 12 1916; p 277; pp 2*; 10c.

Stephenson, Lloyd W.; Crider, Albert F.; Dole, Richard B.—*Geology and Ground Waters of Northeastern Arkansas*.—U. S. G. S. Water Supply Paper 399; pp 315*.

Weidman, Samuel; Schultz, Alfred R.—*The Underground and Surface Water Supplies of Wisconsin*. [Geology of the

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— *Southern Rhodesia Geological Survey's Report for 1915*. [Reprint of the report].—S. Afr. Mg. Jnl. July 8 1916; p 340; pp 1; 35c.

Ore Genesis

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Jeffrey, E. C.—*Methods of Studying Coal*. [A new method revealing plant records in the genesis of coal].—Sci. Conspectus Vol. VI: III; p 71; pp 6*; 25c.

Robinson, Heath M.—*Ozokerite in Central Utah*. [Treats on the geology, genesis and tests for determining the mineral with descriptions of properties and methods used].—U. S. G. S. Bull. 641-A; pp 16*.

Mineralogy and Petrography

Barton, Donald C.—*The Geological Significance and Genetic Classification of Arkose Deposits*.—Jnl. of Geol. Aug. 1916; p 417; pp 33*; 75c.

Connor, E. F.—*Crystal-Modeling*. [A system for crystal building by which not only existing forms, but also new ones may be derived].—Sci. Conspectus Vol. VI: III; p 71; pp 8*; 25c.

Hewett, D. F.—*Some Manganese Mines in Virginia and Maryland*. [On the geology, mineralogy and occurrence of the ores and methods of milling and mining at several mines].—U. S. G. S. Bull. 640-C; pp 35*.

Watts, A. S.—*The Feldspars of New England and North Appalachian States*. [Goes into the lithology of feldspar rocks in general and gives nature of deposits by states. Methods of testing for quality and concentration of rocks are given].—U. S. Bur. of Mines Bull. 92; pp 181*; 35c.

II. ORES AND METALS

(I) METALS AND ORES

Aluminum

Clennell, J. E.—*Estimating Metallic Aluminum in Aluminous Dust*. [Deals mostly with gasometric methods].—E. & M. J. Aug. 12 1916; p 309; pp 1½; 25c.

Stone, G. S.—*Speller: Its Grades and Uses*. [Tells of impurities, the amounts allowable in different grades and their effect on speller's properties].—Mg. World Aug. 12 1916; p 287; pp 1½; 10c.

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Blickenderfer, F. C.—*A Comparative Test of the Marathon, Chilean and Hardinge Mills*. [Tests made at the Detroit Copper Co.'s plant, Morenci, Ariz.].—Bull. A. I. M. E. Aug. 1916; p 1333; pp 16*; 35c.

Hawley, F. O.—*Determination of Copper in Low Grade Ores*. [An electrolytic method for rapid determination].—E. & M. J. Aug. 12 1916; p 307; pp 2; 25c.

McGregor, A. G.—*Features of the New Copper Smelting Plants in Arizona*. [Treats on the transportation and sampling of the ores as well as actual furnace practice].—Bull. A. I. M. E. Aug. 1916; p 1257*; 35c.

Miller, Benjamin L.; Singewald, J. T., Jr.—*Exploitation of Chilean Mines*. [Treats on the industries from an economic and industrial standpoint].—E. & M. J. Aug. 12 1916; p 289; pp 4¼*; 25c.

Scott, W. A.—*Nevada Douglas Mines and Mill*. [Describes the geology, mine workings and equipment with more details on the crushing and leaching plants].—Mg. World Aug. 12 1916; p 277; pp 2*; 10c.

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*.—S. Afr. Mg. Jnl. July 1 1916; p 311; pp 1; 35c.

— *Copper Smelting and Refining in Australia*. [On the economic aspects of the subject].—Mg. Jnl. July 29 1916; p 522; pp 1¼; 35c.

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Alderson, Matt W.—*Mining Possibilities in Colombia, S. A.* [The author tells of his experience in drilling placer ground in Colombia].—*Mg. World* Aug. 12 1916; p 281; pp 2¼*; 10c.

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Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico.* [A complete detailed description with drawings].—*Bull. A. I. M. E.* Aug. 1916; p 1295; pp 38*; 35c.

—*Southern Rhodesia Geological Survey's Report for 1915.* [Reprint of the report].—*S. Afr. Mg. Jnl.* July 8 1916; p 340; pp 1; 35c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

Miller, Benjamin L.; Singewald, J. T., Jr.—*Exploitation of Chilean Mines.* [Treats on the industries from an economic and industrial standpoint].—*E. & M. J.* Aug. 12 1916; p 289; pp 4¼*; 25c.

—*Six Months of Wonderful Prosperity for United States Mining.* [Reviews the first half of the year's production].—*Mg. World* Aug. 5 1916; p 229; pp 8¼*; 10c.

Iron and Steel: Foundry and Furnace Practice

Campbell, H. H.—*The Passing of the Acid Bessemer.* [The phases of its career and an account of its gradual passing].—*Iron Age* Aug. 10 1916; p 302; pp 2; 30c.

Harbord, F. W.; Hall, J. W.—*The Metallurgy of Steel.* [A complete treatise on the subject].—Charles Griffin & Co., Strand, E. C.; book; \$10.

Lead

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Mercury

—*Chinese Mineral Industry in 1915.* [A review of the production of refined metals].—July 8 1916; p 477; ¾; 35c.

—*Six Months of Wonderful Prosperity for United States Mining.* [Reviews the first half of the year's production].—*Mg. World* Aug. 5 1916; p 29; pp 8¼*; 10c.

Silver

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Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico.*

[A complete detailed description, with drawings].—*Bull. A. I. M. E.* Aug. 1916; p 1295; pp 38*; 35c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa.*—*S. Afr. Mg. Jnl.* July 1 1916; p 311; pp 1; 35c.

—*Rooiberg Tin Dressing Plant.* [A reproduction of the plant's flowsheet].—*S. Afr. Mg. Jnl.* July 1 1916; p 309; pp 1*; 35c.

Zinc

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—*Great Britain, Special Reports on the Mineral Resources of.*—*Geol. Surv. of England.* Vols. III, IV, V; \$1.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Crawford, C. W.—*The Calamity Trail—Mine Pumps.* [A discussion of faulty and correct installations and operations].—*Coal Age* Aug. 12 1916; p 266; pp 1½; 20c.

Green, R.—*Horse Haulage vs. Compressed Air Haulage at Collieries.* [In discussing the subject a comparison of actual costs is made].—*Canadian Mg. Inst. Bull.* Aug. 1916; p 711; pp 6; 35c.

Jeffrey, E. C.—*Methods of Studying Coal.* [A new method revealing plant records in the genesis of coal].—*Sci. Conspexus* Vol. VI: III; p 71; pp 6*; 25c.

Lupton, Arnold.—*Coal Resources of the United Kingdom.* [A paper read before the South Wales Inst. of Eng.].—*I. & C. Tr. Rev.* July 28 1916; p 95; pp 2; 35c.

Miller, Benjamin L.; Singewald, J. T., Jr.—*Exploitation of Chilean Mines.* [Treats on the industries from an economic and industrial standpoint].—*E. & M. J.* Aug. 12 1916; p 289; pp 4¼*; 25c.

Webb, W. B.—*The Elkhorn Coal Co.'s Plant, Kona, Kentucky.* [A brief descrip-

tion of development in eastern Kentucky].—*Coal Age* Aug. 12 1916; p 264; pp 1½*; 20c.

Watts, A. C.—*Coal-Mining Methods in Utah—II.* [Various methods for working superimposed beds simultaneously].—*Coal Age* Aug. 12 1916; p 258; pp 5*; 20c.

—*"British Baum" Coal Washing Plant.* [Sectional and plan drawings].—*Colly Guard.* July 28 1916; p 161; pp 2*; 35c.

Coal Preparation, Marketing, Etc.

Allen, Andrew.—*Bituminous Coal Preparation.* [A paper read before the Kentucky Mg. Inst.].—*Coal Tr. Rev.* July 15 1916; p 43; pp 4¼; 25c.

Warden-Stevens, F. J.—*Coal Shipping and Bunkering in Australia.*—*Colly Guard.* July 21 1916; p 109; pp 2½*; 35c.

—*"British Baum" Coal Washing plant.* [Sectional and plan drawings].—*Colly Guard.* July 28 1916; p 161; pp 2*; 35c.

Coal and Coke By-Products

Bowie, C. P.—*Construction and Operation of a Single-Tube Cracking Furnace for Making Gasoline.* [Contains drawings and details, besides information for operation of the furnace].—*U. S. Bur. of Mines Tech. Paper* 161; pp 16*; 20c.

Lishman, G. P.—*Recent Improvements in By-Product Coke-Oven Practice.* [A paper read before the Society of Chemical Ind.].—*I. & C. Tr. Rev.* July 28 1916; p 104; pp 1*; 35c.

Petroleum

Ball, Max W.—*Petroleum Withdrawals and Restorations Affecting Public Domain.* [Oil land law, location of lands restored and withdrawn, and correspondence relative to the same are given].—*U. S. G. S. Bull.* 623; pp 427*; \$1.20

Bowie, C. P.—*Construction and Operation of a Single-Tube Cracking Furnace for Making Gasoline.* [Contains drawings and details, besides information for operation of the furnace].—*U. S. Bur. of Mines Tech. Paper* 161; pp 16*; 20c.

Hennion, Charles.—*The New Baicoi Field of Roumania.* [Describes activities and current events in the field].—*Petro. World* Aug. 1916; p 375; pp 2; 35c.

Taylor, W. G.—*Motor Equipment for Petroleum Recovery.* [A paper read before the American Inst. of Elect. Eng. Deals with the use of induction motors in drilling, pumping, and cleaning oil wells].—*Elect. Rev. & West. Elect.* Aug. 5 1916; p 232; pp 5½*; 20c.

—*Outlook in the Galician Oil Industry.* [Discusses several items affecting the industry].—*Petro. World* Aug. 1916; p 369; pp 1¼; 35c.

—*Six Months of Wonderful Prosperity for United States Mining.* [Reviews the first half of the year's production].—*Mg. World* Aug. 5 1916; p 229; pp 8¼*; 10c.

Natural Gas

Arndt, R.—*The Natural Gas Industry of Hungary.* [Abst. from Vossische Zeitung].—*Petro. World* Aug. 1916; p 367; pp ¾; 35c.

Fath, A. E.—*An Anticlinal Fold Near Billings, Noble County, Oklahoma.* [The geology and formation of the anticline is described relative to the possibilities of oil and gas, which is found 20 miles from the anticline].—*U. S. G. S. Bull.* 641-E; pp 18*.

Wyer, Samuel S.—*Valuation of Natural Gas Rights.* [A paper to be read

before the A. I. M. E. on the economic value of leaseholds on gas land].—I. Tr. Rev. Aug. 10 1916; p 267; pp 4; 25c.

(B) STRUCTURALS AND CERAMICS

Clays, Ceramics

Arbogust, C. O.; Sheridan, L. J.—*The Open Door to Results in Burning*. [On the application of the pyrometer].—B. & C. Rec. Aug. 15 1916; p 310; pp 2*; 35c.

Huac, A. J.—*Cost Accounting for the Clay Plant*. [A series of articles, including forms, tables and description for a complete cost accounting system].—B. & C. Rec. Aug. 15 1916; p 307; pp 3; 35c.

Stone

Hubbard, Prévost; Jackson, F. H., Jr.—*The Results of Physical Tests of Road-Building Rock*. [Gives nature and results of tests with location of place from which sample was obtained].—U. S. Dept. of Agric. Bull. 370; pp 100*.

Humphrey, D. E.—*Drilling and Blasting Shale Banks*. [Discusses several methods of drilling and blasting].—B. & C. Rec. Aug. 15 1916; p 319; pp 4½*; 35c.

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*.—S. Afr. Mg. Jnl. July 1 1916; p 311; pp 1; 35c.

(C) OTHER NON-METALS

Asbestos

Canada, the Manufacture of Asbestos in.—Canadian Mg. Inst. Bull. Aug. 1916; p 671; pp 3; 35c.

Canadian Metal Trades and Preparedness. [A study of production, imports and exports].—Canadian Mg. Inst. Bull. Aug. 1916; p 675; pp 16½; 35c.

Graphite

Bastin, Edson S.—*Graphite in 1915*. [A general review is made as well as one by states for production. The market and prices are reviewed separately].—Min. Res. of U. S. II:11; pp 13.

Canadian Metal Trades and Preparedness. [A study of production, imports and exports].—Canadian Mg. Inst. Bull. Aug. 1916; p 675; pp 16½; 35c.

Great Britain, Special Reports on the Mineral Resources of.—Geol. Surv. of England. Vols. III, IV, V; \$1.

Gypsum

Stone, Ralph W.—*Gypsum in 1915*. [Reviews the uses, methods of refining and production].—Min. Res. of U. S. II:14; pp 9.

Great Britain, Special Reports on the Mineral Resources of.—Geol. Surv. of England. Vols. III, IV, V; \$1.

Nitrates

Miller, Benjamin L.; Singewald, J. T., Jr.—*Exploitation of Chilean Mines*. [Treats on the industries from an economic and industrial standpoint].—E. & M. J. Aug. 12 1916; p 289; pp 4½*; 25c.

Strong, William.—*Electro-Metallurgical Uses of Surplus Power*. [On the possible uses to which the excess hydroelectric power of our western states might be put].—Jnl. Elect. Power & Gas July 15 1916; p 43; pp 3*; 35c.

Sulphur

Miller, Benjamin L.; Singewald, J. T., Jr.—*Exploitation of Chilean Mines*. [Treats on the industries from an economic and industrial standpoint].—E. & M. J. Aug. 12 1916; p 289; pp 4½*; 25c.

III. TECHNOLOGY

MINES AND MINING

Prospecting

Alderson, Matt W.—*Mining Possibilities in Colombia, S. A.* [The author tells of his experience in drilling placer ground in Colombia].—Mg. World Aug. 12 1916; p 281; pp 2¼*; 10c.

Watts, A. S.—*The Feldspars of New England and North Appalachian States*. [Goes into the lithology of feldspar rocks in general and gives nature of deposits by states. Methods of testing for quality and concentration of rocks are given].—U. S. Bur. of Mines Bull. 92; pp 181*; 35c.

Surveying and Drafting

Marshall, R. B.—*Spirit Leveling in Georgia 1896 to 1914, inclusive*. [Gives the elevation and location of all U. S. G. S. bench marks].—U. S. G. S. Bull. 635; pp 60.

Marshall, R. B.—*Spirit Leveling in West Virginia*. [Locates and gives elevation of U. S. G. S. bench marks established from 1896 to 1915].—U. S. G. S. Bull. 632; pp 168; 20c.

Ore Reserves

Dominian, Leon.—*Fuel in Turkey*. [Coal and petroleum are reviewed separately by the places in which they occur. The production, location and nature of the deposits are given].—Bull. A. I. M. E. June 1916; p 1011; pp 20*; 35c.

Lupton, Arnold.—*Coal Resources of the United Kingdom*. [A paper read before the South Wales Inst. of Eng.].—I. & C. Tr. Rev. July 28 1916; p 95; pp 2; 35c.

Drilling and Boring

Alderson, Matt W.—*Mining Possibilities in Colombia, S. A.* [The author tells of his experience in drilling placer ground in Colombia].—Mg. World Aug. 12 1916; p 281; pp 2¼*; 10c.

Humphrey, D. E.—*Drilling and Blasting Shale Banks*. [Discusses several methods of drilling and blasting].—B. & C. Rec. Aug. 15 1916; p 319; pp 4½*; 35c.

Tillson, B. F.—*Hammer Drill Records at the Franklin Mines, New Jersey*. [Abst. of a paper read before the A. I. M. E. Considers drifting, raising and stoping separately and gives costs for each].—Engg. & Cont. Aug. 16 1916; p 163; pp 1½; 20c.

Snake Creek Tunnel, Utah. [A concrete tunnel. The construction and methods used in driving it are described].—M. & S. P. Aug. 5 1916; p 205; pp 2*; 20c.

Explosives and Blasting

Humphrey, D. E.—*Drilling and Blasting Shale Banks*. [Discusses several methods of drilling and blasting].—B. & C. Rec. Aug. 15 1916; p 319; pp 4½*; 35c.

Weston, E. M.—*The Right Use of Explosives in Mining Work*. [Abst. from Practical Mining on the Rand].—Mg. World July 29 1916; p 189; pp 2; 10c.

Tunnels and Tunneling

Concrete Water Tunnel Lining at Chicago. [Abst. from an article in Engg. News].—E. & M. J. Aug. 12 1916; p 299; pp 2¼*; 25c.

Snake Creek Tunnel, Utah. [A concrete tunnel. The construction and

methods used in driving it are described].—M. & S. P. Aug. 5 1916; p 205; pp 2*; 20c.

Ventilation

Air and Temperature in Deep Mining. [Tells of ventilation in the deepest mine in the world, Brazil, operating at 5,826 ft. and intending to go to 7,626 ft. vertically].—Mg. World Aug. 12 1916; p 284; pp 2¼; 10c.

Snake Creek Tunnel, Utah. [A concrete tunnel. The construction and methods used in driving it are described].—M. & S. P. Aug. 5 1916; p 205; pp 2*; 20c.

Lighting

Weigel, W. M.—*The Illuminating Power of Safety Lamps*.—Bull. A. I. M. E. Aug. 1916; p 1349; pp 11*; 35c.

New Approved Safety Lamps. [Brief descriptions of several styles].—I. & C. Tr. Rev. July 14 1916; p 38; pp 1*. Colly. Guard. July 14; p 64; pp 1*; 35c.

Hoists and Hoisting

Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico*. [A complete detailed description with drawings].—Bull. A. I. M. E. Aug. 1916; p 1295; pp 38*; 35c.

Koepe Winding at Plennmeller Colliery, England.—I. & C. Tr. Rev. July 21 1916; p 65; pp 3*; 35c.

Hydraulicking

Barnes, Alfred A.—*Hydraulic Flow Reviewed*. [Gives formulas, etc., and is confined mostly to theory as applied to practice].—Spon & Chamberlain, N. Y.; book; pp 152*; \$4.50.

Mine Gas

Yuvanalieff, N.—*Gas Liberation in Russian Mines and Its Cause*. [From Gorno-Savodskoie Delio].—C. Tr. Bull. Aug. 1 1916; p 53; pp 3; 25c.

Mine Sampling

Watts, A. S.—*The Feldspars of New England and North Appalachian States*. [Goes into the lithology of feldspar rocks in general and gives nature of deposits by states. Methods of testing for quality and concentration of rock are given].—U. S. Bur. of Mines Bull. 92; pp 181*; 35c.

Transport

McBride, W. G.—*Some Records of Motor Truck Mine Haulage Costs and Experience*. [Abst. from a paper in the A. I. M. E. Bull. Detailed costs are given and discussed].—Engg. & Cont. Aug. 16 1916; p 160; pp 1½; 20c.

McGregor, A. G.—*Features of the New Copper Smelting Plants in Arizona*. [Treats on the transportation and sampling of the ores as well as actual furnace practice].—Bull. A. I. M. E. Aug. 1916; p 1257*; 35c.

Safety

Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico*. [A complete detailed description with drawings].—Bull. A. I. M. E. Aug. 1916; p 1295; pp 38*; 35c.

Weigel, W. M.—*The Illuminating Power of Safety Lamps*.—Bull. A. I. M. E. Aug. 1916; p 1349; pp 11*; 35c.

New Approved Safety Lamps.

[Brief descriptions of several styles].—*I. & C. Tr. Rev.* July 14 1916; p 38; pp 1*. *Coll'y Guard.* July 14; p 64; pp 1*; 35c.

Rescue and First-Aid

Brett, A. J.—*First Aid on Rand Mines.* [A paper read before the C. M. and M. Soc. of S. Afr.].—*S. Afr. Mg. Jnl.* July 1 1916; p 314; pp 2; 35c.

Coldham, J. C.—*The Organization and Equipment of a Mine Rescue Station.* [A review of equipment and its use and methods for training a first aid crew. Some information is given on the operation of first aid crews in various mines].—*Proc. Aus. Inst. M. E.* No. 21 1916; p 9; pp 27*; 65c.

Stirling, John T.—*Mine Rescue Work in the Province of Alberta.*—*Canadian Mg. Inst. Bull.* Aug. 1916; p 717; pp 4; 35c.

Production

Dolbear, Samuel H.—*Magnesite Production and Markets.*—*M. & S. P.* Aug. 12 1916; p 234; pp 2*; 20c.

Rickard, T. A.—*Reopening of Old Mines Along the Mother Lode, California.* [A review of conditions past and present, with cost and production figures given].—*M. & S. P.* Aug. 12 1916; p 236; pp 5½*; 20c.

Stone, R. W.—*Sand and Gravel in 1915.* [Gives tabulated production by states, states in which glass-sand was produced and weight of sand and gravel per cubic yard].—*Min. Res. U. S. II*; pp 13.

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa.*—*S. Afr. Mg. Jnl.* July 1 1916; p 311; pp 1; 35c.

—*Canadian Metal Trades and Preparedness.* [A study of production, imports and exports].—*Canadian Mg. Inst. Bull.* Aug. 1916; p 675; pp 16½; 35c.

—*Outlook in the Galician Oil Industry.* [Discusses several items affecting the industry].—*Petro. World* Aug. 1916; p 369; pp 1¼; 35c.

Mining Costs

Green, R.—*Horse Haulage vs. Compressed Air Haulage at Collieries.* [In discussing the subject a comparison of actual costs is made].—*Canadian Mg. Inst. Bull.* Aug. 1916; p 711; pp 6; 35c.

Gudgeon, C. W.—*The Scheelite Gold Mines of Otago, New Zealand.* [Several properties are described. In each the ore body, milling process and milling and mining costs are dealt with].—*Proc. Aus. Inst. M. E.* No. 21 1916; p 37; pp 14*; 65c.

Rickard, T. A.—*Reopening of Old Mines Along the Mother Lode, California.* [A review of conditions past and present, with cost and production figures given].—*M. & S. P.* Aug. 12 1916; p 236; pp 5½*; 20c.

Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico.* [A complete detailed description with drawings].—*Bull. A. I. M. E.* Aug. 1916; p 1295; pp 38*; 35c.

Tillson, B. F.—*Hammer Drill Records at the Franklin Mines, New Jersey.* [Abst. of a paper read before the A. I. M. E. Considers drifting, raising and stoping separately and gives costs for each].—*Engg. & Cont.* Aug. 16 1916; p 163; pp 1¼; 20c.

Mining Miscellany

Finlay, James R.—*The Problem of Efficiency.* [An address before the Colorado

School of Mines].—*M. & S. P.* Aug. 12 1916; p 231; pp 3; 20c.

Hidgkinson, H. H.—*Mining Ore from Pillars.* [A method used by the New Jersey Zinc Co. It is a combination where top-slicing is begun at the bottom of the body and raised from level to level by shrinkage stoping].—*E. & M. J.* July 29 1916; p 217; pp 2½*; 25c.

Latimer, J. W.—*The Roofing of Mine Buildings.* [Abst. of a paper read before the West Virginia Coal Mining Inst.].—*Coal Age* Aug. 5 1916; p 226; pp 1½; 20c.

MILL AND MILLING

Sampling

McGregor, A. G.—*Features of the New Copper Smelting Plants in Arizona.* [Treats on the transportation and sampling of the ores as well as actual furnace practice].—*Bull. A. I. M. E.* Aug. 1916; p 1257*; 35c.

Woodbridge, T. R.—*Ore Sampling Conditions in the West.* [Abst. from advance proofs of a Bureau of Mines Tech. Paper].—*Mg. World* Aug. 12 1916; p 279; pp 1¼; 10c.

Crushing, Grinding, Etc.

Blickenderfer, F. C.—*A Comparative Test of the Marathon, Chilean and Hardinge Mills.* [Tests made at the Detroit Copper Co.'s plant, Morenci, Ariz.].—*Bull. A. I. M. E.* Aug. 1916; p 1333; pp 16*; 35c.

Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico.* [A complete detailed description with drawings].—*Bull. A. I. M. E.* Aug. 1916; p 1295; pp 38*; 35c.

Scott, W. A.—*Nevada Douglas Mines and Mill.* [Describes the geology, mine workings and equipment, with more details on the crushing and leaching plants].—*Mg. World* Aug. 12 1916; p 277; pp 2*; 10c.

Flotation

Palmer, R. C.; Allen, G. L.; Ralston, O. C.—*Some Miscellaneous Wood Oils for Flotation.*—*Bull. A. I. M. E.* Aug. 1916; p 1387; pp 10; 35c.

Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico.* [A complete detailed description with drawings].—*Bull. A. I. M. E.* Aug. 1916; p 1295; pp 38*; 35c.

Concentration: Sorting, Sizing, Washing

Hewett, D. F.—*Some Manganese Mines in Virginia and Maryland.* [On the geology, mineralogy and occurrence of the ores and methods of milling and mining at several mines].—*U. S. G. S. Bull.* 640-C; pp 35*.

Palmer, Leroy A.—*Some Zinc-Lead Mills of California and Nevada.* [Descriptions of some mills and a review of the general practice].—*Met. & Chem. Engg.* Aug. 15 1916; p 203; pp 2*; 35c.

Smith, Howard D.—*Gold Saving on Dredges.* [Results are tabulated and drawings of jigs, etc., used in saving the gold from the dredged gravel are shown].—*M. & S. P.* Aug. 5 1916; p 202; pp 2¼*; 20c.

Watts, A. S.—*The Feldspar of New England and North Appalachian States.* [Goes into the lithology of feldspar rocks in general and gives nature of deposits by states. Methods of testing for quality and concentration of rock are given].—*U. S. Bur. of Mines Bull.* 92; pp 181*; 35c.

Wittich, L. L.—*Exploitation of Arkansas Zinc.* [Speaks of the nature of the deposits, the treating of sludge ore and recent mill construction].—*E. & M. J.* Aug. 12 1916; p 295; pp 2½*; 25c.

—*Concrete Water Tunnel Lining at Chicago.* [Abst. from an article in *Engg. News*].—*E. & M. J.* Aug. 12 1916; p 299; pp 2¼*; 25c.

—*Rooiberg Tin Dressing Plant.* [A reproduction of the plant's flowsheet].—*S. Afr. Mg. Jnl.* July 1 1916; p 309; pp 1*; 35c.

Mill and Smelter Costs

Blickenderfer, F. C.—*A Comparative Test of the Marathon, Chilean and Hardinge Mills.* [Tests made at the Detroit Copper Co.'s plant, Morenci, Ariz.].—*Bull. A. I. M. E.* Aug. 1916; p 1333; pp 16*; 35c.

Carpenter, Jay A.—*Ore Treatment at the West End, Tonopah, Nevada.* [Gives some costs and discusses in detail the results of operations rather than the methods].—*M. & S. P.* Aug. 5 1916; p 197; pp 1½; 20c.

CHEMISTRY AND ASSAYING

Analysis

Clennell, J. E.—*Estimating Metallic Aluminum in Aluminum Dust.* [Deals mostly with gasometric methods].—*E. & M. J.* Aug. 12 1916; p 309; pp 1½; 25c.

Hawley, F. O.—*Determination of Copper in Low Grade Ores.* [An electrolytic method for rapid determination].—*E. & M. J.* Aug. 12 1916; p 307; pp 2; 25c.

Electrochemistry

Hawley, F. O.—*Determination of Copper in Low Grade Ores.* [An electrolytic method for rapid determination].—*E. & M. J.* Aug. 12 1916; p 307; pp 2; 25c.

Kelley, G. L.; Conant, J. B.—*The Determination of Chromium and Vanadium in Steel by Electrometric Titration.*—*Jnl. Ind. & Engg. Chem.* Aug. 1916; p 719; pp 4¼; 60c.

Silsbee, Francis B.—*A Study of the Inductance of Four-Terminal Resistance Standards.* [Laboratory methods for measuring resistance of less than 1 ohm].—*U. S. Bur. of Stand. Sci. Paper* No. 281; pp 48*; 25c.

METALLURGY

Thermic Metallurgy

McGregor, A. G.—*Features of the New Copper Smelting Plants in Arizona.* [Treats on the transportation and sampling of the ores as well as actual furnace practice].—*Bull. A. I. M. E.* Aug. 1916; p 1257*; 35c.

Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico.* [A complete detailed description with drawings].—*Bull. A. I. M. E.* Aug. 1916; p 1295; pp 38*; 35c.

—*Copper Smelting and Refining in Australia.* [On the economic aspects of the subject].—*Mg. Jnl.* July 29 1916; p 522; pp 1¼; 35c.

—*Metallurgical Plants of Arizona.* [A summary of metallurgical practice in the state and an account of the tour of the A. I. M. E.].—*Met. & Chem. Engg.* Aug. 15 1916; p 167; pp 4*; 35c.

Refractories

Nesbitt, C. E.; Bell, M. L.—*Practical Methods for Testing Refractory Fire Brick.* [A paper read before the American Soc. for Testing Materials].—*Met. & Chem. Engg.* Aug. 15 1916; p 205; pp

7%*. B. & C. Rec. Aug. 15; p 312; pp 4*; 35c.

& C. Rec. Aug. 1 1916; p 221; pp 4*; 35c.

Hydro-Metallurgy

Scott, W. A.—*Nevada Douglas Mines and Mill*. [Describes the geology, mine workings and equipment, with more details on the crushing and leaching plants].—Mg. World Aug. 12 1916; p 277; pp 2*; 10c.

POWER AND MACHINERY

Electricity

Dwight, H. B.—*Steel Conductors for Transmission Lines*.—Proc. American Inst. of Elect. Eng. Aug. 1916; p 1259; pp 12*; 35c.

Flaherty, B. G.—*Testing for Defective Insulators on High Tension Transmission Lines*. [Describes methods and apparatus used].—Proc. American Inst. of Elect. Eng. Aug. 1916; p 1221; pp 15*; 35c.

Haas, Herbert.—*The Diesel Engine*. [A paper read before the A. I. M. E. Its field in comparison with the steam-turbine in a large plant. Costs are given].—Iron Age Aug. 10 1916; p 291; pp 1*; 30c.

Lehr, E. E.; Minick, I. C.—*Automatically Controlled Feeder Voltage Regulators*. [On the design of the equipment].—Pract. Eng. Aug. 15 1916; p 700; pp 2½*; 20c.

Magnusson, C. E.; Burbank, S. R.—*An Artificial Transmission Line with Adjustable Line Constants*.—Proc. American Inst. of Elect. Eng. Aug. 1916; p 1245; pp 14*; 35c.

Newton, G. J.—*Underground Distribution Systems*.—Proc. American Inst. of Elect. Eng. Aug. 1916; p 1193; pp 16*; 35c.

Rosa, E. B.; Vinal, G. W.—*Volume Effect in the Silver Voltmeter*.—U. S. Bur. of Stand. Sci. Paper 283; pp 11*; 15c.

Silsbee, Francis B.—*A Study of the Inductance of Four-Terminal Resistance Standards*. [Laboratory methods for measuring resistance of less than 1 ohm].—U. S. Bur. of Stand. Sci. Paper No. 281; pp 48*; 25c.

—*Electric Signaling in Mines*.—Colly Guard. July 28 1916; p 157; pp 3*; 35c.

Hydro-Electric

—*Analysis of Merrill Report on Water-Power*. [Comment on this government report is made, saying that the information and conclusions are at error].—Elect. World July 1 1916; pp 20; 40c.

—*Swedish State Hydro-Electric Power Station at Alfkärleby*.—Engg. July 21 1916; p 51; pp 8*; 35c.

Compressed Air

Green, R.—*Horse Haulage vs. Compressed Air Haulage at Collieries*. [In discussing the subject a comparison of actual costs is made].—Canadian Mg. Inst. Bull. Aug. 1916; p 711; pp 6; 35c.

Klingenberg, G.—*The Transmission of Compressed Air on the Rand, South Africa*. [Abst. from "Large Electric Power Stations"].—S. Afr. Engg. July 1916; p 2; pp 2*; 35c.

Stone, J. P.—*Compressed Air vs. Steam for Steam Hammers*. [An instance where compressed air is more economical than steam].—Pract. Eng. Aug. 15 1916; p 703; pp 1½; 20c.

Combustion Engines

Haas, Herbert.—*The Diesel Engine*. [A paper read before the A. I. M. E. Its

field in comparison with the steam-turbine in a large plant. Costs are given].—Iron Age Aug. 10 1916; p 291; pp 1*; 30c.

Gochnauer, H. W.—*Pumping Costs with Diesel Engines*.—Engg. Rec. April 1 1916; 20c.

Shafer, C. W.—*Two-Crank, Four-Cylinder Combustion Engine*. [A new arrangement for four-cylinder combustion engines].—Pract. Eng. Aug. 15 1916; p 706; pp 1½*; 20c.

Steam and Steam Engines

Haas, Herbert.—*The Diesel Engine*. [A paper read before the A. I. M. E. Its field in comparison with the steam-turbine in a large plant. Costs are given].—Iron Age Aug. 10 1916; p 291; pp 1*; 30c.

Mossman, R. L.—*Construction of Combustion Instruments*. [Describes methods for making gas analyzer and draft gage].—Pract. Eng. Aug. 15 1916; p 697; pp 1½*; 20c.

Stone, J. P.—*Compressed Air vs. Steam for Steam Hammers*. [An instance where compressed air is more economical than steam].—Pract. Eng. Aug. 15 1916; p 703; pp 1½; 20c.

IV. MISCELLANEOUS

Miscellaneous Costs

Haas, Herbert.—*The Diesel Engine*. [A paper read before the A. I. M. E. Its field in comparison with the steam-turbine in a large plant. Costs are given].—Iron Age Aug. 10 1916; p 291; pp 1*; 30c.

Huac, A. J.—*Cost Accounting for the Clay Plant*. [A series of articles, including forms, tables and description for a complete cost accompanying system].—B. & C. Rec. Aug. 15 1916; p 307; pp 3; 35c.

McBride, W. G.—*Some Records of Motor Truck Mine Haulage Costs and Experience*. [Abst. from a paper in the A. I. M. E. Bull. Detailed costs are given and discussed].—Engg. & Cont. Aug. 16 1916; p 160; pp 1½; 20c.

Testing

Blickenderfer, F. C.—*A Comparative Test of the Marathon, Chilean and Hardinge Mills*. [Tests made at the Detroit Copper Co.'s plant, Morenci, Ariz.].—Bull. A. I. M. E. Aug. 1916; p 1333; pp 16*; 35c.

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Ore and Metal Markets; Prices-Current

New York, Aug. 24, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Aug. 23 were as follows:

	New York. Cents.	London. Pence.
Aug. 17.....	66½	31 9/16
18.....	65¾	31 5/16
19.....	65¾	31 5/16
21.....	66	31 7/16
22.....	66½	31 7/16
23.....	66¾	31½

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London Standard Oz.	
	High.	Low.	Avg.	1916.	1915.
January.....	57½	55½	56.775	48.890	25.875
February.....	57	56½	56.755	48.477	27.000
March.....	60¾	56¾	57.935	49.926	27.080
April.....	73½	60¾	64.415	50.034	31.375
May.....	77½	68¾	74.27	49.915	34.182
June.....	68¾	62¾	65.02	49.072	31.038
July.....	65	60	62.94	47.519	29.870
August.....	.....	.....	.....	47.178	.....
September.....	.....	.....	.....	48.68	.....
October.....	.....	.....	.....	49.385	.....
November.....	.....	.....	.....	51.713	.....
December.....	.....	.....	.....	55.038	.....
Year.....	.....	.....	.....	49.690	.....

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—The boom on copper is on. Demand continues to gain in volume each day. Prices are advancing. Nearby metal is scarce and commands a premium. Consumers, both domestic and foreign, are pressing the covering of their requirements. The market situation is taking up the threads that were dropped last May and new records in sales, prices and production are looked for over the winter months. Demand for copper from domestic users is tremendous. Last week sales of over 75,000,000 lbs. for delivery in November and December were reported by leading interests in addition to sales of about 25,000,000 lbs. for export and domestic account for delivery in the first quarter of 1917. Spot electrolytic cannot be had at 28 cts. Consumers reported a few small lots available at 28¾ cts., but any sizeable amount would bring 28½ cts. October electrolytic also commands a premium, while for November and December the latest sales have been made at 27 cts. Thus current prices are 2 to 3 cts. a pound over those prevailing 5 weeks ago. Electrolytic for the first quarter of 1917 has been sold at 26¾@26½ cts., and with the rapidity with which production for the rest of this year is being absorbed, indications are that 1917 copper will soon prevail above 27 cts. Casting copper has felt the impetus, with spot now holding firm and in demand at 25¾ cts. and fourth quarter held at 25 cts. Ordinary lake copper for prompt delivery sold at 27¾ cts. cash, while prime lake for the fourth quarter sold at 27 cts.

Improvement in sentiment is general. Interests usually pessimistic now concede the strength of the red metal. Consumers indicate by their anxiety to cover that prices are again bound higher. The attention being given to refining capacity illustrates the fear of insufficient production. As has been pointed out, refining capacity has not increased in proportion to the expanding demand. New capacity is delayed in completion and while production of ore is mounting the actual outturn of copper does not run above 165,000,000 lbs. a month. Belligerents in their forward purchases are realizing that copper will be needed even after the termination of the war and the new contracts provide for full delivery without regard to the duration of hostilities. Thus the copper situation is gradually shaping for at least 2 years of activity and high prices. On this basis little concern is now expressed over inflation of output.

While domestic consumption of copper is at its highest pitch it has been demonstrated that foreign absorption is

still to reach its apex. Compilation of the production of the 20 leading producers of copper in the first 6 months of this year show an output of 895,000,000 lbs., an increase of almost 300,000,000 lbs. over the production in the first half of 1915. Thus 20 producers turned out on an average 125,000,000 lbs. ore a month, so that the estimates of a total monthly ore output of 200,000,000 lbs. are not amiss.

The large foreign inquiry has not culminated into business as yet, but the matter is active and may be closed before the end of this month. This purchase involves 125,000 tons, and is sufficient in itself to compel buying of copper well into next year. Some good sized foreign orders for delivery this year have been cabled here, but the bulk of the business taken recently has been from domestic users. Prices on wire goods and copper sheets have moved upwards in response to the activity in the primary markets, and manufacturers report that consumers who were waiting for a reaction are now placing their orders. A survey indicates that the future of copper is no longer dependent on the war. The market has been established on a basis where the difference between intrinsic worth and actual values are no longer an item of contention.

At London the situation in standard copper has been a paradox. This grade of copper has been steadily receding, while American electrolytic has advanced. As the Ministry of Munitions forbids the purchase of copper at prices higher than those quoted on the London Metal Exchange, except by special permission, it is evident that users are supporting the upward movement in electrolytic. Last week standard declined £3 in spot and futures, while electrolytic advanced £2. At the opening of the current week standard receded £2 in spot and £1 10s in futures, with another gain of £1 in electrolytic. It is therefore manifest that electrolytic copper is acting independent of the standard market.

Quotations for copper per pound at New York for the week ended Aug. 23 were as follows:

(For Fourth Quarter Delivery.)			
	Lake.	Electrolytic.	Casting.
Aug. 17.....	26¾@26¾	26¾@26¾	24½@24½
18.....	26½@27	26¾@27	24¾@25¼
19.....	27	27	25 @25½
21.....	27	27	25 @25½
22.....	27	27	25 @25½
23.....	27¾	27¾	25¾@25¾

Quotations for copper per ton at London for the week ended Aug. 23 were as follows:

	Standard			Electrolytic.
	Spot.	Futures.		
Aug. 17.....	£114 0 0	£111 0 0		£126 0 0
18.....	113 0 0	110 0 0		126 0 0
19.....	113 0 0	110 0 0		126 0 0
21.....	111 0 0	108 10 0		127 0 0
22.....	110 10 0	108 0 0		127 0 0
23.....	110 0 0	107 10 0		128 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.				
Month.	1916			1915.
	High.	Low.	Average.	Average.
January.....	25.50	23.00	24.101	13.891
February.....	28.50	25.25	27.437	14.72
March.....	28.25	27.25	27.641	15.11
April.....	30.00	28.50	29.40	17.398
May.....	29.75	28.25	29.05	18.812
June.....	29.25	27.25	27.90	19.92
July.....	27.20	26.10	26.745	19.423
August.....	.....	.....	.....	17.472
September.....	.....	.....	.....	17.758
October.....	.....	.....	.....	17.925
November.....	.....	.....	.....	18.856
December.....	.....	.....	.....	20.875
Year.....	.....	.....	.....	17.647

New York—Electrolytic.				
Month.	1916			1915.
	High.	Low.	Average.	Average.
January.....	25.50	23.00	24.101	13.707
February.....	28.50	25.25	27.462	14.572
March.....	28.25	27.25	27.410	14.96
April.....	30.50	28.25	29.65	17.057
May.....	29.75	28.00	28.967	18.601

June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August				17.222
September				17.705
October				17.859
November				18.826
December				20.348
Year				17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	1916	1916	1915.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.33	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August					67.350
September					68.560
October					72.577
November					77.400
December					80.400
Year					

Tin.—The market last week was affected by declines in tin at London and Singapore. Trading which at first was active fell off and prices began to recede in sympathy with the weakness abroad. Spot and futures dropped a full cent during the week. Users who previously had shown a disposition to cover forward needs naturally withdrew on the weaker market. Large sellers were at a loss to explain the recessions abroad, especially in view of the high prices cabled with the limits from the east and also from London.

The spot situation here shows no change. Holders are carrying fair stocks, but are not offering, as they hope to recoup. Spot Straits tin is quoted at 38½ cts., while spot Banka is held at 37¼ cts. A few lots of impure Chinese tin were sold at 36¼ cts. There still appears to be a strong belief that tin will increase in value. Expectations are that Singapore operators will ship less freely. On the other hand, as long as the war continues, tin will be affected, as both Germany and Austria, both large consumers, are out of the world market.

At this writing Straits tin for September and October delivery is held at 38¼@38½ cts., while for November and December 38@38½ cts. is quoted. This indicates the relative strength of futures despite the heaviness of the spot position, as the difference between spot and December is only ½ ct. Arrivals of tin since the first of the month total 3137 tons, and indications are that August imports at both coasts will total about 4000 tons. The stock afloat to this country totals 3085 tons.

Foreign markets closed at the lowest point last week, but at the opening of the current week London came steadier, while Singapore on Tuesday advanced £1 5s to £172.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Aug. 23 were as follows:

Aug.	New York		London.	Singapore.
	Spot.	Sept.	Straits, spot.	shipments.
17.....	38¾c	38½c	£171 15 0	£174 0 0
18.....	38¼c	38¼c	169 15 0	173 0 0
19.....	38¼c	38¼c	169 15 0	172 0 0
21.....	38¼c	38¼c	169 15 0	170 15 0
22.....	38¼c	38¼c	169 10 0	172 0 0
23.....	38¾c	38¼c	169 10 0	

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	62.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August				34.386
September				33.13
October				33.077
November				39.375
December				38.756
Year				38.664

Lead.—This metal is now in the midst of a movement the like of which has not been seen in many months. Last week the A. S. & R. Co. announced two advances of \$5 a ton each, but each time independents topped the advance by

\$2 to \$3 a ton. Business has been very active. Canadian interests have bought heavily and are still in the market. Russia and Japan were also active buyers, while domestic users took freely of spot metal and sought futures, but sellers were shy on forward business. When the A. S. & R. Co. brought its price up to 6.25 cts. independents advanced to 6.50 cts., and when the principal producer brought its price up to 6.50 cts. independents took orders at 6.65 cts. New York. On Monday independents took orders at 6.65 cts. St. Louis and 6.75 cts. in New York.

The influx of lead business did not arise from shell contracts, as no contracts for shrapnel were placed, all the shells being explosive rather than shrapnel. Some orders for September and October were taken at 6.65 cts. New York basis by independents, who reported that they could sell several thousand tons at this price, but did not care to dispose of the metal, as indications point to 7 cts. for lead in the near future. Canadian buyers took 2000 tons spot metal last week and were in the market for 1000 tons on Monday of this week. Sales of about 1500 tons were made to domestic users by independents, while Asiatic interests took about 700 tons. At London the market has been steady, with a fair upward movement.

Quotations for lead per pound at New York and per ton at London for the week ended Aug. 23 were as follows:

Aug.	New York		London.	Futures.
	Indpts.	A. S. & R. Co.	Spot.	
17.....	6.25c	6.25c	£29 15 0	£28 0 0
18.....	6.60c	6.50c	30 0 0	28 10 0
19.....	6.75c	6.50c	30 0 0	28 10 0
21.....	6.75c	6.50c	30 0 0	28 12 6
22.....	6.70c	6.50c	30 0 0	28 12 6
23.....	6.70c	6.50c	30 5 0	29 0 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	1916	1915.	1916.	1915.	
	High.	Low.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August				4.750	22.150
September ..				4.627	22.953
October				4.612	23.932
November ..				5.152	26.240
December ...				5.346	28.884
Year				4.675	23.099

Lead Ore.—In the Missouri-Kansas-Oklahoma district during the week ended Aug. 19 production was increased some because of signs in the pig metal market denoting more strength in price in the near future. Production during the week totaled 1,645,940 lbs. and the year's production totaled 67,262,112 lbs. Values given for these amounts were \$53,271 and \$2,885,899. Even though prices remained at \$65 and \$67 for 80% concentrates, as during the previous week, general conditions and buying were noted as being better.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.25	63.50
July	75.00	70.00	71.9375	59.00
August				47.50
September ..				48.25
October				51.80
November ..				63.00
December ...				71.375
Year				53.34

Zinc Ore.—With the condition of the spelter market changing for the better prices of ores in the Missouri-Kansas-Oklahoma district during the week ended Aug. 19 were up \$5 and the top prices obtained for ores was \$70 and this ranged down to \$50 for the less desirable grades. There were produced 8,127,290 lbs. of concentrates, bringing the total for the year to date at 424,842,454 lbs. Values placed on these amounts were \$245,256 and \$19,287,867.

Calamine.—Little change was noted and the ores sold from \$35 to \$45, as during the previous week. Concentrates

produced during the week were 529,890 lbs. and the total for the year to date was 19,984,610 lbs.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August				60.25
September				76.75
October				82.40
November				92.50
December				87.00
Year				102.96

Spelter.—Although business has not been so brisk, prices have continued to advance, with the market very strong and sellers limiting transactions in futures. Some domestic users were fair buyers, while some export business also came to the surface. There is a very active demand for forward metal, while spot is somewhat scarce, but consumers are generally well covered over September. The sharp advances in copper have furnished additional strength to spelter, as brass makers in taking forward copper have endeavored to cover their needs of zinc. Spot has advanced to 9¼ cts. New York and 9½ cts. St. Louis. The price at St. Louis reflects the scarcity of spot at that point, as usually the difference is a quarter of a cent. For September delivery business was done at 9½ cts. St. Louis, with sellers also asking the same price for October. For November delivery some orders were taken at 9¼ cts., while the quotation for December is 9½ cts. At London the market has been steady, with prices advancing £5 in spot and futures last week, while at the opening of the current week prices advanced £1, sending spot up to £55 and futures to £49. A good business was done in special grades. Brass special advanced to 10¼@10½ cts.

Quotations for spelter per pound at New York and per ton at London for the week ended Aug. 23 were as follows:

	New York.		London.	
	Spot.		Spot.	Futures.
Aug. 17	9½c	£53 0 0	0 0	£47 0 0
18	9½c	54 0 0	0 0	48 0 0
19	9½c	54 0 0	0 0	48 0 0
21	9½c	55 0 0	0 0	49 0 0
22	9½c	55 0 0	0 0	47 0 0
23	9½c	55 0 0	0 0	47 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	High.	Low.	Avg.	High.	Low.	Avg.
January	19.42½	17.30	18.801	6.519	89.840	80.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July	10.75	8.75	9.80	20.803	53.00	98.150
August				16.110		68.250
September				14.493		64.400
October				14.196		64.196
November				16.875		88.240
December				16.675		89.163
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Antimony.—Demand for antimony developed with a rush last week. Large sellers reported sales running over 2000 tons. Prices which had dropped to 9½ cts. advanced up to 15 cts., making a jump of 4 cts. in one day. Large consumers took round lots of spot, but buying of futures was small. The influx of business cleaned up the accumulated spot supplies and the situation is once more favorable for the metal. At present sellers are quoting spot at 13½ cts., with demand less active, but prospects are for an early resumption of demand. The leading Chinese interests secured the bulk of the recent business by reason of their holdings of spot metal.

Quicksilver.—The situation in this metal is unchanged.

Sellers are asking \$75 a flask for spot virgin, but demand is only fair, and with large supplies coming overland and also from Europe, indications are that the price will recede. Powder makers are no longer in the market and with increased production facing only an ordinary absorption it is manifest that sellers will soon be forced to lower quotations.

Spiegeleisen.—Some export business has developed in this alloy, about 2000 tons being sold to European consumers. A domestic user was in the market for about 2000 tons for delivery in the fourth quarter. The market is steady, with prices unchanged at \$45@50 furnace for 20%.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.	2.00	to	3.00
Muriatic, 20 deg.	1.67½	to	3.25
Nitric, 36 deg.	.07½	to	.08½
Nitric, 40 deg.	.09	to	.09½
Alcohol—U. S. P., gal. grain	2.70	to	2.72
Denatured, 183 proof, gal.	2.68	to	2.70
Wood, 97 p. c.	.70	to	.71
Alum—Powdered, lb.	.05½	to	.07
Lump, lb.	.04½	to	.06
Ground, lbs.	.041	to	.06½
Ammonia—			
Muriate, white grain, lb.	.08½	to	.08½
Muriate, lump	.17	to	.18
Arsenic—White, lb.	.06	to	.06½
Red, lb.	.60	to	.65
Barium Chloride—Ton	110.00	to	115.00
Nitrate, kegs, lb.	.14	to	.15
Bismuth—Metallic, lb.	3.15	to	3.25
Subnitrate	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.	4.75	to	5.00
Borax—100 lbs., car lots	7.75	to	8.00
Coke—Connellsville furnace	2.75	to	2.80
Foundry	3.00	to	3.50
Copperas—Spot, lb.	1.50	to	2.00
Ferromanganese—Spot	175.00	to	.....
Last half	175.00	to	.....
Ferrosilicon, 50%			85.00
Ferrotitanium, per lb.	.08	to	.12½
Fuller's Earth, 100 lbs.	.80	to	1.05
Glauber's Salts, bags.	.50	to	.75
Calcined			2.50
Iron Ore—			
Bessemer, old range, ton			4.45
Bessemer, Mesabi			4.20
Non-Bessemer, old range			3.70
Non-Bessemer, Mesabi			3.55
White crystals	.15½	to	.15½
Broken, cakes	.14½	to	.16
Powdered	.17	to	.17½
Lead—Granulated, lb.	.17	to	.17½
Brown sugar	.13½	to	.14
Litharge, American, lb.	.09	to	.09½
Mineral Lubricants—			
Black summer	.13½	to	.14
29 gr., 15 c. t.	.14	to	.15
Cylinder, light, filtered, gal.	.21	to	.26
Neutral, filtered, lemon, 29 gr.	.37½	to	.38
Wool grade, 30 gr.	.19½	to	.20
Paraffin—High viscosity	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto	.23	to	.25
Benzine, 59 to 62°, gal	.28	to	.28½
Nickel Salt, double.	.07½	to	.08½
Single	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.	.15	to	.18
Refined, bbl.			.12
Platinum—Oz. ref.	50.00	to	55.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash			32.00
Muriate, 80 to 85%, basis 80%, ton	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%	400.00	to	450.00
Hard salt, man., 12.4% actual potash	Nominal		32.00
Potassium—			
Bichromate	.39	to	.40
Carbonate, cal. 96 to 98%	1.30	to	1.35
Cyanide, bulk, per 100%	.75	to	1.00
Chlorate	.45	to	.50
Prussiate, yellow	.70	to	.75
Prussiate, red	2.00	to	2.10
Salt peter—Crude, lb.	.12	to	.11
Refined	.25½	to	.26
Soda—Ash, 48% (43% basis), bbl.	2.75	to	3.00
Strontia Nitrate, casks, lb.	.47	to	.48
Sulphur—			
Crude, ton	28.00	to	29.00
Flowers, 100 lbs.	2.50	to	2.70
Roll, 100 lbs.	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.	.13½	to	.14
Crystals, bbls., lb.	.29½	to	.30
Oxide, lb.	.43	to	.45
Zinc Chloride	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid In 1916	Total to date	Latest							Paid In 1916	Total to date	Latest		
						Date	Am't.	Date							Am't.	Date	Am't.
Acacia, g.	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,916	\$1	\$.....	\$98,916	Sept. '01	\$0.01		
Adams, s. l. c.	Colo.	80,000	10	.....	778,000	Dec. 18, '09	.04	Golden Star, g.	Ariz.	400,000	5	.....	120,000	Mar. 16, '10	.05
Adventure, c.	Mich.	100,000	25	50,000	50,000	July 20, '16	.60	Gold' Com. Fra., g.	Nev.	922,000	1	.....	92,111	Oct. 16, '09	.10	
Ahmeek, c.	Mich.	200,000	25	1,200,000	5,250,000	July 10, '16	3.00	Goldfield Con.	Nev.	3,559,148	10	.....	28,999,831	Oct. 31, '16	.10	
Alaska Goldfields.	Alaska	250,000	6	.....	403,250	Jan. 10, '15	.16	Good Hope, g. s.	Colo.	600	100	.....	941,250	Jan. '03	.25
Alaska Mexican, g.	Alaska	150,000	5	.....	3,507,351	Nov. 26, '15	.10	Good Sp. Anchor, z.s.	Nev.	560,000	1	23,000	119,765	June 15, '16	.01	
Alaska Mines Sec.	U. S.	500,000	5	.....	90,000	Nov. 1, '06	.....	Grand Central, g.	Utah	600,000	1	.....	1,545,200	Dec. 23, '16	.02%
Alaska Treadwell, g.	Alaska	200,000	25	250,000	15,780,000	May 29, '16	.60	Grand Gulch, c. s.	Nev.	239,845	2.50	9,594	11,992	June 1, '16	.03		
Alaska United, g.	Alaska	180,200	5	64,060	2,046,270	Feb. 28, '16	.30	Granite, g.	Alaska	430,000	1	17,200	17,300	May 10, '16	.02		
Allouez, c.	Mich.	100,000	25	450,000	550,000	July 15, '16	2.00	Qwin, g.	Cal.	100,000	10	.....	481,500	Feb. '06	.25	
Amalgamated, c.	Mont.	1,538,829	100	.....	103,444,983	Aug. 30, '15	3.77	Hazel, g.	Cal.	900,000	1	.....	1,114,000	Jan. 5, '15	.01
Am. Sm. & R. com.	U. S.	600,000	100	1,500,000	30,833,333	June 1, '16	1.60	Hecia, s. l.	Idaho	1,000,000	0.25	800,000	4,555,000	July 3, '16	.15		
Am. Sm. & R. pf.	U. S.	600,000	100	1,750,000	66,646,386	June 1, '16	1.76	Hercules	Idaho	1,000,000	1	1,650,000	12,400,000	July 15, '16	.20		
Am. Sm. Sec. A pf.	U. S.	170,000	100	765,000	11,465,000	July 1, '16	1.60	Hidden Treasure, g.	Cal.	30,000	10	.....	457,452	Sept. '00	.10	
Am. Sm. Sec. B pf.	U. S.	300,000	100	1,125,000	16,635,000	June 3, '16	1.25	Holy Terror, g.	S. D.	600,000	1	.....	172,000	Jan. '00	.01	
Am. Zinc, L. & S.	Mo.	193,120	25	2,414,000	16,635,000	June 10, '16	12.50	Homestake, g.	S. D.	251,160	100	1,142,778	36,843,486	July 25, '16	.66		
Anasconda, c.	Mont.	2,331,250	50	6,993,750	171,351,771	May 20, '16	1.50	Hope Dev.	Cal.	600,000	1	.....	6,000	Dec. 31, '15	.01	
Annie Laurie, g.	Utah	25,000	100	.....	439,561	Apr. 22, '05	.50	Horn Silver, l. s. z.	Utah	400,000	1	40,000	5,182,000	June 30, '16	.06	
Argonaut, g.	Cal.	200,000	5	40,000	1,690,000	June 27, '16	.10	Imperial, c.	Ariz.	500,000	10	.....	300,000	June 24, '07	.20	
Arizona, c.	Ariz.	.....	.....	531,164	20,212,164	Apr. 1, '16	.....	Independ'ce Con., g.	Colo.	2,500,000	1	.....	281,375	Apr. '01	.04
Atlantic, c.	Mich.	100,000	25	.....	990,000	Feb. 21, '05	.50	Inspiration Con.	Ariz.	920,687	20	3,091,233	3,091,233	July 31, '16	2.00	
Bagdad Chas. & P.	Cal.	84,819	5	.....	202,394	Jan. 1, '09	.10	Inter' Nickel, com.	U. S.	1,673,384	25	6,438,498	3,941,338	June 1, '16	2.00	
Bald Butte, g. s.	Mich.	250,000	1	.....	1,354,648	Nov. 1, '07	.04	Inter' Nickel, pf.	U. S.	89,126	100	267,378	5,614,822	May 1, '16	1.50	
Baltic, c.	Mich.	100,000	25	60,000	7,950,000	Dec. 31, '13	2.00	Knob Hill, g. s. c.	Wash.	100,000	100	.....	4,100,000	May 2, '14	2.00	
Barnes-King, g.	Mont.	40,000	5	60,000	60,000	June 1, '16	.07%	Interstate-Calahan	Idaho	464,990	10	1,394,970	3,952,415	June 30, '16	1.60		
Beck Tunnel Con.	Utah	1,000,000	0.10	.....	940,000	Nov. 16, '07	.02	Iowa, g. s.	Colo.	1,666,667	1	.....	270,167	Dec. 31, '16	.00%
Big Four Expl.	Utah	400,000	1	60,000	70,000	July 15, '18	.06	Iowa Tiger, g. s. l.	Colo.	3,000	1	.....	25,179	Jan. 16, '15	.50	
Bingham-N. Haven	Utah	228,689	5	.....	960,493	Dec. 20, '15	.20	Iron Blossom, l. s. g.	Utah	1,000,000	1	260,000	2,750,000	July 20, '16	.10	
Board of Trade, z.	Wis.	120,000	1	.....	79,000	Jan. 15, '11	.06	Iron Cap pf. c.	Ariz.	33,481	10	6,422	29,803	July 1, '16	.35	
Bonanza Dev.	Colo.	300,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Clad, g.	Colo.	1,000,000	1	.....	60,000	Nov. '05	.06
Booth (Reorganized)	Nev.	999,296	5	349,949	349,949	June 25, '16	.06	Iron Silver	Colo.	600,000	20	.....	5,050,000	Dec. 31, '16	.10	
Boss, g.	Nev.	405,000	1	.....	40,850	Dec. 10, '14	.10	Isabella, g.	Colo.	2,250,000	1	.....	742,500	Mar. '01	.01
Boston & Colo. Sm.	Colo.	16,000	10	.....	402,350	Oct. '02	.75	Isle Royale, c.	Mich.	150,000	25	150,000	300,000	July 31, '16	1.00	
Boz & Mont. Con.	Mont.	100,000	25	.....	63,225,000	May 15, '11	4.00	Jamison, g.	Cal.	390,000	10	.....	300,000	Jan. '11	.02
Breche, l. s.	Cal.	300,000	1	.....	220,000	Dec. 15, '13	.06	Jerry Johnson, g.	Nev.	2,700,000	10	.....	175,000	Nov. 5, '14	.00%
Brunswick Con., g.	Utah	100,000	10	.....	203,315	Sept. 15, '15	.06	Jim Butler	Nev.	1,718,020	1	171,892	343,604	Feb. 2, '16	.04%	
Bullion B. & Champ	Utah	100,000	10	.....	2,768,400	July 11, '08	.10	Joplin E. & Spelter	Mo.	400,000	5	62,000	62,000	July 22, '16	.04%	
Bullwhacker, c.	Mont.	450,000	1	.....	10,000	July 1, '07	.01	Jumbo Ext., g.	Nev.	1,550,000	1	194,000	634,995	June 30, '16	.05	
Bunker Hill Con. g.	Cal.	200,000	1	35,000	855,000	July 4, '16	.02%	Kendall, pf.	Mont.	600,000	6	60,000	1,555,000	Apr. 3, '16	.10		
Bunker Hill & Sull.	Idaho	327,000	10	991,000	17,754,000	July 4, '16	.10	Kenebeck Zinc.	Mo.	200,000	.....	60,000	60,000	June 30, '16	.10	
Butte Alex Scott.	Mont.	75,000	10	844,662	1,054,119	Apr. 10, '16	10.60	Kennecott.	Alas.	250,000	10	7,000,000	12,000,000	June 30, '16	1.50		
Butte-Ballklava, c.	Mont.	250,000	10	.....	125,000	Aug. 1, '10	.60	Kennedy, g.	Cal.	100,000	100	.....	1,801,001	June '00	.05
Butte Coalition, c.	Mont.	1,000,000	16	.....	4,700,000	Dec. 1, '11	.25	King of Arizona, g.	Ariz.	200,000	1	.....	396,000	Aug. 2, '09	.12
Butte & Superior, z.	Mont.	672,687	10	5,662,993	11,383,017	June 30, '16	10.75	Klar Piquet, z.	Wis.	20,000	1	.....	167,500	Dec. 16, '12	.25	
Caledonia, l. s. c.	Idaho	2,636,000	1	.....	1,429,751	July 15, '16	.03	Knob Hill, g. s. c.	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%
Calumet & Hecla, c.	Mich.	641,923	10	2,565,676	174,213,001	June 23, '16	2.00	La Fortuna, g.	Ariz.	250,000	1	.....	1,200,500	Oct. '02	.01%	
Camp Bird, g.	Colo.	1,750,000	25	112,584	32,250,000	June 23, '16	15.00	Lake View	Utah	500,000	0.05	.....	184,000	June 23, '16	.02	
Cardiff, l.	Utah	600,000	1	125,000	10,243,964	Jan. 1, '16	.17%	Last Dollar, g.	Colo.	1,500,000	1	.....	184,000	June 23, '16	.02	
Carla, g. s. c.	Utah	600,000	1	.....	250,000	June 1, '16	.25	Liberty Bell, g.	Colo.	133,551	5	.....	1,762,795	Jan. 31, '16	.05
Centennial Eureka.	Utah	100,000	25	100,000	60,000	Dec. '06	.01	Lightner, g.	Cal.	102,255	1	.....	331,179	June '06	.05	
Center Creek, l. z.	Mo.	100,000	10	40,000	4,000,000	Apr. 25, '16	1.00	Linden, z.	Wis.	1,020	10	.....	11,200	Dec. 31, '15	.30	
Central Eureka, g.	Cal.	100,000	1	.....	585,000	July 1, '16	.16	Little Bell, s. l.	Utah	300,000	1	15,000	75,000	Apr. 22, '16	.05	
Century, g. s. l.	Utah	1,000,000	1	44,000	799,159	Mar. 5, '06	.05	Little Florence	Nev.	1,000,000	1	.....	430,000	Jan. '08	.03	
Champion, c.	Mich.	100,000	25	4,360,000	391,957	Feb. 15, '16	.06	Lost Packer	Idaho	150,000	1	.....	37,500	Oct. 23, '13	.26	
Chile Con.	U. S.	892,960	1	.....	14,389,000	July 7, '16	6.40	Lower Mammoth.	Utah	1,000,000	1	.....	67,000	Dec. 15, '15	.01
Chino Copper c.	N. M.	868,980	5	3,044,930	439,212	May 15, '16	.05	MacNamara, g. s.	Nev.	734,676	1	.....	46,800	Apr. 23, '06	12.00	
C. K. & N. g.	Colo.	1,431,900	1	.....	9,742,925	June 30, '16	2.25	Magma, c.	Ariz.	240,000	5.00	240,000	480,000	June 30, '16	.60	
Cliff, g. s. l.	Utah	300,000	10	.....	174,828	Nov. '04	.01	Manmoth, g. s. c.	Utah	400,000	10	60,000	2,380,000	June 30, '16	.05	
Clinton, g. s.	Colo.	1,000	100	.....	115,000	Feb. 6, '14	.05	Manhattan-Big 4, g.	Nev.	762,400	1	.....	30,248	Aug. 15, '11	.02
Colo. O. Dredging.	Colo.	200,100	10	100,000	90,000	Jan. 1, '13	.10	May McKinney, g.	Colo.	398,282	1	.....	1,169,306	July 28, '14	.02	
Colorado, s. l.	Utah	1,000,000	0.20	.....	60,000	Dec. '03	.30	May Day	Utah	800,000	0.26	40,000	284,000	May 26, '16	.02	
Columbus Con. l. s. c.	Utah	283,540	5	.....	425,000	Feb. 23, '16	1.00	Mary Murphy, g. s. l.	Colo.	370,000	6	25,067	93,108	May 1, '16	.07	
Combination, g.	Nev.	320,000	1	.....												

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
					Date	Amt.							Date	Amt.	
Petro, g. s.	Utah	600,000	\$ 1	\$.....	\$55,000	Aug. 9, '06	\$0.04	Success	Ida.	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03
Pharmacist, g.	Colo.	1,600,000	1	.....	91,600	Feb. 1, '10	.003	Superior & Pitts, c.	Ariz.	1,499,792	10	.....	10,318,568	Dec. 21, '15	.38
Phelps, Dodge & Co	U. S.	450,000	100	5,400,000	53,771,527	June 30, '16	6.00	Swansea, s. l.	Utah	100,000	5	.....	334,600	Apr. 29, '07	.06
Pioneer, g.	Alaska	5,000,000	1	.....	2,041,528	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	.....	9,420,000	July 23, '07	4.00
Pittsburg, l. z.	Mo.	1,000,000	1	.....	20,000	July 15, '07	.02	Tamarack-Custer	Idaho	2,000,000	1	80,000	80,000	June 1, '16	.02
Pittsburg-Idaho, l.	Ida.	1,000,000	1	.....	249,104	July 15, '13	.04	Tennessee, c.	Tenn.	200,000	25	300,000	5,296,250	Apr. 15, '16	.75
Pitts Silver Peak	Nev.	2,790,000	1	.....	840,800	Dec. 1, '14	.02	Tightner	Cal.	100	100	.....	160,000	Jan. 3, '14	.....
Platteville, l. z.	Wis.	600	60	.....	179,600	June 15, '07	10.00	Tomboy, g. s.	Colo.	310,000	5	74,400	3,861,555	June 30, '16	.24
Plumas Eureka, g.	Cal.	150,625	10	.....	2,831,294	Apr. 8, '01	.06	Tom Reed, g.	Ariz.	909,555	1	.....	2,555,934	Sept. 6, '15	.01
Plymouth Con.	Cal.	240,000	6	58,250	231,050	Apr. 10, '16	.24	Tom-Belmont, g.	Nev.	1,600,000	1	562,500	8,206,827	July 1, '16	.12%
Portland, g.	Colo.	3,000,000	1	270,000	10,447,080	July 20, '16	.03	Tom-Extension, g. s.	Nev.	1,272,501	1	413,600	1,400,856	July 1, '16	.15
Prince Con., s. l.	Nev.	1,000,000	2	125,000	250,000	July 1, '16	.05	Tomopah, g. s.	Nev.	1,000,000	1	450,000	13,450,000	July 21, '16	.16
Quartette, g. s.	Nev.	100,000	10	.....	375,000	July 31, '07	.20	Tomopah Midway, g.	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.06%
Quicksilver, pf.	Cal.	43,000	100	.....	1,331,411	Apr. 8, '03	.50	Tremmis	Cal.	200,000	2.50	.....	234,000	Apr. 25, '15	.02
Quip, g.	Wash.	1,500,000	1	67,000	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,100,000	Oct. 30, '12	3.00
Quincy, c.	Mich.	110,000	25	770,000	22,547,500	June 30, '16	4.00	Tuolumne, c.	Mont.	800,000	1	.....	495,525	Apr. 15, '13	.10
Ray Con., c.	Ariz.	1,571,279	10	1,571,279	8,144,406	June 30, '16	.50	Uncle Sam Con, s.	Utah	600,000	1	.....	470,000	Sept. 20, '11	.05
Red Bird, g. & c. l.	Mont.	300,000	6	.....	72,000	Oct. 9, '04	.01	Union, g.	Colo.	1,250,000	1	.....	444,244	Jan. 27, '03	.02
Red Metal, c.	Mont.	100,000	10	.....	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	.....	167,070	Nov. 16, '15	.10
Red Top, g.	Nev.	1,000,000	1	.....	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	50,000	100	.....	1,500,000	Apr. 15, '07	3.00
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	.....	6,125,000	Aug. 6, '07	1.75
Richmond, g. s. l.	Nev.	54,000	1	.....	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	.....	211,627	Oct. 15, '07	.50
Rocco Home, l. s.	Nev.	300,000	1	.....	152,500	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Rochester Ld. & L.	Mo.	4,900	100	.....	190,846	July 1, '12	.50	United (Crip. Cl.)	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev.	889,018	1	.....	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	759,000	3,335,000	June 30, '16	18.00
Sacramento, g.	Utah	1,000,000	5	.....	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	60,000	100	.....	11,000,000	Sept. 23, '10	6.00
St. Joseph, l.	Mo.	1,464,798	10	704,793	10,972,631	June 20, '16	.25	United Verde, c.	Ariz.	300,000	10	1,620,000	38,047,000	July 9, '16	7.50
St. Mary's M. L.	Mich.	160,000	25	1,760,000	6,560,000	July 28, '16	2.00	U. S. Red & R. com.	Colo.	59,188	100	.....	414,078	Oct. 9, '03	1.00
Schoenherr-Wal'n. z. l	Mo.	10,000	10	.....	20,000	Sept. 20, '11	.20	U. S. Red & R. pf.	Colo.	39,458	100	.....	1,775,936	Oct. 1, '07	1.50
Scratch Gravel.	Cal.	1,000,000	1	20,000	90,000	Feb. 1, '16	.02	U. S. R. & M. com.	USMx	351,115	60	965,566	7,590,745	July 15, '16	1.00
Seven Tro. Ch., g. s.	Nev.	1,443,077	1	36,076	252,632	Apr. 1, '15	.02%	U. S. R. & M. pf.	USMx	486,350	60	1,288,656	13,084,366	July 15, '16	.87%
Shannon, c.	Ariz.	300,000	10	.....	750,000	Jan. 30, '13	.50	Utah, c.	Utah	1,624,490	10	8,934,695	41,656,592	June 30, '16	3.00
Shattuck-Ariz., c.	Ariz.	350,000	10	1,225,600	4,200,000	June 20, '16	1.26	Utah, s. l. (Fish Sps)	Utah	93,000	10	.....	283,720	Oct. 21, '10	.02%
Silver Hill, g. s.	Nev.	108,000	1	.....	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	525,200	6	261,100	330,125	July 1, '16	.25
*Silver King Coal'n	Utah	1,250,000	6	562,500	14,147,455	July 1, '16	.15	Utah Con., c.	Utah	300,000	5	450,000	9,600,000	June 26, '16	.75
Silver King Con.	Utah	637,682	1	127,516	942,373	July 22, '15	.10	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00
Silver Mines Expl.	N. Y.	10,000	100	.....	250,000	June 16, '10	2.00	Victoria, g. s. l.	Utah	250,000	1	.....	207,500	Apr. 23, '10	.04
Sioux Cons., l. s. c.	Utah	745,359	1	.....	872,106	July 20, '11	.04	Indicator Con., g.	Colo.	1,500,000	1	135,000	3,397,500	July 23, '16	.03
Skidoo, g.	Cal.	1,000,000	5	.....	223,000	Oct. 2, '14	.01	Wasp No. 2, g.	S. D.	600,000	1	100,000	619,466	May 15, '16	.02%
Smuggler, s. l. z.	Colo.	1,500,000	1	.....	2,235,000	Nov. 22, '06	.03	Wellington, l. z.	Colo.	10,000,000	1	400,000	1,050,000	July 1, '16	.02
Snowstorm, c.	Idaho	1,500,000	1	.....	1,169,610	Oct. 10, '13	.01%	West End Con.	Nev.	1,788,486	1	.....	536,545	Jsn. 15, '16	.05
Socorro	N. M.	377,342	5	37,734	177,205	June 1, '16	.05	West Hill.	Wis.	20,000	1	8,000	40,000	June 29, '16	.20
South Eureka, g.	Cal.	299,981	1	146,930	1,388,764	July 15, '16	.07	White Knob, g. pf.	Cal.	200,000	10	40,000	170,000	May 29, '16	.10
So. Swansea, g. s. l.	Ida.	300,000	1	.....	287,500	Apr. 3, '05	.01%	Wilbert.	Ida.	1,000,000	1	20,000	30,000	May 1, '16	.01
Spearfish, g.	S. D.	1,600,000	1	.....	165,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	360,600	8,760,000	Apr. 1, '16	6.00
Standard Con., g. s.	Cal.	178,394	10	.....	5,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c.	Ariz.	118,674	15	.....	63,403	.....	.25
Standard, c.	Ariz.	425,000	1	.....	69,600	Sept. 8, '05	.50%	Work, g.	Colo.	1,600,000	1	.....	1,597,655	Apr. 31, '12	.02
Stewart, l. z.	Idaho	1,238,362	1	.....	2,043,297	Dec. 31, '15	.05	Yak.	Colo.	1,000,000	1	120,000	2,127,655	June 30, '16	.07
Stratton's Crisp. Cl.	Colo.	2,000,000	1	.....	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	.....	167,500	Feb. 1, '13	.01
Stratton's Ind.	Colo.	1,000,000	5	.....	5,028,568	Dec. 23, '06	.12	Yellow Arrow, g.	Cal.	100,000	10	15,000	1,187,759	July 6, '16	.02
Str'n's Ind. (new)	Colo.	1,000,000	30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine.	Cal.	1,000,000	1	650,000	1,543,008	July 26, '16	.15
Strong, g.	Colo.	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	.....	102,553	July 15, '14	.10

Corrected to August 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,676.00

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid In 1916	Total to Date	Latest		Paid In 1916					Total to Date	Latest			
						Date	Amt.							Date	Amt.		
Ajuchitlan	Mex...	60,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrilas	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00		
Amistad y Concordia g.s	Mex...	9,600	50	.....	429,358	July 15, '08	1.28	Le Rol No. 2, g.	B. C.	120,000	25	.....	1,627,320	Dec. 15, '15	\$0.24
Amparo, s. g.	Mex...	2,000,000	1	200,000	2,132,176	May 10, '16	.05	Lucky Tiger	Mex...	715,337	10	264,675	3,528,066	July 20, '16	.03		
Barlo de Medina Mill	Mex...	2,000	25	.....	103,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,692	1	202,293	4,810,061	July 1, '16	.03	
Batopilas, s.	Mex...	446,268	20	.....	55,870	Dec. 31, '07	.12%	Mexican, l. pf.	Mex...	12,500	100	.....	1,018,750	May 1, '12	3.50
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex...	240,000	10	.....	660,000	Mar. 10, '05	.25	
Boleo, g.	Mex...	120,000	20	.....	721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex...	180,000	5	.....	4,478,500	June 26, '14	.96
British Columbia, c.	B. C.	591,709	5	.....	615,399	Jan. 6, '13	.15	Minas Pedrazzini	Mex...	1,000,000	1	.....	497,500	Jan. 23, '11	.06%
Buena Tierra	Mex	330,000	5	.....	160,380	Jan. 30, '15	.24	Mines Co. of Am.	Mex...	900,000	10	.....	4,958,600	July 25, '13	.12%
Buffalo, Ont.	Ont.	1,000,000	1	.....	2,787,000	July 1, '14	.05	Minning Corp. of Canada	Can.	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%	
Canadian Goldfields	Can.	600,000	0.10	.....	237,039	July 15, '14	.01%	Montezuma, l. pf.	Mex...	6,000	100	.....	402,600	Nov. 15, '12	3.50
Cananea Central, c.	Mex...	600,000	10	.....	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex...	500,000	1	.....	100,000	July 20, '09	.04
Cariboo-Cobalt	Ont.	1,000,000	1	.....	295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11	
Cariboo-McKinney, g.	B. C.	1,250,000	1	.....	65,250	Dec. 1, '09	.00%	Naica, s. l.	Mex...	100	300	.....	3,190,000	Oct. 11, '09	\$253
City of Cobalt	Ont.	600,000	1	.....	138,375	May 15, '09	.01%	N. Y. & Hond. Rosario.	C. A.	200,000	10	220,000	3,970,000	July 28, '16	.60	
Cobalt Central, s.	Ont.	4,761,500	1	.....	192,845	Aug. 29, '14	.02%	Nipissing, s.	Ont.	1,300,000	5	900,000	14,340,000	July 20, '16	.25	
Cobalt Lake, s.	Ont.	3,000,000	1	.....	465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	.....	533,000	Feb. 1, '10	.02
Cobalt Silver Queen	Ont.	1,515,000	1	.....	315,000	Dec. 1, '08	.03	Paloma, s.	Mex...	98,000	.....	.....	38,600	Dec. 1, '11	5.00
Cobalt Townsite, s.	Ont.	199,232	5	.....	1,042,259	Aug. 20, '14	.24	Panuco	Mex...	10,000	.....	.....	7,465,000	Nov. 4, '09	.03
Coniasas, s.	Ont.	800,000	5	200,000	8,040,000	Feb. 5, '16	.25	Pedocles, s. g.	Mex...	120,000	20	.....	6,451,687	Sept. 30, '13	1.25	
Con.-Mg. & Sm., g. s. c.	B. C.	63,050	100	420,517	2,740,654	July 1, '16	2.50	Peregrina, pf.	Mex...	10,000	100	.....	328,656	Sept. 1, 10	3.50	
Crown Reserve, s.	Ont.	1,999,357	1	.....	6,102,408	July 15, '15	.03	Peterson Lake	Ont.	2,401,820	1	84,064	340,287	July 1, '16	.01%	
Dolores	Mex...	400,000	5	.....	1,374,865	July 24, '11	.22%	Pinguic, pf.	Mex...	20,000	100	.....	780,000	Apr. 15, '13	3.00
Dome Mines, s.	Ont.	400,000	10	400,000	590,000	June 1, '16	.50	Porcupine Crown	Ont.	2,000,000	1	180,000	600,000	July 2, '16	.03		
Dos Estrellas, (El Oro)	Mex...	300,000	0.50	.....	15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	MeX.	6,000	15	.....	963,360	Apr. 1, '05	1.00
El Favor	Mex...	3,500,000	1	.....	210,000	Apr. 30, '14	.01	Rambler-Cariboo	B. C.	17,600	100	62,500	472,500	June 15, '16	.02	
El Oro, g. s.	Mex...	1,147,500	5	.....	9,136,842	July 11, '13	.24	Rea Mines, Leasing	Ont.	200,000	1	.....	12,750	Feb. 20, '15	.06%
El Rayo, g. s.	Mex...	280,000	2	.....	140,412	Apr. 24, '11	.15	Right of Way	Ont.	1,655,500	1	16,855	669,614	June 15, '16	.00%	
El Triunfo, c.	Mex...	2,000,000	1	.....	30,000	Aug. 28, '11	.01	Rio Plata	Mex...	374,510	5	.....	345,744	Feb. 1, '13	.05
Esperanza, s.	Mex...	350,000	5	.....	12,521,250	Dec. 31, '15	.50	San Francisco Mill	Mex...	6,000	25	.....	445,068	Oct. 15, '09	1.00
Granby Con., c. g. s.	B. C.	149,985	100	449,966	6,050,341	May 1, '16	1.50	Sao Rafael	Mex...	2,400	25	.....	6,798,260	Jan. 11, '12	.20	
Oreono-Cananea, c.	Mex...	474,111	100	1,458,627	5,694,432	May 29, '16	2.00	San Toy, s. l.	Mex...	6,000,000	1.00	.....	540,000	July 24, '13	.01	
Greene Con., c.	Mex...	1,000,000	10	2,500,000	12,544,000	July 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex...	1,500,000	5	364,500	2,819,772	June 16, '16	.24		
Greene Cold-Silver, pf.	Mex...	300,000	10	.....	194,871	Mar. 28, '07	.40	Sta. Gert'y Guadalupe, g.	Mex...	60,000	.....	.....	3,960,000	Mar. 27, '09	1.00
Guanajuato Con.	Mex...	540,000	5	.....	600,000	Oct. 8, '06	.07%	Sta. Maris del Paz	Mex...	9,900	12 1/2	.....	5,606,000	Jan. 2, '13	2.50
Guana, l. l. Dev. p.	Mex...	10,000	100	.....	274,356	Jan. 1, '11	3.00	Seneca-Superior	Ont.	478,844	1	475,854	1,400,096	July 15, '16	.80	
Qu.,senheim Explorat.	Mex...	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.85	Solidad, s. l.	Mex...	960	20	.....	4,439,840	Oct. 17, '11	8.00	
Haleybury, s.	Ont.	50,000	1	.....	50,000	Apr. 8, '11	.50	Sorressa, g. s.	Mex...	19,200	20	.....	3,979,340	Jan. 6, '11	34.00
Hedley	Ont.	120,000	1	120,000	1,943,520	June 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	350,000	2,150,000	July 16, '16	.50		
Hindcon, E. & L.	Mex...	6,000,000	1	.....	30,000	Aug. 28, '11	.01	St. John & Hud. Bay	Ont.	2,000,000	1	.....	2,940,220	Nov. 10, '11	3.00
Hindlinger	Ont.	600,000	5	320,000	5,130,000	July 14, '16	.20	Temiskaming, s.	Ont.	2,500,000	1	75,000	1,534,156	July 22, '16	.03		
Jimulco, c.	Mex...	10,000	100	.....	975,000	Feb. 27, '11	1.00	Teziutlan, c.	Mex...	8,000	100	.....	1,955,000	Jan. 1, '09	1.50
Kerr Lake, s.	Ont.	600,000	5	300,000	6,420,000	June 1, '16	.25	Torgh-Oskes	Ont.	531,500	5	199,311	265,750	July 3, '16	.32%		
La Blanca	Mex...	140,000	20	.....	2,775,700	Mar. 31, '13	.90	Tretheway, s.	Ont.	1,000,000	1	.....	1,061,988	July 15, '14	.05
La Republica, s.	Mex...	400,000	5	.....	110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.	Ont.	1,416,690	1	.....	656,336	Oct. 20, '13	.05
La Rose Con., s.	Ont.	1,498,627	6	224,793	6,611,913	July 20, '16	.06	Yukon, g.	Y. T.	3,500,000	5	525,000	8,108,110	June 30, '16	.07%		

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Mines and Mining Operations at Ely, Nevada

A. G. HILLEN.

An inspection of the mines and mining operations, the mills and smelters of the Robinson mining district, of which Ely is the center, presents a most interesting and inspiring view. Whether considered at the mines, in the mills, or at the smelters at McGill, the effect produced is that efficiency, smooth running and good management prevail.

The Nevada Con. Copper Co. is moving and reducing better than 10,000 tons per day. This volume or tonnage of ore is transported from the mines at Ruth each 24 hours a distance of 25 miles to the mills at McGill in trains of 20 to 24 cars each, and the average is a train of 50-ton cars every two hours.

A daily production of 2000 tons of this ore comes from the Ruth mine shaft daily, the balance is mined by steam shovel from the great open-cuts or pits. To accomplish this great task, an immense plant, an army of operatives and tremendous mechanical forces are employed. The result is approximately 250 tons of copper matte, running well in silver and gold, as the daily production of the Nevada Con. Co.

Following the ore as it is mined and loaded in the 50-ton cars, across the 25 miles of hill and valley to the crushers, where it is automatically and mechanically unloaded, mechanically fed from the ore bins to the hoppers, from hoppers to crushers, from crushers to Huntington mills, and after grinding, to the immense batteries of concentrator tables, which number over 1100, where coarse concentration is effected, the pulp is conveyed by mechanically-driven conveyors to rolls and re-ground for further reduction in 12 batteries comprising 470 Frue vanner tables. By gravity launders and pumping, the solution is conveyed to the settling tanks, the pulp material segregated by draining off the solutions, dried and loaded into cars by other mechanical devices and transferred to the huge McDougall reverberatory roasters, a quarter mile from the mill. After preliminary roasting, it is conveyed by car and tram to the converters, which produce the red metal in matte form, weighing about 400 lbs. each.

This briefly, is an account of the transformation or transmutation of the ore and its copper, gold and silver content from the immense mountain area of

porphyry, containing 1½, 2 or 3% copper in the porphyry mass. To all intents the operation would appear continuous and complete, though the processes are perhaps technically complex and require deep scientific demonstration. For instance, the addition of a little oil sprayed in the roasters at just the right time, where the sulphur content of the ore does not complete the roasting, the dumping of quantities of lime in the converters, appears simple enough, but produces a condition that permits pouring the copper at just the right heat, at the right moment, and secures first, the oxidation of the ore completely, and later by the addition of the lime, produces complete combustion of the iron content of the roasted ore and evolves the complete processes of smelting and reduction essential to a high saving of the copper.

Necessary to the operation of the mines and mills of the Nevada Con. Copper Co. and its immense reduction plant, reducing upwards of 3,000,000 tons of ore per annum, are first the immense power plant consisting of one 2500 k.w. Westinghouse turbo-generator, two 15-kw. engine-driven generators, Nordberg engines and Allis-Chalmers generator, two 800 kw. Allis-Chalmers generators driven by Allis-Chalmers engines, one 1500 cu. ft. and one 18,000 cu. ft. Nordberg blowing engines for the copper converters, one 8000 cu. ft. Allis-Chalmers engine, one 20,000 cu. ft. General Electric turbo blower. In addition, a 300 cu. ft. Connorsville blower connected to tandem compound engine, a 1000 cu. ft. Laidlaw-Dunn-Gordon steam-driven air compressor, all these units being supplied with steam at 160 lbs. gauge pressure 100° super-heat, and are uncondensing and connected with surface condenser. Approximately 40% of steam is derived from waste heat boilers and reverberating furnaces; the balance of the steam is derived from coal-fire boilers in power house, a building about 400 by 180 ft., with concrete base.

There is a steam-driven Nordberg pumping engine at the concentrator plant with capacity of 12 second-feet, supplied with steam from power house. This engine is for handling return water from the mill. Approximately 15,000 hp. is used.

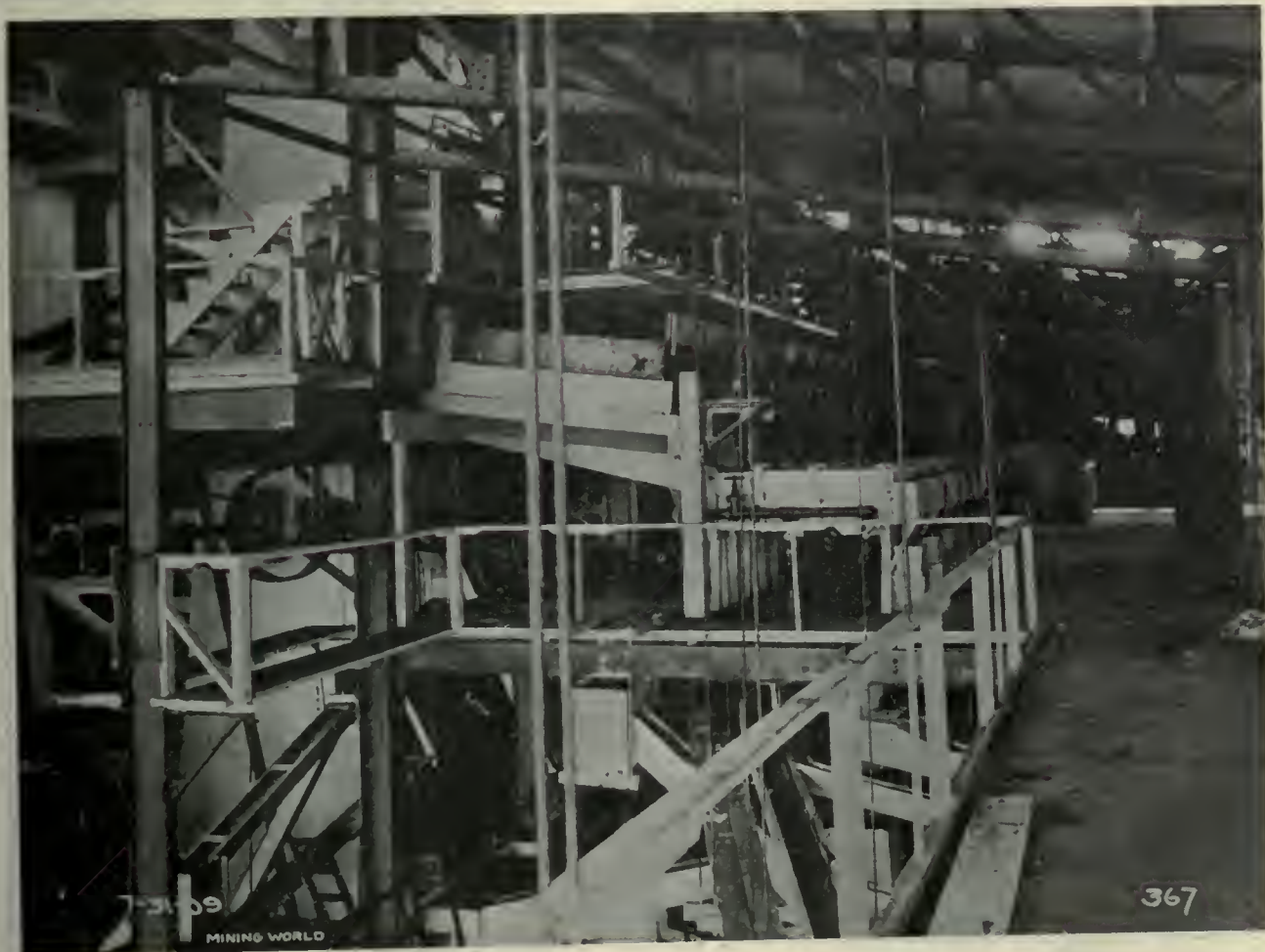
Utilizing waste heat at the reverberatories are



BUCYRUS SHOVEL IN OPERATION AT THE NEVADA CON. PROPERTY.

eight 400-hp. Sterling boilers, and two 400-hp. B. & W. boilers. This steam is super-heated in separately fired Foster super-heater, located in the power house boiler room. In this room are eight 400-hp. Babcock & Wilcox boilers and two 600-hp. Sterling boilers. These are fired and equipped with Green and Sturtevant economizers. There are four Goubert feed-water heaters. The boiler-feed pumps are of the steam turbine-driven type, and 3-stage centrifugal, with Terry turbines and Jeanesville pumps. The draft is furnished by five Sturtevant induced draft fans direct-connected to Sturtevant engines. The circulat-

from Duck creek, in a valley comprising about 100 sq. miles of arable valley land, 12 miles east of the range of mountains close to the plant, and is brought in by a 32-in., wood-stave pipe line 10 miles in length, with gravity flow. This is supplemented by two 5 second-feet De Laval centrifugal pumps, motor driven, which pump water from a large spring below the smelter. These pumps work against a head of 460 ft. Due to the isolated location of the plant, extensive machine shops are maintained with modern foundry. The average output of the foundry is about 130 tons per month. All structural steel work required for the



CLASSIFIERS IN STEPTOE MILL, MCGILL, NEVADA.

ing water for the condensers is furnished from Duck creek, and after passing through power house condensers flows by gravity to the mill, thus eliminating circulating pumps or cooling towers. The make-up water for the boilers is taken from outside the circulating line and passes through a mechanical filter and a water softener, both built by the Kennecott Co. The electric current is generated to 600 voltage, and is used at this voltage in shops and smelters. The electric current going to the mill is stepped-up to 14,000 volts and the current going to the mines is stepped-up to 40,000 volts. The mill transmission line is 3000 ft. long and the transmission to the mine is 25 miles long, at both places the current is stepped down to 600 volts before being used. The water supply is furnished

plant is fabricated at McGill. The estimated cost of the entire plant is \$4,000,000.

In charge of this immense plant of power and mechanical machinery is Lindsay Duncan, mechanical engineer and former professor at Cornell University.

A new crusher plant is being added to the big mill of the Nevada Con. Co., and new furnaces installed. It is expected that by January 1 these new additions will be complete and in operation, when the daily tonnage of ore will be increased to about 15,000 tons.

The Hidden Treasure Co.

Owens four claims, 63 acres, northeast of Ely, near the Ruth mine, and covers about 3500 ft. of the porphyry and porphyry-line area. The property has pro-

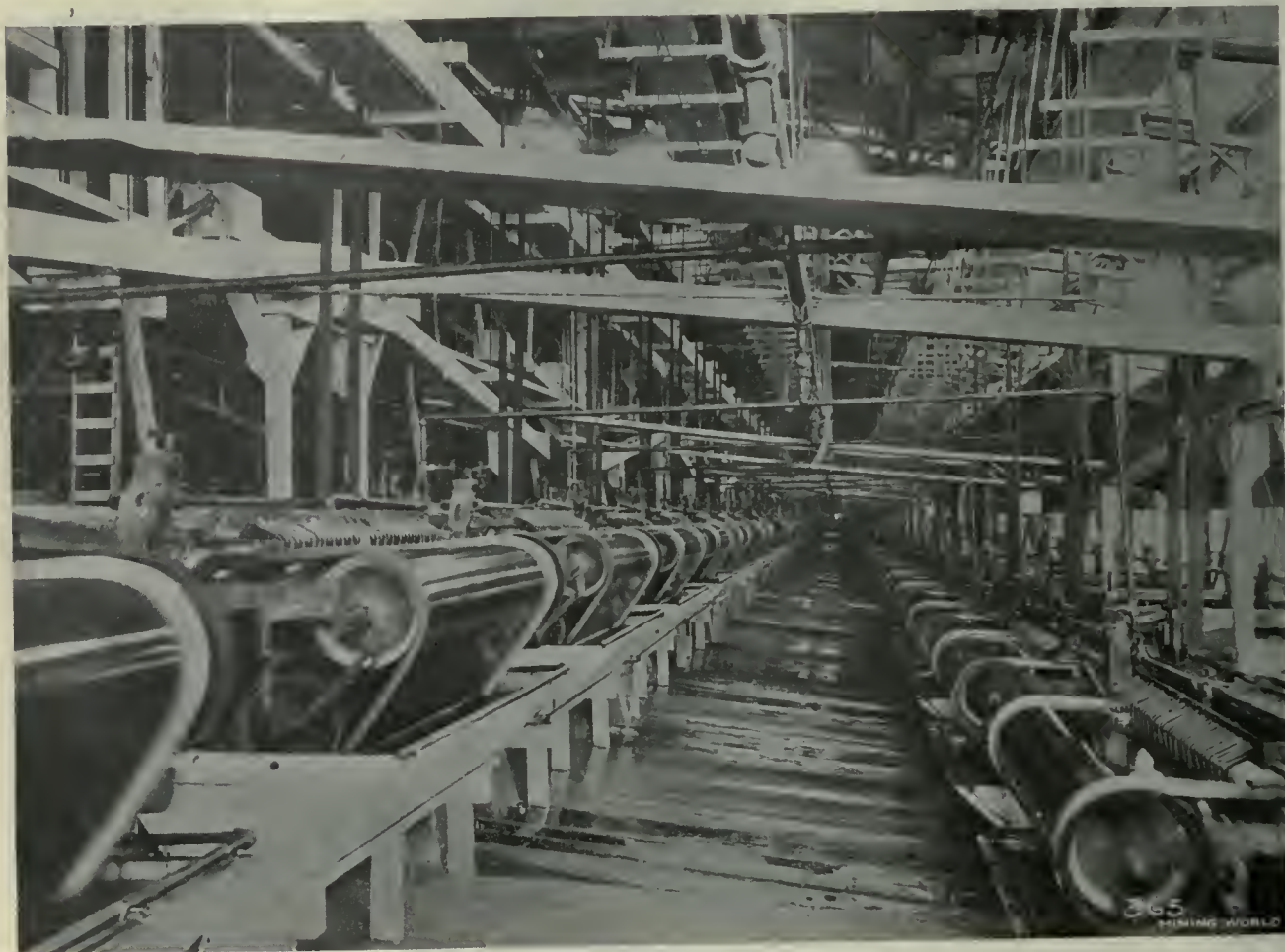
duced a rich copper and silver-lead ore of shipping grade. A shaft in the porphyry shows copper ore at 50 ft. At 100 ft. appreciable enrichment appears and assays running as high as \$14 gold, 47 oz. silver, and 42% lead were obtained. A tunnel driven 400 ft. to tap a silver-lead vein is still 200 ft. from the lime contact. There are quartz croppings on this claim showing stringers and bunches of high-grade copper ore, with gold and silver values, and much iron capping, the usual indication in the district of copper ore bodies. On the north end of the Ontario claim, owned by this company, are rich bodies of silver-lead ore, consider-

erly and with a strip about north 30°. The property lays 2 miles east of Ruth and about the same distance from the Nevada Northern railroad.

Mr. Paine also owns three claims near Lane city, 2 miles west from Ely, which show valuable deposits of silver-lead ore partially developed.

The Argus Mines.

At the old camp of Taylor, White Pine county, situated 18 miles southeast of Ely, is located the property of the Argus Mines Co., of which H. G. McCulloch of Ely is manager. This camp was a producer



LOWER CONCENTRATING FLOOR, STEPTOE MILL, MCGILL, NEVADA.

able of which has been extracted from surface workings in past years, but which now require further development. The Hidden Treasure Co. is controlled by D. C. McDonald and associates of Ely.

The Hayes Mine.

Consisting of a patented claim, 200 by 1000 ft., adjoining the Ruth of the Consolidated, and owned by D. F. Paine of East Ely, and is preparing to ship. The Hayes is working in a body of copper-lead-silver ore in a tunnel being run to tap workings above, which show bodies of silver-lead and gold and silver ore and from 4 to 5 ft. of zinc carbonate ore that will run 30% or better. The ore lays in pipes and shoots between strata of lime about 20 ft. in thickness, pitching east-

of silver-gold ore in the 80s, most of which was taken from a bedded deposit and milled at Argus Lake on Steptoe creek, 8 and 12 miles distant respectively, the old pan amalgamation process being used with an extraction of 75% to 85%, the ores being free from base metals. The total production from the Argus and Monitor mines is reported to have aggregated close to \$2,000,000.

The ores from the Argus mine as milled averaged between 45 and 50 ozs. silver and 80 cts. gold per ton. In the 90s these properties closed down, with the decrease in price of silver. The material of the principal lode is quartz and feldspar, containing pyrite and manganese, much oxidized at the surface and assaying \$1 gold, 1 oz. silver, with traces of copper and

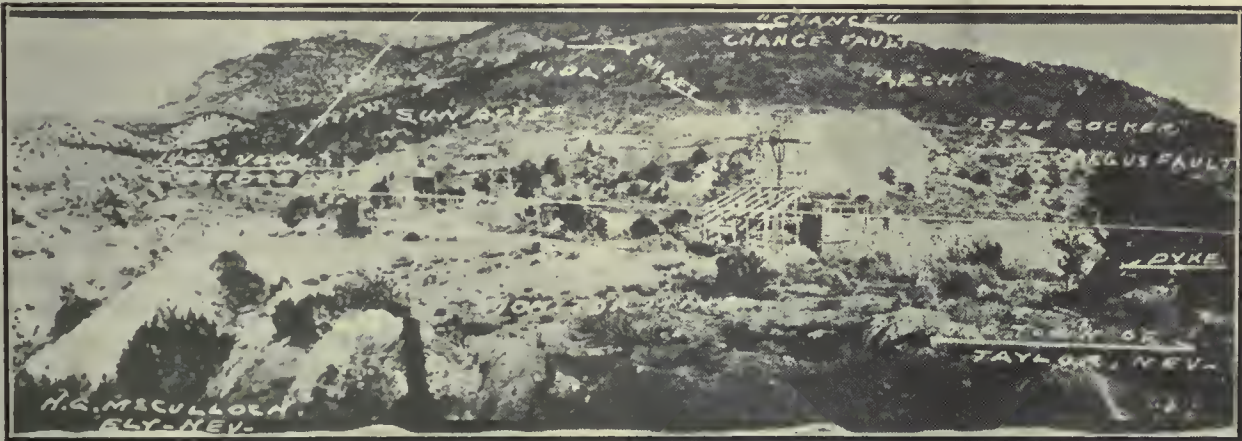
lead. During the past 2 years the sulphide primary ore of this fissure has been opened at a depth of 240 ft. just above the contact with the bedded deposit at two places in the old Argus workings. This ore is a black quartz, with portions of white quartz and calcite, stringers carrying galena 4%, zinc (blende) 6%, gray copper 1% and silver 12 oz., of an average value of \$27 per ton at present metal prices. The solutions forming this primary ore also extended into the contact forming the bedded deposit, altering the gray lime to a jet black siliceous lime carrying small values in galena, zinc and copper and silver, except where secondary enrichment has taken place by shattering along fault planes, where the ore is of commercial grade. This constitutes the upper strata of the bedded deposit.

The ores now being developed are in the main fissure at a depth of 256 ft., and grade up to \$100 per

tunnels, drifts, raises, etc., the deepest being on the Success, which is 300 ft. The property of the Success Co. constitutes an immense mineral domain and with proper development should become one of the big silver-lead mines of the west. Equipment consists of 50-hp. hoist, two 60-hp. boilers, a 4-drill compressor, drills, pumps, blacksmith shop, saw mill, pipe line 3700 ft. long, giving ample water supply, carpenter shop, store house, powder magazine, etc., office buildings, assay office, stables; \$110,000 has been expended in development. D. C. McDonald, one of the pioneer mining men of White Pine county, is manager and general director of the Success, with offices at Ely, Nev.

Hoan and Fourth of July.

Owned by M. B. Garrighan and associates of Ely, adjoins the Hidden Treasure, 3 miles west of Ely, and has made shipments of lead-silver and gold ore.



ARGUS PROPERTY AT TAYLOR, NEV.

ton in copper, lead and silver, which is extracted for shipment.

The Argus Mines Co. is capitalized for \$250,000, with 1,000,000 shares, par value 25 cts. and is controlled by the Harker estate of Canton, Ohio, and H. G. McCulloch of Ely, Nev. The company is a close corporation and has no stock for sale.

The Success Mining Co.

Owns valuable property in the Schell Creek range, 15 miles east of Ely, consisting of 28 claims. The formation is dolomite lime, shale and quartzite. The ore, carrying gold, silver and lead, makes in the lime, a bedded deposit between the shale and quartzite, some 1200 ft. in width. Lead ores, up to 66% carrying \$3.50 gold and 30 to 40 ozs. silver have been shipped from the Fairplay claim. A vein on the Success claim has been opened 180 ft. in length and down to the 200 level, which is better than 3 ft. wide, principally a brown and yellow carbonate. Shipments show 123 ozs. silver, \$12.80 gold, 65% lead. A feature of this ore is the gold content, which frequently runs as high as \$60 to \$80 per ton in the carbonate ore. Development consists of over 3000 ft. of shafts,

The Hoan is developed by shaft and tunnel. Shipments run 4 oz. silver, 35% lead and carry some gold.

The Silver Bell Group.

Fourteen claims, located at the head of Grass Valley, White Pine county, 85 miles east of Ely, and owned by W. B. Bergman and associates of Ruth, is being developed, and shows from 1% to 8% tungsten ore, carrying high-grade silver values up to 200 oz. Samples of tungsten up to 12% in a 14-in. vein in granite is being run on by tunnel and drift and some good ore put on the dump.

Butte & Superior Oil Flotation Plant.

The Butte & Superior preliminary report for July on its oil flotation plant compares as follows:

	Tons ore.	Costs per ton.	Zinc con- cen., tons.	Value per ton.
July	45,875	\$3.64	8,686	\$48.83
June	48,475	.....	10,830	.....
May	50,683	3.22	11,658	65.25
April	50,112	2.84	12,080	83.79
March	52,089	2.69	12,190	83.62
February	49,800	2.52	10,775	93.56
January	49,428	3.05	10,535	101.60
December, 1915	45,277	2.93	10,409	86.00
November	47,872	2.91	10,386	90.58
October	43,092	2.75	10,473	79.59
September	37,278	3.19	8,968	81.27
August	40,809	3.38	9,561	80.73
July	41,547	2.95	9,482	75.76

Treating Zinc-Lead Tailings in Utah.

STAFF CORRESPONDENCE.

A concentrating plant is in operation at Midvale, Utah, treating 60 tons per day of zinc-lead tailings, which resulted from the operations of the plant of U. S. Smelting, Refining & Mining Co. The tailings deposit is on the Jordan river, and embankments are made to hold back the excess of water. In the midst of the tailings an excavation was made, which was allowed to fill with water, where a small barge is floated; and upon this barge is placed a Krogh 3-in. centrifugal pump, electrically driven. By this means the well-watered tailings are pumped to a higher point and passed through a trommel, to take out coarse sand, thence through an Esperanza classifier. A second pump of same kind forces the material to a sump on higher ground, in which it is settled, and thickened by an overflow of excess water. This sump is 4 ft. deep and 30 ft. diameter. The thickened pulp is moved toward the center by mechanical devices,



TAILINGS ON JORDAN RIVER, UTAH, BEING TREATED BY THE CHILDERS LEASING CO.

and finds an outlet through the cone-shaped bottom, whence it passes by gravity to the concentrating mill, consisting of a 6-cell Minerals Separation machine, cleaner cells and tables. The mineral froth from the main cells passes to a cleaner cell, and the tailings to a rougher air-cell of Callow type. The overflow from the latter goes to another cleaner cell, and the tailings to waste dump. The second cleaner-cell product is returned to the head of the mill. The final product is taken from the first cleaner cells. This is dewatered to some extent and passed over Wall tables by which the lead and zinc concentrates are separated.

Some of the product marketed ran 45% lead and 35% zinc, all of which is sulphide, the extraction being about 75% of lead and zinc. The flotation machines used here are belt driven, instead of by gears.

This material is finely divided, 92% of the lead concentrates will pass a 240-mesh screen, and 25% of the heads will pass 400 mesh. The idea is to install an Oliver filter to dewater the zinc concentrates; the lead concentrates are dewatered by decantation. The capacity of the plant is to be increased. The

heads are said to run 2½ to 4% lead, and 7 to 8% zinc. The plant is owned by the Childers Leasing Co. E. R. Richards is general manager, assisted by H. B. Richards; C. C. Brayton, San Francisco, is president of the company.

The plant of Midvale Minerals Co., practically completed, is beginning operations on another section of the mill tailings deposit from the U. S. Smelting, Refining & Mining Co.'s concentrator at Midvale. This new mill has a capacity of about 200 tons. It is equipped with nine double-cell Janney flotation machines used as roughers, each one operated by a separate motor, and three Janney cleaner cell machines; also 12 Overstrom-Deister tables of Deister Concentrator Co. make.

The tailings, containing lead, zinc and iron, are forced to a classifier building by a 300-gal. Krogh pump, anchored on a small barge in the tailings pond. The first stage is to pass them through a trommel, the oversize passing out as waste; the undersize goes to two Dorr classifiers, the coarse goes out as waste, and the fines go to two Dorr thickeners. The thickeners, or partly dewatered pulp, pass to emulsifiers, and then to the flotation rougher machines. The concentrates from the latter are passed to cleaner cells, the rougher tailings to waste. The cleaner-cell product is carried through distributors to six tables by which the lead and zinc concentrates are separated. The cleaner-cell tailings are passed over six other tables. The table tailings are returned to thickeners, and thence to the mill circulation again. An Oliver continuous filter has been installed to dewater the zinc concentrate. J. W. McKim is superintendent of the plant, interested in which are Kirk & Leavell, Salt Lake, and associates.

Montana's New Powder Plant.

The du Pont's new powder plant being built a few miles from Butte, Mont., near Silver Bow, is rapidly nearing completion. The site covers about 1000 acres and is ideally located for the purposes of a large plant. When completed it will supply powder for Utah. Montana and Idaho mining enterprises and construction work. The local field is one of the largest in the country and by manufacturing the powder here the company will save thousands of dollars of freight charges. Sulphuric acid, an essential commodity in the manufacture of powder, is a by-product of local smelters and recent discoveries of potash will aid the company in obtaining materials for use in manufacturing the finished product. Whether the recent agitation of the government advisers to have powder factories located inland to prevent them from falling into the hands of an enemy who could reach the seacoast in time of war was instrumental in determining the site of the present factory, is, of course, problematical. Butte should benefit much from the new factory in a material way.

Mining and Smelting at Casapalca, Peru

THOMAS F. ROCHE.*

Casapalca, where the Backus & Johnston Co. operates, is noted as one of the oldest mining camps in the copper districts of Peru. It is situated on the Rimac river, 13,700 ft. about sea level and 153.3 km. from Lima along the line of the Central Railway of Peru. The village consists of 3000 inhabitants, the smelter of 500 tons and the concentrating mill of 200 tons capacity. The clearest idea of the operation of the smelter and the mill can be obtained from the following extracts from a report of the superintendent.

Ores from Morococha and other points near the line of the Central are received in cars and weighed on railway scales above the smelter. Samples are taken there and the ore is unloaded into storage bins located at the top of the smelter, these having a capacity of 5000 tons. In the bins the ore is classified according to its chemical analysis. The remainder of the ore for the storage bins goes direct to the blast furnaces without being screened. The flue dust is periodically removed from the chamber and sent to the briquetting department. Here it is mixed with burned lime, and pressed into briquettes. These ores are classified as follows: (1) Coarse ore from the screening plant. (2) Raw ore direct from the storage bins. (3) Sintered ore. (4) Briquettes.

Smelting.

The charge for the furnaces is made up from these four classes to which is added slag from the converters and limestone. The charges are made up in side dumping cars and dumped into the furnaces. The molten product runs into brick lined steel tanks called settling tanks in which matte separates from the slag. The slag overflows into a stream of water which graduates it and carries it into the river. The matte is drawn off at intervals and sent to the converter. Air at 15 lbs. pressure is used in converting and from the converters the copper is cast for shipping.

Concentrating.

In the concentrating plant the ore is first crushed in a gyratory crusher and then reduced in a ball mill. From the ball mill the ore is sent to the screens, from which the coarse particles go to a jig, and the fines to hydraulic classifiers. The jig concentrates go to the smelter; the tailings are discharged into the river and middlings are recrushed and treated on the tables. The fines going to the hydraulic classifiers are separated into various sizes to be treated on tables operating at various speeds according to the character of the ore. The slimes are collected as usual in the sump tank at the bottom mill, and from this pumped to a settling tank. The filtered slime cake is then sent to the blast furnace.

Mining.

The principal mines of the district are the Lower Carlos Francisco, Upper Carlos Francisco, Chuquichucho, Corina and Cuarenta. They yield about 3000 tons monthly. Shortage of labor keeps the production down to this figure. Privately owned mines of the district produce 1000 tons a month, all of which is smelted at the Backus & Johnston plant. About 50 miles of tunnel have been drilled in the different mines and in Lower Carlos Francisco there are eight levels opened. These levels are reached by an electric hoist, while the ore is hauled out by an electric tramway. The latter runs in the mine a mile and a half. During the last 5 years air drills have been installed resulting in increased and greater facility in production. The augmentation in production is helped by the new shrinkage system of stoping as this way of attacking the ore gives more confidence to the miners. The upper mines were worked 200 years ago by the Spaniards and some of the ore which they and subsequent owners before the time of the present company mined and deposited on the dump is being concentrated by the present owners.

Transportation and Power.

Though, considering all, transportation is excellent, they still use the time-honored method of Peru, the llama. While the greater part of the ore is received by rail, a good quantity is also packed on llamas. Each llama carries 100 lbs. of ore. Some of the ore is received over a narrow gauge tramway connecting with some of the nearby mines. Ore from the lower workings of the Carlos Francisco mine is sent directly to the smelter and concentrating mill, while that from the upper workings of the same mine is sent down over an aerial tram.

Power is supplied from two hydro-electric stations, one at Casapalca, the other at Bellavista, about 2 km. above Chicla. The first contains two 150-kw. generators, besides the water driven blowers for the blast furnaces and sintering pots. In this plant are also located two air compressors for the mines, the blowing engine for the converters, a motor driven turbo-blower for the blast furnace, and all of the electrical apparatus for utilizing the power transmitted to Casapalca from Bellavista. At Bellavista are two 800 kw. generators driven by water taken from the Rimac and the Yauliaca, the latter a small tributary of the Rimac. The water is conveyed about 2 kws. by canal, thence by a steel pipe to the water wheels, where it is delivered under a head of 83 meters. Power is transmitted to Casapalca at 10,000 volts, and there stepped down to 2000 and 440 volts for distribution about the works. The Casapalca plant derives power from the

*In the West Coast Leader.

Rimca river and water from the Carlos Francisco mine. The electric lines from this plant are connected with those of the Cerro de Pasco Co., so that either company can help the other in case of a shut down of their electric plant.

Miscellaneous.

There are about 70 staff employees and 1200 native operators at the smelter. Considerable has been done in the way of making surroundings as agreeable as those in a more central place. Club houses and like for social affairs are being constructed. Besides the regular hospital for treating injured patients and those with non-contagious diseases, an isolated hospital is kept by the company.

Although nearly 14,000 ft. above sea level, the average temperature for the year is 45°. The thermometer seldom records less than 32° nor more than 60°. The combination of height and proximity to the equator are responsible for this even climate. Casapalca is about 10° south of the equator. The seasons are known as the wet and the dry, although some years they seem misnamed, because during the wet season, from September to April, more than half the days are clear, and during the dry season there are at least 5 or 6 days with some rain or snow.

The copper which contains silver, and sufficient gold to pay for refining, is taken over the Central railroad to Callas and shipped to Chrome, N. J., for electrolytic refining.

Improvements in Dump Cars.

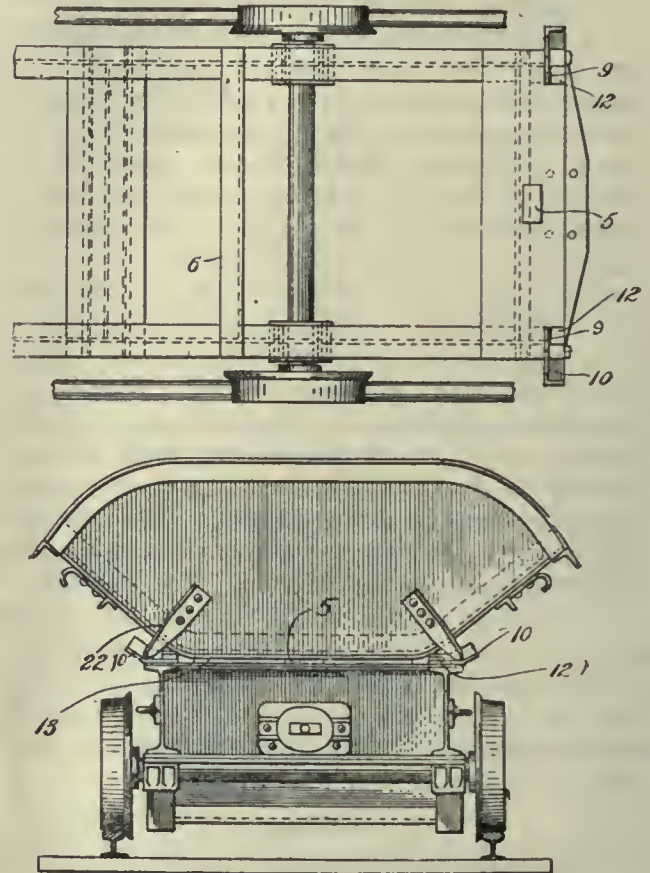
Samson D. Wright, of Cleveland, O., and Samuel R. Vanderbeck, of Philadelphia, Pa., have invented improvements in dump cars, relating more particularly to preventing endwise movement of the body upon the frame and to giving greater facility in swinging the body at the dump. They have been granted a patent upon their invention (No. 1,187,593) and the essential details are as follows:

In operation the car normally rests upon the supporting bars (5) and (6), and is held against endwise movement by reason of the ends of the body with the pivots being mounted between or inside of the flanges (9) of the pivot members so that the pivots engaging the flanges at the ends and hold the body. The body is held against transverse movement by means of the pivots engaging the stops (12) on the one hand and the inclined flanges (10) on the other. In this way the body is held by reason of its weight against endwise and transverse movements.

When the car is to be tilted or dumped, suitable hoisting mechanism is connected to the hooks (13) on the side opposite to which the car is to be dumped and the body is tilted, the body turning upon the pivots which engage in the angle of the pivot members on the side of the car corresponding to the one upon which the car is to be dumped.

When the car reaches complete dumping position

the flanges (22) engage the flanges (10) and prevent the body from being tilted beyond the proper point, this point being one which is not the center of gravity of the car body so that upon the release of the hoist-



AN IMPROVED DUMP CAR.

ing mechanism the car body will have a tendency to assume normal position upon the frame or bed of its own weight.

Study of Castings of Zinc Bronze.

An investigation of the various foundry operations influencing the properties of castings of one of the most generally used commercial alloys, known as government bronze having the composition 88% copper, 10% tin and 2% zinc, has been completed by the Bureau of Standards and the results just published in Technologic Paper No. 59. The quality of metal castings is usually determined by measuring the properties of a test specimen cast from that particular metal. The investigation included a study of the effects of temperature of casting, methods of casting, molding, etc., kind of sand, heat treatment, and the effects of similar factors upon the resulting mechanical properties. A microscopic examination of the fractured test specimens was also made which showed that the most common source of weakness is the occurrence of oxides within the metal. Such oxides appear frequently as thin films throughout otherwise sound metal producing a condition of brittleness and low ductility.

Notes on the Park City Mines and Mills, Utah

W. A. SCOTT.

Daly-West mill, Park City, is concentrating 130 tons per day of sulphide ore, containing lead, silver and zinc. The mill heads run approximately 4 to 6% lead, 6 to 12 ozs. silver and 4 to 6% zinc. A coarse silver-lead product is made on Franz jigs; a finer lead-zinc product on Hartz jigs, and coarse and fine concentrates on Wilfley tables; and finally, a silver-lead froth is recovered from flotation machines of the Federal Lead Co. type. The zinc slimes, as much as possible, are kept out of the flotation process.

The mill ore is first reduced to 2-in. size by a jaw crusher, the product passing to a 2-mesh revolving screen; the screen oversize is recrushed to $\frac{1}{4}$ -in. in Symons rolls. The entire product is then carried up an incline by a 120-ft. belt conveyor to the head of the main concentrating mill, where it is classified in a revolving screen. There are two sets of Franz jigs, one of which takes the screen oversize, and the other the undersize after it has passed through an Akins classifier. The slime from the latter goes to a Janney classifier. The Franz jigs make a heavy lead product and a middling of mixed lead and zinc, the middling being reground in a set of Sherman rolls. This reground product is elevated to Colorado Iron Works impact screens, the 6-mesh oversize being concentrated in Hartz jigs, the undersize passing to a Janney classifier through a launder. The Hartz tailings are concentrated on three Overstrom tables. The coarse material from the Janney classifier is treated by 10 Wilfley tables, the middlings therefrom being reconcentrated over another set of Wilfleys. The fines from Janney classifiers are retreated by Wilfley slime tables. The tailings from all tables pass to fine Hartz jigs, and the headwater slimes from all tables are thrown by a centrifugal pump to a tank, the settlings in which go to the flotation machines of 16 cells. This mill, which was built after the destruction of the old plant by fire in 1913, resumed operations last May, after an idleness of several months. It is doing satisfactory work, in charge of John C. Thompson.

At the Daly-West mine, development has been in progress since completing the installation of the new Laidlaw-Dunn-Gordon air compressor and the Wellman-Seaver-Morgan hoist, both of which meet all the requirements of efficiency. Result of this work was to open new ore bodies on the 1700, 1900, 2000 and 2100-ft. levels. The ore in the higher levels is being missed by lessees under company supervision. Most of the ore being mined by company direct is taken from the Daly fissure, between the 1200 and 2100-ft. levels. This ore occurs in the fissure proper, and also in the lime bedding planes adjacent thereto. All of it is a sulphide, of varying grade. The highest grade

ore has been found above the 1200-ft. level; the ore bodies below that level are large, but of lower grade. The per cent of iron, with its accompanying lead and silver, has increased on the deeper levels. The zinc content has decreased some with depth, although high-grade zinc ore has been found on the 2000 level. A considerable tonnage of ore is shipped to the smelters without concentrating, and they are quite successful in separating milling ore from shipping ore as the two grades are mined. The following are on the Daly-West staff: H. G. McMillan, general manager; E. L. Talbot, general superintendent; Frank Kane, master mechanic; John C. Thompson, mill superintendent.

New Quincy.

The New Quincy mine, Park City district, adjoins the Daly-West on the south, and lies on the opposite side of the mountain from the latter. The New Quincy workings are connected with those of the Daly-West through the latter's 900 and 1200-ft. levels. The Quincy operations are carried on through the Daly-West, and at present it has no other outlet to the surface. Daly-West's 900 level south, having been extended into Quincy ground, opens the latter at a depth of 1300 to 1400 ft. below the surface; and its 1200-ft. level, in a similar manner, was extended into the Quincy at a depth 1600 ft. The Quincy's mine water, amounting to about 100 gals. per minute, is drained out to the Daly-West's 1200-ft. station, thence down to the latter's 2100-ft. level, where the drainage line is connected with the Ontario drain tunnel.

Two fissure veins have been opened in the Quincy, on which considerable development has been accomplished. These veins are within limestone from the surface down to 1000 or 1100 ft., and below that they become contact veins between limestone and quartzite. The ore consists mainly of sulphides of lead, zinc and copper, carrying silver and gold, in a quartzite gangue, and occurs in shoots. However, in some parts the ore makes out 20 to 60 ft. from the vein into the limestone bedding planes. Ore recently shipped sampled 30 to 50 ozs. silver, 10% lead, although that now mined in a new place is said to run over 20% lead. In some places there is 3 to 4% copper, but the last shipment contained only 1%. All the ore carries about \$1 per ton gold. P. P. Harrington, superintendent, states that shipments amount to 150 tons per month. This ore is hauled in mine cars to the Daly-West shaft, dumped into chutes, then loaded into cars on the latter's haulage tunnel. There is a 600-ft. shaft on the New Quincy, but, not being connected with the workings, is not used. W. Mont Ferry, Salt Lake, is president of the Quincy; A. L. Thomas, secretary. The directors are W. S. McCor-

nick, F. J. Hagenbarth, F. B. Cook, V. R. Hutchinson and Herman Bamberger.

Judge Operations.

The Judge Mining & Smelting Co., formerly Daly-Judge, is shipping close to 1000 tons of ore per month direct to smelters; and is milling about 250 tons per day, producing 50 to 75 tons per day of lead-silver concentrate, and 20 to 30 tons of zinc concentrate, the latter product averaging 45% zinc. The milling ore consists of three-fourths sulphide and one-fourth carbonate. In the mill a lead jig product and a zinc jig product are made, and a Marcy mill was lately put in place to regrind the jig tailings. The jig products comprise about one-third of the total zinc recovered in the mill, and one-half of the lead. The overflow slimes from the classifiers are passed to Dorr tanks, and thence to Callow flotation cells, four rougher and two cleaner cells. Tailings from roughers are reconcentrated on tables. The concentrates from cleaner cells are passed over Wilfley tables to separate the lead from the zinc. The cleaner tailings are passed back into the mill circulation.

At the Judge mine a new Allis-Chalmers electric hoist, capable of operating to a depth of 2500 ft., at a speed of 2200 ft. per minute, has been placed in position in a steel and concrete building, over the 3-compartment shaft. Waste is hoisted to the top of the shaft, and all ore is hoisted to the haulage level at the 1200-ft. station. The portal of the haulage is near the mill site. Other improvements consist of a new steel gallows frame, at the collar of the shaft, 72 ft. from collar to sheaves. Judge workings are drained through a connection at its 2500 ft. station with the Ontario drain tunnel. The lowest mine workings on the property are at a depth of 2300 ft. The exploration and development work are being kept far ahead of the mine production.

Snake Creek Mining & Transportation Co., subsidiary to the Judge Mining & Smelting Co., has driven the Snake creek tunnel a distance of 14,350 ft. from the portal, which is 9 miles from Heber. The purpose is to advance it farther to connect with the Judge mine, tapping the latter's workings at the 1900-ft. level. This tunnel is about 400 ft. higher than the Ontario drain. A volume of water equal to 19 second-feet is now flowing from it. It is figured that eventually it will be advantageous to use it for ore-haulage purposes.

Electrolytic Zinc Plant.

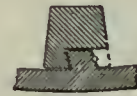
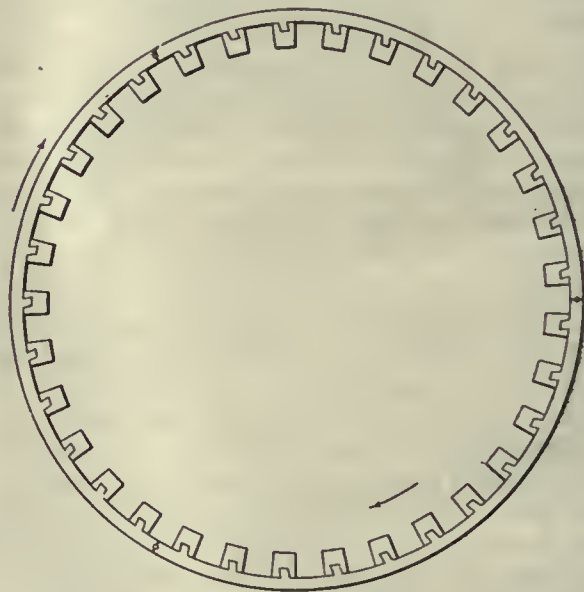
Judge Mining & Smelting Co. has under construction an electrolytic zinc plant in Deer Valley, 1½ miles east of Park City, where it has Union Pacific and Denver & Rio Grande railroad connections. The plant is to treat zinc concentrates, and will have capacity to produce 15 tons of pure electrolytic spelter per day. The process is to roast the concentrates, then leach the calcined product with a weak solution of sulphuric acid. The solution is then clarified of its impurities

and by-products. After this, the zinc is deposited on rotating aluminum cathodes, arranged in 120 electrolytic cells. The product is then stripped from the cathodes and melted and cast into pigs. The electric current consumption is estimated at 2500 kw. All the lead, silver, copper and cadmium are to be saved as by-products in the leaching process. The Utah Power Co., which obtained a large volume of water for power purposes from the Snake Creek tunnel, controlled by the Judge Co., will furnish the current for the new plant, which is expected to be in operation this autumn. The equipment includes transformers, motor-generator sets and motors.

G. W. Lambourne, Salt Lake, is general manager of the Judge Co., also of Snake Creek Co.; O. N. Friendly, E. M., who has been with the Judge Co. many years, is general superintendent, Park City.

Ribbed Tube Mill.

An improvement in tube mills, of the type comprising a shell liner having longitudinal wear members or ribs on the interior, has been made by Joseph S. Peterson and Walter B. Rogers of Smuggler, Colo. They have designed the wear members to be individ-



RIBBED TUBE-MILL LINER.

ually removable so that they can be renewed as they wear out. The accompanying diagram shows the simple method by which the idea has been worked out, and upon which they have been granted U. S. Patent No. 1,188,203.

Copper exports for the week ended Aug. 25 totaled 7287 tons; since Aug. 14 they were 25,205 tons, against 14,215 a year ago.

Four Stages of Cyanidation Combined in One

Since 1890 when cyanidation was introduced in a practical way to treat dumps containing gold in South Africa, practically nothing has been done until late years in the way of changing the general principles of the method, except for a few mechanical changes perfecting the operation of agitating, the filter press, clarifier and precipitation press. In this respect, J. N. Lewis has made something of a change in the method by combining the agitator, filter press, clarifier and zinc boxes into one machine, thus saving considerable labor by accomplishing each part of the process separately. In developing this machine, known as the Eureka cyanidation-precipitation machine, the general cyanidation practice has in no way been changed. The general well-known practice of four separate stages has simply been combined into one.

In Fig. 1, illustrating the laboratory machine, three compartments or cell-cases will be noted. The lower sides of these cell-cases are made from perforated plates, with air and water-tight plates making up the bottom. Two thicknesses of filtering material are placed next to the outer side of these perforated

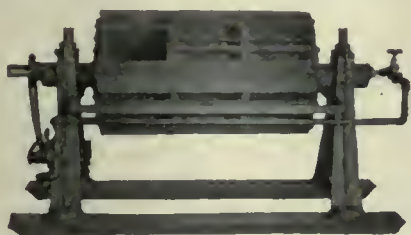


FIG. 1.

plates. The first makes a partial filtration and the second is of a closer textured material for completely clarifying the solution, which next comes in contact with zinc and the gold precipitated. The barren solution then drops to the tank noted as the triangular shaped bottom part in Fig. 2. The pipe is shown leading from the bottom of this solution tank to the small pump driven by a sprocket and chain. The solution is then pumped to the right end of the tank and its flow into the cells may be controlled by the valve noted at the right end of the machine in the longitudinal view Fig. 2. The cell-cases are made to revolve on a horizontal axis driven by the chain and sprocket noted in Fig. 2.

In practice the ore is first crushed to the desired fineness and distributed in the cells of the machine to be spoken of collectively later as the container. The machine is then made to revolve slowly and the solution from the tank at the bottom is pumped around and forced into the end of the container and through the crushed ore. The pump aids in forcing the solution through the pulverized ore and filtering plates which with the perforated plates make up part of each cell-case. Agitation is accomplished by the revolving

motion on the horizontal axis. After going through the filter of only 2 ins. thickness, the pregnant solution encounters the zinc and is relieved of its gold, the barren solution draining back to the tank and again pumped through the cell cases as a second and weaker wash. This operation is continued for about 3 or 4 hours after which about 30 minutes are required to discharge and refill the container with another charge.

At any time during operation samples for various tests may be taken from the machine enabling the

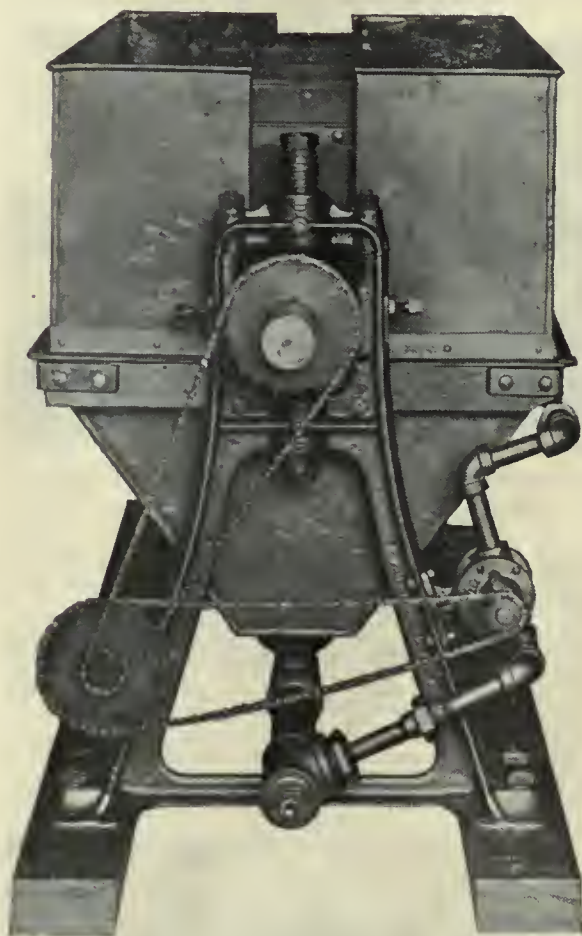


FIG. 2.

operator to run the machine as the tests may designate is best. Oxygenation is cared for by the introduction of air from the compressor. In case a heated solution is thought necessary steam can be ejected into the container.

Among some of the features embodied are smaller space required, less labor and less chance for loss, claimed to be made by passing the pregnant solution through long pipes. A laboratory machine handling test runs of from 100 lbs. to 300 lbs. is made as well as machines for practical use. The latter come in 20, 40 and 60-ton sizes each having respectively 17, 34 and 51 cells. The parts for each of these different sized machines are the same, the only discrim-

ination being the addition of 17 cells for each 20 tons of capacity.

These machines are handled by the Eureka Agency, 1531 18th street, Denver.

Spray System of Water Cooling Saves Power.

Taking as an example a modern steam turbine plant, operating at a vacuum of 26 ins., if this vacuum can be increased to 27 ins. the saving of fuel is 5%. Increase it to 28 ins. and an additional saving of 6% is made. Twenty-eight and one-half inches will gain



SYSTEM OF WATER COOLING AT THE COPPER QUEEN CON. PLANT, DOUGLAS, ARIZ.

another 4%—15% total saving in fuel in 2½ ins. increase in vacuum.

To increase the vacuum requires colder water—for 26 ins. vacuum the temperature of the condensing water must be not over 103° F., for 28½ ins. not over 68° F.

The spray system of cooling condensing water is the most efficient in use, and by lowering the tempera-



2000 H.P. SPRAY SYSTEM, SHOWING PROXIMITY TO POWER PLANT.

ture those few degrees brings about a great saving in fuel. By its use it is possible to obtain an average vacuum of 28 ins. the year round in almost all parts of the United States.

In cases where there is a cooling pond at hand, a spray system can be added to it with comparatively small outlay. Even when an earthen pond or cement basing has to be constructed the resulting economies make the cost of construction seem insignificant.

The spray nozzles are the most important feature of this system. They produce a fine uniform spray without clogging. They have removable turbine centers with large passageways. These are held stationary in the nozzles, and the water in passing through is given a rapid rotary motion. A central driving jet, which impinges on the rotating water at the orifice, causes it to be ejected in a fine, dense, uniform spray. The above, with the necessary piping, rests on concrete piers—an installation requiring practically no maintenance and having very long life.

Careful tests of the system show that the total loss of water from evaporation and drift is only 1½ in New England states—considerably less than with a cooling tower. The drift is in fact practically negligible, owing to the low pressure used. The particles, while broken into fine spray, are yet of sufficient size to settle within the limits of the pond.

The following tables are interesting, showing what the spray system will do on a typical cold winter day and a typical hot summer day.

TYPICAL WINTER DAY.

A. M.	Temperature air. Deg. F.	Relative humidity. Per cent.	Temperature of water.	
			Before spraying. Deg. F.	After spraying. Deg. F.
7	16	..	90	57
8	15	72	100	60
9	20	..	104	63
10	22	..	105	64
11	24	..	107	65
11.45	26	..	108	66
P. M.				
1.15	28	..	108	64
2	30	..	110	66
3	31	..	110	66
4	30	..	110	67
5	28	..	112	67

TYPICAL SUMMER DAY.

A. M.	Tempera- ture air. Deg. Fahr.	Relative humidity. Per cent.	Temperature of water.		Vacuum obtained. Inches mercury.	Average barometer. Inches
			Before spray- ing. Deg. Fahr.	After spray- ing. Deg. Fahr.		
7	69	..	104	87	27.9	..
8	71	40	108	82	27.5	30.05
9	75	..	110	84	27.45	..
10	78	..	112	86	27.25	..
11	85	..	113	98	27.25	..
11.45	88	..	114	98	27.10	..
P. M.						
1.15	90	..	112	98	27.25	..
2	92	..	113	96	27.25	..
3	93	..	113	96	27.25	..
4	93	..	113	97	27.20	..
5	92	..	113	98	27.20	..

The editor will be pleased to give the manufacturer's name and address to those interested in obtaining more detailed information concerning this system.

The introduction of zinc dust as a precipitant of gold and silver from cyanide solutions is due to H. L. Sulman, who proposed its use in 1894.

Ore-bedding and reclaiming systems have proved highly satisfactory at all the plants where they are in use.

Why Highly Oxidized Red Lead is Superior

G. W. THOMPSON.*

The use of red lead in the preparation of paints for the preservation of iron and steel dates so far back that it might almost be said that the "memory of man runneth not to the contrary." The red lead so used has varied greatly in composition, particularly as to the percentage of true red lead contained therein. True red lead has a formula of Pb_3O_4 and the percentage in red leads used for painting may vary from 70% up to 100%. Red leads which do not contain 100% of true red lead are considered as mixtures of red lead and unconverted litharge, PbO , litharge being the material from which red lead is produced by oxidation.

There has been much progress made in the manufacture of red lead during the last 25 years. This progress is to be noted principally in two directions—one is that in general the red leads have gradually increased in the percentage of true red lead present; the other is that red leads have generally become finer through better methods of grinding. These two ways in which red lead has improved in quality are closely related. It has been found that in most cases a red lead low in true red lead is comparatively coarse, the litharge present being found inside the coarse particles. By finer grinding the surface of the particles has been increased, thereby permitting higher oxidation and the consequently higher percentage of true red lead.

That red lead may be considered par excellence the pigment to be used in the production of paints for the protection of iron and steel is indicated by numerous tests conducted by Cloyd M. Chapman, of Westinghouse, Church, Kerr & Co., who found that the protective value of numerous composite paints tested by him was roughly in proportion to the red lead present. To be more exact he found that those paints which contained red lead were always the best paints.

The tests conducted by Committee D-1 of the American Society for Testing Materials on the Havre de Grace Bridge were extremely interesting. Paint No. 11 was graded as best out of nineteen paints. It stood in the first class after $7\frac{1}{2}$ years' exposure. A paint, the pigment of which was red lead, was used, the red lead containing 95.9% true red lead. Paint No. 10, which was the next best paint was rated in the first class for $5\frac{1}{2}$ years. For the remaining 2 years it was rated in class two. A paint, the pigment of which was red lead, was used, the red lead containing 88.5% of true red lead. Paint No. 6 which was third in value was rated in class one for $4\frac{1}{2}$ years and class two for 3 years. The pigment in the first coat of paint was mostly red lead, the balance being a magnesium silicate.

It is unnecessary to consider here the other Havre de Grace tests, except to note that those immediately following in grading contained some red lead in the paints, while those that were graded lower down in the scale contained no red lead or only insignificant quantities. These Havre de Grace Bridge tests speak eloquently for the value of red lead paint for the protection of iron and steel. They also point to the desirability of using a red lead containing a high percentage of true red lead.

This latter conclusion deserves careful consideration. Two questions present themselves—Is a red lead containing a high percentage of true red lead best because of its containing less litharge or because of its physical qualities? We have shown that a red lead high in true red lead is generally finer than one low in true red lead, and it is proper to ask whether superior fineness is not the determining factor rather than absence of litharge. In endeavoring to answer this question a number of samples of commercial red lead, varying in percentage of true red lead, were sent us from different sources and we tested these by a system of classification by flotation, whereby we were enabled to determine the percentage of relatively coarse particles these red leads contained. These coarse particles we customarily call sandy lead, and they may be considered as in the main being composed of particles having a diameter greater than one four-hundredth of an inch. This figure has been obtained by microscopic measurement. The percentages of true red lead and coarse and sandy lead obtained on these samples are as follows:

True red lead. Per cent.	Coarse and sandy lead. Per cent.
95.16	1.90
92.21	11.34
90.10	17.76
88.21	21.62
82.53	28.72

These figures show in a very striking manner the truth of the point for which we are contending, that as a general rule the finer the red lead, the higher will be its contents of true red lead. Of course, it is obvious that this is not a necessary condition. In the manufacture of red lead, litharge or its equivalent is subject to a temperature of about 900° F., with an ample supply of air, and the usual custom of manufacturers is to carry this oxidation on as far as is practicable. They can of course draw out from the furnaces before this oxidation is complete, in which case, however, they would probably have a red lead which when rubbed out would show streaks due to the presence of unconverted litharge. It is possible also for a manufacturer of red lead to mix litharge with his red lead after having manufactured it. Neither of these conditions are found to exist commercially, and it is true that commercial red leads of an equal

*Chief Chemist, National Lead Co.

purity show a percentage of red lead corresponding to the fineness of the product.

Reverting now to the figure given above as the minimum diameter of the particles included in the class known as coarse and sandy lead, namely one four-hundredth of an inch, and considering this in connection with the thickness of ordinary paint coatings, it becomes at once obvious why the highly oxidized and consequently fine red leads are superior for use in the making of paints for iron and steel. Paint coatings occupy space, that is, they have length, breadth and thickness. This being the case, it is very easy to show the direct relation between the spreading rate of a paint and its average thickness. We give here a formula which will help us in this conclusion:

Let t = thickness in inches of coating
 a = sq. ft. coated per gallon
 $a144$ = sq. ft. coated per gallon
 231 = contents in cu. in. per gallon

Then

$$t = \frac{231}{a144} = \frac{1.604}{a}$$

From which we get this table—

A—Thickness in fractions of an inch of coating.

B—Square feet at which a gallon of the paint is spread.

A	B
1/100.....	160.4
1/200.....	320.8
1/300.....	481.2
1/400.....	641.6
1/500.....	802.
1/600.....	962.4
1/700.....	1122.8
1/800.....	1283.2
1/874.....	600.
1/561.....	900.
1/748.....	1200.

The average thickness of a coating of paint for iron and steel may be one two-hundredth of an inch. In many parts, however, the coating may easily reach a thinness of one six-hundredth of an inch. If, therefore, a paint contains particles whose smallest dimension is one four-hundredth of an inch, it is obvious that the particle will stand out in a paint coating where the thickness of the paint coating is only one six-hundredth of an inch. Many particles of pigment classed as coarse or sandy lead are considerably larger in size than the size indicated by 1/400th of an inch diameter, and these will project still further through the paint film. Such coarse particles become therefore the weak point in the film, and corrosion may start around such particles. The paint film itself is weak at such points, as the coarse particle may not be completely encased in the oil of the film.

All this leads us to conclude that the superiority of a highly oxidized red lead is really due to its fineness. It is a better pigment. Its superiority, however, lies not only in the more continuous paint film it produces, but in its producing a better working paint, a paint that flows out well, but will not run, sag or weep.

In the Havre de Grace tests, paint No. 11, which

contains a highly oxidized red lead gave good satisfaction when each of the three coats was spread at 1200 sq. ft. per gallon. Paint No. 10 gave good results when each coat was spread at 600 sq. ft. per gallon, but it failed to give the best service when spread at 900 or 1200 sq. ft. per gallon.

Returning now to the question as to the function of litharge in red lead, we think we are justified in saying that so far as our accurate knowledge goes litharge is not a necessary component of red lead to be used for paints for iron and steel. It may be that some have obtained better results when litharge is present in appreciable amounts. Litharge in itself may or may not be of advantage to red lead. Speculative arguments do not help us. The experience of the practical user of red lead is and must be the final test. If any user of red lead finds that litharge has been of advantage it is obvious that this litharge can be added to the highly oxidized red lead at the time it is used just as well as it can be left in the red lead by the manufacturer.

If it is left in the red lead by the manufacturer, the chances are that the product so produced will be undesirably coarse and consequently not the best that the manufacturer can produce as a good pigment. If, on the other hand, the consumer buys a highly oxidized red lead, and still believes that litharge is an advantage in the red lead, he can add the amount of litharge which he thinks is necessary and thereby have complete control of the chemical and physical composition of his paint. If litharge is used in this way, it should be the very finest that is obtainable and the manufacturer should be expected to furnish the litharge on as rigid specifications as the red lead with which the consumer intends to mix it.

As to whether red lead containing litharge withstands the chemical action of the atmosphere, we can simply refer to our own experience. Whenever we have exposed a paint composed of a highly oxidized red lead, it has kept its color longer than when a similar paint made from a low oxidized red lead has been similarly exposed. There may be highly oxidized red leads in regard to which we have no information, which are subject to the destructive action of the atmosphere. It may be that such red leads are converted to carbonate and sulphate more readily than other red lead containing large percentages of litharge. We have yet to see it demonstrated, however, that the highest grade of red lead now on the American market is affected as much when used in paint by the destructive action of the atmosphere as the ordinary commercial red leads containing high percentages of litharge.

It would seem, however, that this highest grade of red lead does not need this kind of trivial defense. Its real merit lies, as we have pointed out, in its being the best form of red lead used in the preparation of paints for iron and steel, and the fact that it retains its color when so used is of minor importance.

It must be remembered, however, that such a high

grade red lead conforms to the best usage in paint practice. It is now furnished ground in oil and can be used on the job with the same ease that white lead-in-oil can be used. It obviates the dusty and wasteful practice of mixing dry red lead with linseed oil on the job. In this respect it is a more sanitary product.

In all we have said, we wish it to be understood that we are not condemning any form of red lead for the protection of iron and steel. We are simply pointing out that this particular kind of red lead, the highly oxidized kind, is the best that can be made from the standpoint of protection to the iron and steel, ease of application, and all the other good qualities that should go with a superior product.

Managaneose Deposits in Virginia and Maryland.

The great demand for manganese ores and the high prevailing prices lend additional interest to a recent report on some manganese mines in Virginia and Maryland, by D. F. Hewett, of the Survey. The demand for large amounts of manganese ores in this country began in the period 1865-1870, with the introduction of the Bessemer and open-hearth processes of steel making, and has grown enormously. The domestic supplies have furnished only a small fraction of the manganese required by our industries—in 1915 only about 3%, and from 1910 to 1914 only 1%.

Virginia has contributed more heavily than any other state to the domestic production. Five of the six deposits described in this report are on the east side of the valley that lies west of the Blue Ridge and is commonly known as the Great Valley of Virginia. They coincide roughly in position with the outcroppings of a group of Cambrian shales and quartzites. The other deposit lies well east of the Blue Ridge, in the piedmont region. Psilomelane is the commonest manganese mineral of all the ores, but manganite and wad are also present. The ores are all of near-surface origin and were formed mainly through the replacement of clays and schist by manganese carried in solution in the ground water. Some of the clays replaced were the residual products of rock weathering, others were deposited in ancient stream channels, and still others were formed through the crushing of wall rocks along zones of fracturing. The greatest depth to which the ores have been traced is 260 ft.

Many manganese deposits in other regions are the result of presentday processes of oxidation and deposition through the agency of air and the surface waters. The Virginia deposits were formed not long ago, in Tertiary time, and furthermore that the manganese oxides were in part deposited below the permanent ground-water level, their formation resembling in this particular the deposition of certain of the Lake Superior iron ores.

It is considered improbable that manganese ores in any of the Virginia or Maryland deposits will extend to depths of more than 500 ft.

Production of Salt in the United States.

The average reader does not realize the importance of the salt industry of the United States. According to the recently issued report by the U. S. Geological Survey, there was produced in 1915, 38,231,496 bbls. of 280 lbs. each.

Michigan ranked first among the states both in the quantity and the value of the output of salt in 1915. The quantity of salt produced was 12,588,788 bbls (1,762,430 tons), valued at \$4,304,731, an increase of 917,812 bbls. (128,494 tons) and of \$1,005,726 in value compared with 1914.

New York ranked second among the states in both quantity and value of the salt produced in 1915. The output was 11,217,471 bbls. (1,570,446 tons), valued at \$2,976,405, an increase of 828,157 bbls. (115,942 tons) in quantity and of \$151,672 in value.

Ohio ranked third among the states in both quantity and value of output of salt in 1915. The quantity produced was 5,880,243 bbls. (823,234 tons), valued at \$1,462,192, an increase of 379,407 bbls. (55,651 tons) in quantity and of \$141,638 in value, compared with 1914.

Kansas ranked fourth among the states both in the quantity and the value of the salt marketed in 1915. The quantity produced was 3,765,164 bbls. (527,123 tons), valued at \$1,035,879, an increase of 797,300 bbls. (111,622 tons) in quantity and of \$111,329 in value, compared with 1914.

Louisiana ranked fifth among the states in quantity and sixth in the value of the salt produced in 1915.

California ranked sixth among the states in quantity and fifth in value of the salt produced in 1915. The quantity produced was 1,048,457 bbls (146,784 tons), valued at \$694,070, a decrease of 51,986 tons in quantity and of \$88,850 in value, compared with 1914.

Salt was made by only one operator in Idaho in 1915 and the production came from Stump creek, Bannock county, in the southeastern part of the state.

The production of salt in Nevada in 1915 was 6929 bbls. (970 tons), valued at \$3950.

The production of salt in Texas in 1915 was 44,978 bbls. (62,297 tons), valued at \$345,944, an increase of 109,999 bbls. (15,400 tons) in quantity and of \$94,451 in value, compared with 1914.

The production of salt in Utah in 1915 amounted to 394,850 bbls. (55,279 tons), valued at \$266,334, an increase of 19,393 bbls. (2715 tons) in quantity and of \$34,822 in value, compared with 1914.

Small non-condensing steam turbines are now coming into more general use as auxiliaries in mine power plants for driving excitors, centrifugal boiler feed pumps, centrifugal pumps for condensers, etc.

Benzol, one of the many by-products from the coking of coal in by-product ovens, is a colorless, inflammable liquid hydrocarbon having the chemical formula C_6H_6 .

The Stockholders' Responsibility

LETSON BALLIET.

About 15 years ago I was employed to examine a mine for a mining company that had three long tunnels, and two good veins of ore. They were driving a fourth tunnel much lower down, to tap their veins 1000 ft. deeper. It was a good mine—and it is a good mine today. There were about 500 stockholders in that company—I don't know who they were, for I was not a stockholder. I was only an employed engineer to make a report.

My report said: "Your mine is a good one—the opening of the vein at the great depth that will be reached by the lower tunnel should make it a big producer of ore. It will take about 10 months longer to drive the lower tunnel in to the vein, and will cost about \$4000 a month for that time. After that you can expect the mine to produce profitable ore, if you spend \$4000 for 10 months in driving the tunnel

Do you know what those 500 stockholders did? They just sat down quietly and waited 10 months, without making any more payments or furnishing any money at all. Of course the work had to stop. There wasn't money enough coming in to pay even a watchman, at the mine which had already spent \$100,000.

Ten months later the stockholders began writing to me, saying that "10 months were up" and that I had said "the mine will be producing in 10 months." Of course I had told them nothing of the kind. I had said that "if they furnished \$4000 a month that they could expect the mine to be producing at the end of that time."

The man who was manager of that mine is now a very high official, and a very competent man in mining operations, but at that time he was a poor man working for wages, and had to hunt another job when the stockholders quit furnishing money for his and the miners' wages.

That mine, of course, couldn't pay bills; its cars and track were stolen when they couldn't pay a watchman, and it was idle for years, and abandoned. Later it was taken up by others and is today a good property.

The outcome of that experience of 15 years ago is that I learned a lesson, and that is—never set a time limit when a mine can be expected to pay. If you were to ask me when will a mine pay I would answer, "When a level has been run 1000 ft., or 500 ft. or 100 ft." or whatever work had to be done. Never in months.

You might ask me, "When can I rent rooms in a new hotel I am going to build?" The answer is, "When it is completed." I don't know whether you are going to build it in 6 months by rushing the work, or whether you will build it at all, or build it next year or year after. It is evident that the quicker

you get it completed the sooner you begin to collect room rents.

I find that 90% of the mining propositions that stop work are forced to stop by the stockholders failing to push the work—failing to provide funds. When a mine manager says, "We can have the mine producing in 6 months or a year," the stockholders sit down and wait a year—and the mine stands idle. Sometimes they are abandoned, and the same manager will hunt up someone else to buy it in, and open it. Thus the same mine, with the same manager, becomes a big paying mine, and the stockholders accuse him of being crooked—when their real cause of loss is that they didn't furnish the money to open it and get the ore out.

If you are a stockholder in any mine, and you have sat quietly by for years, without making any effort to keep your mine running, you deserve to lose every cent. The hardest part of mining is to raise funds sufficient to develop it right. You expect a secretary or a manager to "raise the money" and keep the records and direct the work. Suppose you were elected secretary, could you do it? You'd expect others who were interested to raise some of the money, too, wouldn't you?

A director, or officer, is only a stockholder, like yourself, who has been elected to act as a head, or keep a record of all business. Maybe he has less stock than some of the other stockholders. Don't blame him if your work isn't going on as fast as you'd like to see it; he can't make it go faster than there is money to pay for the progress. He simply directs what money there is to the best advantage, and keeps a record of what is done. Stockholders have no one to blame but themselves for speed of progress.

There are hundreds of mines now working that were started by some former owners, who failed, and gave it up. New men took it up, and went ahead with the work and reaped the profit the original owners might have had if they had gone ahead. With the exception of two, I think every operating mine in Tonopah and Goldfield is a reorganization—reorganized to raise operating finances, yet the same working methods, on the same property, and in many cases under the same managers, are producing handsomely. Some of them have been changed to assessable companies to force the stockholders to come through with operating expenses and thus they have been able to make them produce. An idle mine can't pay—it must reach its ore and take it out before it can pay. No mine can reach its ore without money to buy supplies and hire men. These are cold facts.

Mining is a business that must be developed. Mining investors frequently lose enthusiasm and quit—or

get cold feet. Quitters nearly always lose—there is no chance to win success when you quit and run away. The stickers, who finish their development, are the winners in the end.

Everybody belongs to one of the two classes—they are either "stickers" or "quitters." It makes no difference whether a quitter quits in the first hour or in the eleventh hour, just when victory is in his grasp, the result is the same.

If you are not enthusiastic about your business you can't expect others to be. If you have no enthusiasm, and no ambition to make your business a success, don't go into it in the first place. If you start, stick. Make it a success by your own efforts.

If your mine needs funds for further development, for building ore bins and so forth, it naturally falls on you as a stockholder, or partner, in the mine to furnish your share of that expense, before the returns can be taken from the ground. If you can't furnish \$1000, or \$500, or \$100, right now, you can at least furnish \$10 or \$20 or perhaps \$50 a month, for a few months, which will accomplish the same result. It is strictly up to you how fast the progress is. Spread your enthusiasm and stick-to-it-ive-ness to your neighbors and friends, and interest them. If you were a partner in a grocery store you'd rustle your friends for patronage, and boost your business, until you became established.

Use of Slags for Fertilizing.

Utilization of iron and steel works slags was discussed by E. C. Brown, chief civil engineer, Carnegie Steel Co., Pittsburgh, in a paper read before the Engineers' Society of Western Pennsylvania and printed in the January issue of the Proceedings of the Society. Little commercial or industrial use, he said, has been made of either open-hearth or converter slags, as compared with blast-furnace slag. When slag is high in lime it may be returned to the blast furnace as a flux. Open-hearth slag has been ground and used in agriculture as a soil corrective, giving higher and quicker results than lime applied in the usual form. At Birmingham, Ala., slags from high phosphorus local ores are being built up by recharging until they contain as high as from 12 to 18% of phosphorus, thereby being about in the same class of fertilizer as imported "Thomas meal" or phosphate slag.

A dry granulation process, he mentioned also, has been developed in Germany for preparing slag for cement. The essential feature of the process is a rotating cylinder into which the slag stream is directed with a blast of air and a small amount of high-pressure steam. The product is dense and contains but little moisture.

Britania metal is an alloy of 10% antimony and 90% tin.



THE CREW OF THE DEUTSCHLAND.

The American people are naturally divided in their sympathies as regards the warring nations of Europe. But they are noted for their fairness as well, and a feeling of admiration arose when through ingenuity and daring a seemingly impossible feat was accomplished. In the above, for which we are indebted to the *Marine Review*, is shown the crew of the German submarine *Deutschland* which recently completed its record voyage to the United States and back to Germany. Of interest to the mining fraternity is the knowledge that part of the return cargo of this vessel was nickel bars.

What the Mining Companies are Doing

Consolidated Arizona Smelting Co.

The following condensed statement of operations for the first half of 1916 has been issued by the Consolidated Arizona Smelting Co.:

	First quarter.	Second quarter.	Half year.
Blue Bell and De Soto mines produced, tons	25,618	28,237	53,855
Concentrator treated, tons.....	19,369	20,884	40,253
Smelter treated (custom material included), tons.....	20,842	26,077	46,919
Gold production, ozs.....	905,143	1,576,297	2,481,440
Silver production, ozs.....	21,903.57	35,787.62	57,691.19
Copper production, lbs.....	1,681,000	2,450,000	4,131,000

Net profits during the same periods were as follows:

January	\$26,312.50
February	55,770.78
March	78,395.52
April	\$93,889.48
May	87,660.75
June	67,473.84
Half year	\$409,502.87

Barnes-King Co., Montana.

The second quarterly report of the Barnes-King Development Co. for the period ending June 30, 1916, shows as follows:

Receipts—	
Balance March 31, 1916.....	\$184,709.59
North Moccasin bullion.....	62,490.21
Piegan-Gloster bullion	20,992.10
Kendall power plant earnings.....	3,185.90
Kendall power plant merchandise.....	4.57
Kendall mine royalties.....	446.25
Interest received	475.57
Miscellaneous items	173.50
Total	\$272,482.69
Disbursements—	
North Moccasin property.....	\$ 46,663.33
Piegan-Gloster property	65,433.08
Shannon property	29,116.60
Kendall property	37,809.64
Woodrow Wilson property.....	5,099.39
Other expenses	32,783.34
Total	\$215,068.78
Cash in bank and on hand.....	49,474.06
Bullion in transit.....	7,939.85
Total	\$ 57,413.91

Nevada Con. Co.

The report of the Nevada Con. Copper Co. for the quarter ended June 30, shows a production of 24,091,021 lbs. of copper, as compared with 19,160,274 lbs. in previous quarter. Profits were \$4,853,945, compared with \$2,781,811 in March 31, 1915, quarter.

The income account compares as follows:

	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.	Sept. 30, 1915.	June 30, 1915.
Earnings	\$4,853,945	\$2,781,811	\$2,739,196	\$1,590,621	\$1,365,094
Dividends	1,449,592	999,728	999,728	749,769	749,746
Balance	\$3,354,352	\$1,782,083	\$1,739,468	\$ 840,824	\$ 614,297
Depreciation ...	185,079	142,360	142,724	.....	.....
Ore extinguishment	109,355	88,498	82,228	228,472	230,309
Surplus	\$3,059,917	\$1,556,225	\$1,514,515	\$ 612,352	\$ 383,988

Copper production in pounds compares as follows:

	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.	Sept. 30, 1915.	June 30, 1915.
First month....	7,716,101	6,157,862	5,880,082	6,292,413	4,710,684
Second month...	7,723,148	6,436,853	5,495,487	6,261,858	5,271,756
Third month....	8,651,772	6,565,550	6,912,360	6,021,850	5,123,480
Total	24,091,021	19,160,274	18,287,930	18,516,121	15,106,920

Average monthly production was 8,030,340 lbs., compared with 6,386,758 lbs. in previous quarter. The cost of copper produced, including Steptoe plant depreciation and all charges except ore extinguishment, and after crediting all miscellaneous earnings, was 8.51 cts. per pound, as compared with 9.65 cts. for previous quarter. Excluding the item of de-

preciation the cost was 7.78 cts., as compared with 8.94 cts. for previous quarter. The earnings for the quarter are computed on the basis of 27.23 cts. per pound. On June 30 company had no copper available for delivery unsold.

Ray Con. Co.

Ray Con. Co. reports net earnings for the quarter ended June 30 of \$3,242,542. Production amounted to 18,667,664 lbs. of copper in concentrates, as compared with 15,801,568 in the previous quarter. The income account for the past five quarters compares as follows:

	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.	Sept. 30, 1915.	June 30, 1915.
Net operating profit	\$3,226,749	\$2,191,592	\$1,791,599	\$802,775	\$1,367,736
Miscellaneous income	15,792	13,954	16,383	14,172	9,298
Total	\$3,242,542	\$2,205,547	\$1,807,982	\$816,947	\$1,377,135
Bond interest.....	.....	.....	29,415	.....	36,249
Balance	\$3,242,542	\$2,205,547	\$1,778,567	\$816,947	\$1,340,886
Dividends (50c)	788,589	789,302	777,482	547,802	547,035
Surplus	\$2,453,952	\$1,416,245	\$1,001,085	\$233,470	\$ 793,850

The average net cost per pound of all copper produced for the quarter was 10.507 cts., compared with 10.579 cts. in previous quarter.

Earnings for first quarter this year are based on a price of 28.067 cts. per pound for copper, as compared to 24.598 cts. for first quarter of 1916.

Production for past five quarters follows:

	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.	Sept. 30, 1915.	June 30, 1915.
First month....	6,162,117	4,164,043	5,894,441	4,352,571	5,303,213
Second month...	6,106,657	5,539,408	5,576,083	5,681,734	5,016,048
Third month....	6,398,890	6,098,117	5,725,009	4,997,083	4,205,119
Total	18,667,664	15,801,568	17,195,533	14,931,138	14,524,380

Average monthly production in first quarter of 1916 was 6,222,555 lbs., compared with 5,267,189 lbs. in previous quarter.

President Aldrich says: Both tonnage and production for quarter were greater than for any previous quarter, and notwithstanding that average daily tonnage treated exceeded by nearly 1000 tons highest average previously maintained, both recoveries and costs compared favorably with the best heretofore made, thus illustrating the benefit which is just beginning to be derived from plant improvements that have been in progress for several months.

Upon June 30, after payment of the second quarterly dividend, the company had a net surplus of quick assets of \$8,157,892. Of this, \$1,814,659 was cash and cash accounts in process of immediate collection, the balance being represented by copper and other metals in transit and operating supplies.

Wolverine Copper Mining Co.

The Wolverine Copper Mining Co. reports for the year ended June 30 as follows, comparing same with previous years:

	1916.	1915.	1914.	1913.	1912.
Receipts	\$1,369,286	\$929,193	\$484,061	\$1,326,501	\$1,327,030
Total expenses.....	634,068	610,991	402,936	724,987	713,840
Profit	735,218	318,201	81,075	601,514	613,180
Dividends	660,000	360,000	.....	600,000	540,000
Total surplus....	862,529	787,311	\$29,109	748,034	746,520

President Stanton of Wolverine Copper Co. says in part in annual report: The decrease in production was due primarily to the severe winter. Decrease in copper contents is noticeable as bottom limits of territory are approached, but as rock is of considerable commercial value, we will continue to open the mine to bottom, and as we gradually acquire a full-working force results should show an extraction of greater tonnage which will insure larger product. It will require two years or longer before we will reach the bottom of the mine, and directors believe it will then require 10 years to exhaust the mine.

The balance sheet of June 30 shows cash amounting to

\$80,936, deposit in trust company \$450,000, copper on hand sold \$252,546, cash and supplies \$55,663, accounts receivable \$14,572. Mine debts and accounts payable total \$71,189.

Alaska Gold Mines.

The Alaska Gold Mines milled 150,403 tons of ore in July, assaying an average of \$1.24 per ton, as compared with \$1.06 in June. Preceding months compare as follows:

	Tons ore milled.	Assay value per ton.		Tons ore milled.	Assay value per ton.
July	150,403	\$1.24	March	162,796	\$1.03
June	164,800	1.06	February ...	122,856	1.02
May	175,215	1.40	January	119,914	1.42
April	165,930	.94	December ...	114,183	1.36

Extraction and loss in tailings we compare:

	% of extraction.	Loss in tail- ings per ton.
July	80.64	24c
June	79.25	22c
May	82.85	24c
April	78.71	19.8c
March	77.47	20.3c

General Manager Thane reports as follows: "Mill was closed July 4 and 5 for the holiday. During the month, heads have steadily increased due to better conditions for operation of the three stopes east on the sixth level, which are in condition to deliver a good tonnage. August should show an increase of tonnage and heads over July."

The July report shows improvement over June, which was one of the poorest months the company has had. In July there was a decrease of 14,400 tons in the tonnage treated, due in part, of course, to the shutdown for the holiday.

The encouraging feature was an increase in the assay value of the ore to \$1.24 per ton, against \$1.06 in June. The July assay is much below the original estimates of the engineers—that the ore would show an average gross value of \$1.75 per ton, from which the tailings loss would probably be 25 cents per ton. On this basis it was expected that a profit of 75 cts. per ton of rock would be realized after mining and milling costs of 75 cts. per ton.

Calumet & Hecla Co.

The Calumet & Hecla Mining Co. has filed with the Massachusetts secretary of state a statement of its financial condition, dated Dec. 31, 1915, which compares with that on April 30, 1915, as follows:

Assets—	Dec. 31, '15.	Apr. 30, '15.
*Real estate	\$ 4,542,183	.....
*Machinery and equipment.....	15,628,995	.....
Real estate and machinery.....		\$36,999,904
Merchandise, material, stock in process...	5,531,006	6,019,623
Cash and debts receivable.....	2,404,647	3,672,065
Patent rights and licenses.....	84,971	.....
Investments in other companies.....	19,625,746	22,792,400
Sinking fund investment.....	1,599,823	.....
Total	\$49,317,375	\$69,483,994
Liabilities—		
Capital stock	\$ 1,200,000	\$ 1,200,000
Accounts payable	1,280,865	294,416
Floating debt	4,134,000	4,134,000
Profit and loss.....		63,855,577
Surplus	42,702,510	.....
Total	\$49,317,375	\$69,483,994

*Book values.

Bingham Mines.

Bingham Mines has called \$89,000 bonds for retirement at 102, this being the balance of an original issue of \$587,000. When the bonds are cancelled the company will be free of all bonded indebtedness. At the time of its organization in 1908 Bingham assumed \$902,000 first mortgage bonds issued by its predecessor, and it also issued \$577,790 in second mortgage income bonds to take care of floating indebtedness. The first mortgage bonds were all retired from earnings prior to April 1, 1914. The second mortgage bonds at maturity in January, 1914, were exchanged for \$587,000 first mortgage 6 per cent convertible sinking fund bonds. In April, 1915, \$87,000 bonds were purchased and retired, and since then

\$411,000 bonds have been converted into stock. The \$89,000 bonds called for retirement will clean up the issue.

Bingham's net earnings from its own operations in May totaled \$15,426, which is at the rate of \$185,112 per annum, equivalent to \$1.27 per share. Bingham controls through stock ownership the Eagle & Blue Bell Mining Co. The latter paid 20 cts. a share in 1913; 15 cts. in 1914; 15 cts. in 1915, and 5 cts. on July 24 of this year. Assuming a return of 15 cts. a share this year on the Blue Bell stock held by Bingham Mines, the latter's net income should be equivalent to \$2 a share.

Miscellaneous Notes.

Receipts of the Nevada Douglas Con. Copper Co. for the quarter ended June 30, 1916, totaled \$297,524.

President Utley Wedge of the Tennessee Copper Co. says the four suits instituted against the company by Wm. H. Steiner & Son, involving \$980,853, are unwarranted; that the only purpose in filing them was to anticipate action that would be taken against Wm. H. Steiner & Son by Tennessee Co. Mr. Wedge also says counter suits will soon be filed and that the copper company has nothing to fear from present actions.

Operating profits of the McIntyre Porcupine Mines for the quarter ending June 30 were \$120,000. This is by far a big margin above the best showing on record. For previous quarter the total was \$97,128, and for the quarter ending Dec. 31, \$75,486. It is understood that latterly the rate of operations has exceeded considerably that of the first half of the period.

Arizona Copper Co. turned out 4,800,000 lbs. of copper in June, which was at the rate of nearly 60,000,000 lbs. per annum. The strides which this company has made in increasing its output since Dr. Ricketts completely remodeled the smelter have been noteworthy, and the current rate of operations represents a record volume for this Scotch-owned mine in the American Southwest.

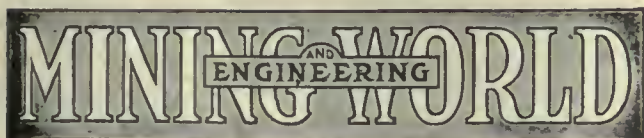
The Jim Butler Mining Co. reports for 6 months to June 30, 1916, net profits of \$157,837, or at the rate of 18½ cts. per share yearly on the 1,718,021 issued shares. Profits in the entire year 1915 were \$186,720; in 1914, \$110,087, and in 1913, \$102,682. Liquid assets as of July 1, 1916, include \$232,867 cash in bank; \$63,963 receivable, and 339,994 ozs. silver, a total of \$466,828, counting the silver at 50 cts., or \$514,428 reckoning silver at the prevailing market, around 64 cts.

Butte & Superior Co.'s capitalization has been increased to 290,069 shares as the result of the exchange of 17,500 of its shares for 35,000 shares of the common stock of the American Zinc, Lead & Smelting Co. By the same transaction American Zinc's issued common stock is increased to 228,120 shares, exclusive of 96,560 shares of preferred, which latter pays \$6 per share, cumulative, and is retireable at not less than par. There will also be outstanding \$4,000,000 in 10-year 5% bonds, and \$2,000,000 in short-term 5% notes, upon acquisition of the Granby properties. Formal acquisition takes place Jan. 1, 1917.

Considerable dissatisfaction exists among stockholders over proposed plan for reorganizing Ohio Copper by bondholders. Sale of property by foreclosure will take place Aug. 29 at Salt Lake City. Under the plan the only recognition Ohio stockholders get is the right to subscribe to bonds of a proposed new company at par and interest. In the first reorganization stockholders paid an assessment of \$1 a share, to supply working capital. The response was liberal and later it was discovered that a considerable portion of the assessment went to meet claims presented by the late F. A. Heinze, who then dominated the company. For the past year the Ohio property has been operated under lease. The lease, it is understood, provided for the payment of interest on the bonds, with further provision that profits over and above certain amounts should be paid to the receiver. Just how much has been paid over under his lease has never become known in New York, although net in a single month is said to have been well above \$100,000. With profitable operations now possible under existing metal market conditions, it has been felt that conditions of the proposed reorganization have been unnecessarily harsh toward stockholders who have already stood by the guns in one reorganization.



Yours Sincerely
W. B. Clark



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*Illustrated.

WHO'S WHO IN MINING.

The subject of this week's "Who's Who in Mining" is ex-U. S. Senator William Andrews Clark of Montana, whose likeness appears on the opposite page. Besides being recognized as the world's largest individual mine operator, he is interested in numerous commercial enterprises, many of which are affiliated with mining. His greatest holding, perhaps, is the United Verde Copper Co. of Arizona, of which he owns practically all the shares. Since entering the dividend-paying class this company has paid dividends, mostly to Mr. Clark, totaling to the end of June, \$37,822,000. Other holdings of Mr. Clark include railroads, banks, cattle, sugar, lumber, real estate, flour mills, etc.

Mr. Clark's greatest activities may, however, be said to have been with Montana mining, where he owned numerous properties, many of which have since been sold to others. Anaconda being among the purchasers.

Co-Operative Selling of Metals and Manufactures in Export Trade.

The advices from London stating that British interests have contracted to purchase more than half of Australia's zinc output, not only during the war but for ten years afterward, throw striking light upon what are to be the applications of the economic policies agreed upon at the recent Paris conference of representatives of the allies.

The avowed purpose of this agreement is to put out of business so far as possible the zinc smelting industries of countries which are enemies of the entente powers, and this proof of a resolution to carry on a trade war, after the war of armies and navies is ended, must give neutral nations food for reflection.

It is plain warning to them to provide for their commercial security even after the war is over, lest they be involved in trade wars in which they have nothing to gain and much to lose. It adds powerfully to the argument for the prompt enactment of the pending industrial legislation in this country.

Among the most important of the measures now before Congress is the Webb bill, permitting American exporters of metal and manufactured articles to combine for the purpose of engaging in export trade.

An inquiry addressed by the editor of this paper to President Wilson, asking for his position on the subject, brought the answer printed on page 380 of our August 26 issue, which shows that the whole

weight of the National Administration will be thrown in favor of such legislation.

The recently published plea of Chairman Hurley of the Federal Industrial Commission for support of the Webb bill is indicative of the fact that the federal government is anxious to bring about commercial as well as military preparedness. It is only fair that American manufacturers be enabled to engage in international trade under the same rules as foreign manufacturers. Guns and commerce go together. We cannot demand a fair deal without being able to enforce our demands.

The sympathetic co-operation of the government with business will make the United States supreme in the commercial world. The public has gradually come to a realization that "big business" does not necessarily mean "bad business." Modern international trade competition demands combination and organization, and it is most fortunate that our highest government officials realize this fact.

Every European government permits cartels and syndicates which result in strength sufficient to compete in foreign markets and it was by just such methods that Germany was forging ahead to industrial supremacy when the war broke out. When peace is declared, not only that country but every other will adopt the same methods again. The United States cannot afford to attempt to enter into competition for foreign trade unless our metal producers and manufacturers can enjoy the same advantages.

The Price of Silver.

The recent spurt in the price of silver leads to the belief that a restoration to the high price of 77¼ cts. in May is among the possibilities. At that time the price advanced about 30 cts. With a similar rise the price would be near to the ancient parity of 16 to 1. There is, however, not at present much expectation that the price will go to any such figure.

The present demand is not only very strong from the far east, but is very heavy in Europe, where it is being coined rapidly to pay the troops. Bankers in this country have manifested great interest in the extent to which the latter coinage will go. It amounts practically to reopening the mints to free coinage on the old basis, but it is not believed it will extend to what will amount to inflation. It is well known that all of the belligerent nations have issued immense sums of paper money, which are more or less covered by gold reserves.

One New York banker is of the opinion that free silver coinage may be adopted by all of the belligerent nations after the war simply as an alternative to repudiation of large amounts of paper money or allowing it to become greatly depreciated. Apparently there is no general belief that such a thing will take place, although it must be admitted that important changes in world finance are to come when the war is over

and national obligations are put on a permanent basis. About the only result in this country is that a number of mines long abandoned because of the low price of silver are going into commission, and this new supply may have a depressing effect upon the price.

Precautions Necessary to Avoid Forest Fires.

The season has arrived when conditions are such that the danger from forest fires is greatest. After the long dry season when the underbrush is like tinder and to which the dead leaves are beginning to fall, it takes only a spark to start a bad fire. Many of the forest fires are started from sparks from fires left smoldering by thoughtless hunters, prospectors and others. Once started these fires are difficult to extinguish and may soon spread and be the beginning of destructive forest fires.

The greatest sufferers from forest fires are the lumber and mining interests and the devastations of recent years have taken a heavy toll from them, both in property losses and lives. It is too heavy a tax to pay for carelessness. Most forest fires are preventable, and easily preventable, by the exercise of care and common sense. Campers should select a safe place for building their camp fires and whenever leaving camp should make sure that no burning material is left behind from which fire might possibly spread. Neglect of these simple precautions is inexcusable.

The disastrous forest or brush fires of recent years which brought destruction and death to the mining camp of Porcupine, Ontario, and to the Coeur d'Alene mining region of Idaho and Montana, and in other mining regions, taught the necessity of keeping the ground around the mines clear of underbrush, always a source of danger.

These simple precautions are usually neglected through thoughtlessness or through a disinclination on the part of the mining men to go to the trouble or expense to protect themselves before it is too late.

The present year has so far not been distinguished by serious fires in either the United States or Canada. Have the lessons been well learned or are the fates being kind?

Experts in copper assert the industrial consumption of the metal at present absorbs two-thirds of the output of the world's mines. This combats the generally accepted theory that the war requirements are responsible for most of the advance in prices. There was an advance in copper last Thursday by the large producers from 27½ to 27¾ cents, or an advance of ¼ to ½ cent from the prices of the previous day for first quarter 1917 delivery. Little copper is to be had for delivery this year.

The limited means available for the opening of some mines has brought the ingenuity of the management of these mines into active play, and the various devices improvised and applied to the work in hand are instructive, though sometimes amusing.

PERSONAL.

Matt W. Alderson is in Marysville, Mont., looking over the country in that section.

Edwin S. Berry, mining engineer, will open consulting offices in New York on Sept. 15.

Curtis F. Burt, mining engineer, has returned to Yerington, Nev., from Houghton, Mich.

W. B. Pool and U. T. McCurry, Spokane, Wash., are in Slocan, B. C., inspecting properties.

Horace A. Scott has been elected instructor in geology at the Missouri School of Mines, Rolla, Mo.

C. B. Croner, mining engineer, Pasadena, Cal., recently examined the Alvord mine, near Otis, Cal.

I. Kamimura, chief mining engineer for the Mitsu Bishi Co., Japan, is visiting in Kennett, Cal.

Walter A. Burrows, Jr., Brainerd, Minn., has been elected president of the Thomas Iron Co., Easton, Pa.

W. N. Smith, mining engineer, has joined the staff of the Canadian Copper Co. at Copper Cliff, Ontario, Can.

George H. Heintz has left Denver, Colo., and is now with Platt & Cleff, mining engineers, Leadville, Colo.

W. C. Orem of Boston, general manager of the Nevada-Douglas Con. Copper Co., has been recently at the company's property.

R. E. Cranston, mining engineer, San Francisco, Cal., is on an extended professional trip through Colorado, Montana and Nevada.

H. L. Brown, Denver, Colo., and C. A. Heberlin, Los Angeles, Cal., engineers with the American Metal Co., are in Spokane, Wash.

H. K. Najarian, formerly with the Nevada Con. Copper Co., is now with the Missouri Cobalt Co., Fredericktown, Mo., engaged in smelter designing.

J. H. Kern, managing director of the Hypotheek Mining Co., Kingston, Idaho, has returned to Moosejaw, Sask., from a trip to the company's property.

Morton Webber, mining engineer, after being wounded while with the British forces, has returned to associate himself with Ellis P. Earle, New York.

I. L. Church, formerly of Cobalt, Ont., is now superintendent of the Moose mine, River, Manitoba, and has recently returned from a trip back to Cobalt.

B. B. Thayer, president of the Anaconda Copper Co., Anaconda, Mont., has been in Potrerillos, Chile, looking over the property of the Andes Copper Co.

B. S. Butler and F. L. Ransome of the U. S. Geological Survey are now in Salt Lake City, Utah, relative to work in the American Forks and Alta districts.

James McNaughton, vice-president and general manager of the Calumet & Hecla Co., Calumet, Mich., will change his headquarters to New York after Dec. 1, 1916.

F. W. Traphagen, former professor of metallurgy at the Colorado School of Mines, is now president of the Colorado Metal Mining & Reduction Co., Denver, Colo.

W. A. Bancroft of Boston, secretary-treasurer of the Mass, who supervises that property for the Boston office, is making his summer trip to the Copper Country.

A. E. Redner, captain of the East Norrie group of mines on the Gogebic range, has resigned to become superintendent of the Anvil mine at Bessemer which belongs to the Newport of Ironwood, succeeding Alex. Clusk, who has been promoted

to be assistant superintendent of the Newport. Mr. Redner's place will be taken by H. W. Byrne, assistant chief engineer of the East Norrie group.

Thomas A. Stroup is now assistant engineer for the Utah Copper Co., Salt Lake City, Utah. He was formerly on the engineering staff of the Tennessee Copper Co.

J. C. Devine, president of the Pinal Development Co., Ray, Ariz., has returned from a trip to Chicago and other eastern cities via Salt Lake and San Francisco and has opened an office for the company in Phoenix, Ariz.

Milnor Roberts, dean of the University of Washington College of Mines, Seattle, Wash., is on his way to the Copper River region, Alaska, where he will examine a number of properties in the neighborhood of the Kennecott Bonanza.

J. H. Musgrave, mining engineer with the British Columbia Department of Mines, is making examinations of prospects for owners. He is now in Nelson, B. C., and will later visit Cultus creek, Bayonne camp, and Hall and Lockhart creeks.

OBITUARY.

On Aug. 17, 1916, A. T. Rankin, a prospector of the Cripple Creek district since 1874, died from apoplexy at the age of 65. He was born in Keosauqua, Ia., to which place he was taken for burial.

John Edwards died on Aug. 21, 1916, at his home at Burlington, Mont., a short distance east of Butte, Mont. The deceased had been prospecting the old workings of the Blue Bird mine for some 31 years and at the time of death was 54 years old.

Barney Dougherty passed away at Philipsburg, Mont., Aug. 19, 1916, after having prospected in that vicinity of Montana for over 24 years. He was 68 years of age, a veteran of the Civil War and owned considerable property in Ross Fork, near Philipsburg.

Martin Goldsworthy, head mining captain of the Chapin mine, Iron Mountain, Mich., passed away on Aug. 16, 1916, at his home. He had been an active mining man in the Lake Superior district for 34 years, having spent most of his time around Iron Mountain, to which place he came from the copper mines near Calumet, Mich. He was a member of the Lake Superior Mining Institute and at the time of death was 67 years old.

J. McDermott, Oreville, S. D., died on Aug. 10, 1916, in Deadwood, S. D., at the age of 78 years. He was a pioneer of Colorado, Montana, Alaska and the Black Hills district, South Dakota. He made seven trips into Alaska and was among the first in the gold rush to that country. His last trip there was made when he was 70 years old and then he covered over 800 miles on the Yukon. In the Black Hills he operated placers near Golden Gate. In 1883 he opened the Hartman iron mine in Wyoming.

SCHOOLS AND SOCIETIES.

National Exposition of Chemical Industries.—At this exposition the American Electrochemical Society has arranged a series of very interesting meetings beginning on Thursday morning, Sept. 28, with the "Made in America" technical session at the Grand Central Palace. This session will be devoted to papers and discussions on the great and varied electrochemical industries of America. This will be followed on Friday morning by another technical session, devoted to the theoretical side of electrochemistry. Registration will be held on Wednesday evening at the exposition. Headquarters of the Electrochemical Society will be at the Electrochemical Society booth at the exposition.

TRADE PUBLICATIONS.

Storage Batteries for Mine and Industrial Locomotives. The Electrical Storage Battery Co., Philadelphia, Pa. Bulletin 159; pp 7; illustrated.

The construction and features of the battery for this particular use are dealt with in the first pages and accompanied with several illustrations. The last four pages are given to illustrations of locomotives in the field using this type of storage battery.

Flotation Concentration Testing. Southwestern Engineering Co., Los Angeles, Cal. Bulletin No. 2; pp. 4.

In this bulletin the company has briefly spoken in regard to the nature of flotation tests in general and have given further details regarding tests made by it. The tests are divided into three classes, as those on 10 to 25 lbs. of ore, 100 lbs. and 150 lbs. The nature of the test run on each of these different classes is given with charges for the same.

Packing for Machinery, Piping, Etc. The Garlock Packing Co., Chicago. Catalog P-1913; pp. 140; illustrated.

In most cases an illustration of the packing, with a brief description and prices, is given. The catalog is indexed and the telegraph code is given in tabulated form. In indexing the different classes of packing have been classified according to the materials which are being handled, such as acids, air, brine, steam, etc. Under each of these headings another classification is made according to the particular use of the packing as for rods or plungers, pump valves, gaskets, piston rods, etc.

Bar and Tool Steel. The Midvale Steel Co., Philadelphia, Pa. Catalog No. 31; pp. 135; illustrated.

This catalog contains both an index and contents which are well arranged. Practical information is given regarding the properties of steel and its treatment. Various descriptive and detailed tabulated information is then given on the different grades of steel made by this company. Here the particular applicability of the different grades is brought out. In the last pages of the catalog a page description accompanies 24 reproductions of curves showing the critical temperatures and physical properties of Midvale steels.

INDUSTRIAL AND TRADE NOTES.

Edward H. Fowler, manager of Pacific Foundry Co., San Francisco, made a business trip to Salt Lake City last week.

The Lord Byron mill at Sugar Loaf, Colo., is being dismantled and shipped to Denver by the Morse Bros. Machinery & Supply Co., for resale. The equipment consists of crushers, rolls, roadsters and cyanide equipment.

Stimpson Equipment Co., Salt Lake City, has taken the sales agency of the Columbia Steel Co., San Francisco, for the intermountain territory, and will be in position to make quick delivery of manganese steel and nickel chrome steel.

The Brennan Engineering Co., 36 West Randolph street, Chicago, announces that its business has been incorporated under the name of the Brennan-Wahl Co. The company acts as consulting engineers—mechanical, structural, chemical—and manufacturers' sales and purchasing agents for machinery and allied products.

The Westinghouse Electric & Mfg. Co. of East Pittsburgh, Pa., has recently sold to the Montana Power Co. complete electrical equipment for the operation of a hydro-electric station on the Missouri river at Holten, Mont. The equipment furnished includes four 12,000-kva., 3-phase, 60-cycle, 6600-volt, 150-rpm. vertical water wheel generators; two 500-kw. 250-volt, 450-rpm. vertical water wheel exciters;

four 12,000-kva., oil-insulated, water-cooled, 3-phase, 60-cycle transformers, 107,000 volts high voltage, 6600 volts low voltage, with a maximum continuous rating of 16,000-kva.; switching equipment for the entire station, including type GA circuit-breakers for 107,000-volt circuits, and type E-6 circuit breakers for 6600-volt circuits. Battery charging motor-generator sets, air compressors, testing set, oil filter, and all other necessary adjuncts are included in the order.

W. D. Coos, who has been elected secretary-treasurer of the Lima Locomotive Corporation, brings to the duties of that position a long and varied experience in similar lines of work, beginning with one of the subsidiary organizations of the corporation. For a time, also, he was identified with the Westinghouse interests in the railway equipment field. The Lima Locomotive Corporation is now classed with the American Locomotive Co. and the Baldwin Locomotive Works as a builder of standard trunk line locomotives and is also known throughout the world for its industrial types, particularly in mining and logging operations. It has recently been engaged on large foreign orders.

NEW PUBLICATIONS.

Sand and Gravel in 1915. By R. W. Stone. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 11:17; pp. 13.

In tabulated form the production is given by states for 1914 and 1915. The locations which produced glass-sand during the year are given and the concluding pages give the weight of sand and gravel per cubic yard.

Geology and Ground Waters of Northeastern Arkansas. By Lloyd W. Stephenson and Albert F. Crider. Washington, D. C., U. S. Geological Survey. Water Supply Paper 390; pp. 315; illustrated.

A complete review of the geology of the area as pertaining to water supplies is given. This is followed by a similar but more detailed review of the area by separate counties.

Gypsum in 1915. By Ralph W. Stone. Washington, D. C., U. S. Geological Survey. Min. Res. of U. S. 11:14; pp. 9.

Imports of gypsum into this country being small, the item is treated briefly. Market and trade conditions of the industry are reviewed for the United States as a whole and tables show the production of the mineral by states. Methods of preparation are briefly described and uses of both calcined and uncalcined gypsum are spoken of with respect to the manufacture of cements, plasters and fertilizing materials.

Rhodesia Chamber of Mines' Twenty-fourth Annual Report. Bulawayo, Rhodesia, Chamber of Mines. Annual Report, 1915; pp. 71.

A brief review on the proceedings of the Chamber for the year occupies the first 15 pages. Briefs are then given reviewing matters connected with mine operation, as sanitation, the labor question, metal production, etc. The general situation of the mining industry is gone into and reports of many of the mining companies are reproduced. Many items of financial interest are given as well as information relative to the effects of the war on the mining industry in this state.

Investigation of the Peat Bogs and Peat Industry of Canada, 1913-1914. By Aleph Anrep, Ottawa, Ont., Canada Department of Mines, Mines Branch. Bulletin No. 11; pp. 185; illustrated.

In the first pages of the bulletin each bog is described separately and are classified according to the province in which they are located. In describing the different bogs the quantity of peat available in each is estimated and the qualities of the same are given. In the appendix there appear 24 different articles descriptive of Canadian patents on machinery and methods for the handling and manufacture of peat fuel.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Anchorage.

According to T. L. Young, in charge of the Bernard interests on Lewis river, the ground is not wide enough for a dredge. They found pretty good pay in the crosscuts and the river is a good proposition for hydraulic operations. He said they found pay on the Kellar claims in the old channel and that Sam Wagner and partners had quit the river and were now operating on the benches with good results. Chittick and Armstrong's last clean-up was favorable and these operators seem well satisfied with their prospects. Young will wait for word from Mr. Bernard in regard to future plans.

Dawson.

The excavation at the Yukon Gold is surpassed only by that at Panama, exceeding 40,000,000 cu. yds. in 8 years. Up to the present more than \$185,000,000 has been taken from the Klondike, more than 40% from recent machinery mining of low-grade. Streams about 8 or 9 ins. in diameter hit the icy gravel at 100 lbs. to the inch, and in other places the earth is first thawed by steam in pipes driven down 6 ft. apart, to depth of 40 to 50 ft. and then taken up by dredges, 26 bites a minute and a third of a ton to a bite. Nine dredges are thus working to get out the 60 cts. average of gold. In other places the content is but 20 cts., half of which is saved as profit. Some patches will run \$5 or more per yard. 1 or 2 cts. per ton is lost. The winters are so cold that the machinery cannot be worked more than 7 months a year.

Kennecott.

The Alaska-Westover Copper Co. owns 460 acres in southwestern Alaska, in the eastern end of the Chitina district, on the Nezina river, in the Copper River country. The property lies southeast of the Bonanza mine of the Kennecott Copper Corporation and the Mother Lode mine and is in the same formation as these properties, the Chitstone limestone. The development work done on the property to date includes 790 ft. of tunnel, 72 ft. of raises and 168 ft. of open cuts, developing about 8000 tons. Assays of this ore body vary from 30% to 50% copper, but the management places the average at 30%. On this basis the tonnage blocked out has a gross value of \$1,148,000, equivalent to about 38 cts. per share on the entire capitalization, without making allowance for gold and silver values, which are estimated at several dollars per ton. Including these values the ore reserves would have a total valuation of \$1,780,000, equivalent to 56 cts. per share. According to Superintendent Foster, a tunnel was started southwest from the No. 5 drift in solid ore and continued for 14 ft., when it was cut off by a slip. This is on an incline with the dip of the break that occurs at this point, and the ore continued up for 12 ft. At this point a change took place and the large body of ore was cut off, but was connected up by 1 ft. of copper glance that was much richer than anything formerly encountered on the property. This glance continued up to 90 ft. varying from 1 ft. to 6 ins. in width. The management believes that it will lead to an ore body higher up, as is indicated by the surface outcrop of glance 120 ft. above the present workings. Developments on the Kennecott properties have proved that these limestone deposits are continuous. The Alaska-Westover Copper Co. has an authorized capitalization of \$3,000,000, divided into shares of a par value of \$1, of which 2,250,000 shares are outstanding.

Treadwell.

Reports show that Alaska Treadwell in June crushed 78,918 tons, recovering \$131,730, or \$1.69 per ton. Operating

expenses were \$95,894; operating profit \$35,835; construction \$17,932; net profit \$18,443; other income \$11,200. Alaska Mexican milled 15,820 tons in June, yielding \$16,505, or \$1.05 per ton; operating expense \$24,992; operating loss, \$8,486; construction \$4405. Alaska United's Ready Bullion in June crushed 24,220 tons, yielding \$49,019 or \$2.04 per ton; operating profit, \$18,725; construction \$4003, net profit \$14,721. Alaska United's 700-ft. claim showed a net loss of \$26,934 on 20,335 tons of \$1 ore.

Valdez.

B. C. Wiltse, developing a copper group at Wells Bay, reports that he is now driving a tunnel on one of the claims for the purpose of tapping a 14-ft. vein at a depth of about 150 ft. The vein runs parallel to a rather deep canyon and about 150 ft. distant the tunnel being run from this canyon. It is expected to crosscut this vein within a short time, and if the values indicated by the croppings is upheld at this depth, a valuable mine is assured. The claims adjoin the Glendenning properties, on which development is now in progress on an extensive scale, and which are showing up well.

Angus Chisholm has purchased a one-sixth interest in the Gold King mine from Tony Dahlstrom. It is reported that Gustafson, Newman, Hanson and the new co-owner, Chisholm, who now own the entire property, have adopted a new policy and are planning on working the property on a larger scale.

An amount between \$8000 and \$9000 was the yield from about 26 tons of Cliff mine ore, run through the mill recently, or better than \$300 per ton. This ore was taken out of the mine last spring by Paul Capris. The Cliff mine, which was the first mine in this vicinity, under its former management, produced nearly \$1,000,000 and it is expected will continue to be a big producer. Recent development work at the mine has uncovered a considerable amount of high grade.

ARIZONA.

Ray.

Final Development Co. has ore ready to ship to the smelter at Hayden. The company will begin in September the sinking of a vertical shaft, to go to a depth of 500 ft., to open sulphide ore. Gasoline engines for hoist and air compressor will be used for the present.

Jerome.

For approximately \$100,000 the Green Monster Co. has taken over 32 new adjoining claims. Several units of the machinery plant, which is to be installed at the collar of the deep-working shaft on the Green Monster property, have arrived and the remainder are on the way. The new roadway leading to the company's camp from the main trail to Jerome has been completed with the exception of a few culverts, and the work of erecting the camp buildings is well advanced. As soon as the mine machinery is in operation the crew of miners will be augmented with a view to opening the ore bodies at depth in the shortest time compatible with safe and sane mining operations. In the interim work will be continued in the various tunnels for the purpose of making determinations which will serve as a guide to operations in the underlying strata of copper ore.

Recent developments in the Loma Prieta workings are very encouraging and lend emphasis to the contention of local mining men that a large and valuable body of copper sulphides underlies the Copper Basin section. The shaft on the property has a depth of 155 ft. and is in ore, heavily impregnated with chalcopyrite, from the 65-ft. point to its bot-

tom. In other words, the shaft is in ore for a depth of 90 ft. A considerable tonnage mined in sinking has commercial value, and there are several tons of sorted ore on the dump that carries 15% copper. A few days ago a level was established at 140 ft. and crosscuts started east and west in the ore. The face of the east drive is completely filled with chalcopryite. This condition has prevailed from the shaft to the present point of development and presents indications of continuing several hundred feet further to the east. The west crosscut carries bands of ore impregnated with chalcopryite which seem to be converging into a solid body as the cut is advanced. Water trouble is hampering operations considerably, due to the inadequacy of the small hoisting plant.

Another property in the Copper Basin country that is attracting a good bit of attention in mining circles is the McNulty & McBride, where a churn-drill plant recently began operations. Two shifts of nine men each are at work and three holes are being drilled. As yet no determinations have been made public. The holdings show very favorable copper indications at surface and nominal depth, however, and the opinion is general that the churn drills will disclose commercial values at depth. The venture is backed by the Crawford Syndicate.

Stringers of ore showing native copper have been encountered in the limestone-capping at a depth of 400 ft. in the Dundee-Arizona shaft. The property is located in the Jerome field and is viewed with favor by the mining men of that section. Considerable water is seeping into the shaft, but is not hampering operations as the plant of machinery recently installed is amply capable of handling both water and waste.

Satisfactory progress is being made in unwatering and retimbering the Jerome Victor Extension shaft and in installing the big pump on the 700 level. To date most of the unwatering has been accomplished by bailing and to good purpose taking into consideration the fact there were approximately 3000 ft. of lateral openings to be drained on the 700 level. For a while delays were enforced by the necessity of repairing certain parts of the hoist, by the jamming of the bucket in the shaft timbers just above the 700 level and by the non-arrival of timbers, coal and other mine essentials. Now, however, an adequate amount of timber, fuel, drill-steel, etc., is on hand and the work is progressing to better advantage than formerly.

Prescott.

F. A. Johnson has been appointed superintendent of the property of the Gold Blossom Mining Co., located about 6 miles south of here. Johnson has put three shifts on and will sink the main shaft to a depth of 500 ft. The present depth of the shaft is 200 ft. and on that level an ore body 3 ft. wide is being developed. Gold values are reported to run close to \$100 per ton. This ore body is to again be opened by crosscuts and drifts run out at the 400 and 500 levels. A hoisting plant, air compressor and other mine equipment is in transit to the property.

The Midnight Test group of gold-bearing claims in the Groom Creek country have been sold to R. M. Merrill of San Francisco. The property is one of a number of former producers in Yavapai county that has passed to outsiders of late. The retiring owner, Colonel Chase, of Faribault, Minn., opened the property to a depth of 400 ft. and mined a large tonnage of free-milling ore which was treated in the Nissen mill erected by him. The new owners have taken possession of the mine and are preparing to open it at greater depth.

Development of the recent strike in the Lady Alldy mine indicates it to be one of the most important made in the Chaparral section in a number of years. The ore body has a breadth of 3 ft., where opened on the 200 level, and is said to assay close to \$100 gold per ton. Ben Rybon and Dr. R. N. Looney, of Prescott, are the owners. The mine is being worked by the Smith brothers under a \$20,000 option to purchase.

Mayer.

Officials of the Big Ledge Development Co. announce the purchase of the old Treadwell smelter at Mayer and that it is at once to be overhauled and placed in commission. They likewise announce the purchase of the Hackberry and Gopher properties and the intention to thoroughly de-

velop them. The company has for some time operated the Henrietta and Butternut mines in the Big Bug country. The intention is to reduce the ores mined on all four of the properties mentioned at the smelter recently bought.

Humboldt.

A 50-ton reduction plant and a new equipment of mine machinery, all to be operated by a Semi-Diesel engine, are to be installed at once by the Arizona Mine Supply Co., of Prescott, at the Arizona mine. The property is being operated by Anderson & Birch and has of late been a frequent shipper of high grade silver-lead ore. When the new machinery is in commission the mine is to be opened at greater depth.

Manager W. S. Vilhelm of the New State mine, recently the scene of a strike of high grade gold ore, will at once equip the property with additional machinery, including a large air compressor and drills. The fissure from which the high grade is being mined continues on into the Elk and Perry properties, also controlled by the New State people. Hoisting and compressor plants are to be installed on these groups. All three of the properties are to be developed at depth as soon as the machinery is in operation. In furtherance of the plan accommodations for additional miners are being established and other surface improvements made.

CALIFORNIA.

Nevada City.

The Delhi Mines Con. has been formed, with a capital stock of \$1,000,000, to operate the Delhi mines, at Columbia Hill. The directors are C. R. Clinch, Frank Vestal, L. P. Larue and Roy Tremereaux of Grass Valley, and Carrol Searls of Nevada City. The mine produced good ore years ago and is considered a property of promise.

Crosscutting from the main shaft of the Pittsburg mine to penetrate the Gold Flat vein is progressing, but hard rock is retarding work. The crosscut is out 500 ft. and is expected to tap the ore body within 600 ft. The mine is well equipped.

Arrangements have been made to work the Massachusetts quartz property in the Gold Flat district, about 2 miles below Nevada City. The 2-stamp mill of the Norton mine, in Willow Valley, has been moved to the Massachusetts and will start crushing within 10 days. Some good ore has been opened. The property is operated by C. H. and E. O. Dougherty of Nevada City.

A new hoist has been installed at the Texas mine and sinking on the New York vein has started with 10 men. This ledge formerly produced some rich quartz and is expected to persist to considerable depth. The mill is running on ore from the main workings.

Placerville.

A large compressor and machine drills have been installed at the Rising Hope gravel mine on Webber creek, 3 miles east of Placerville, and a new bedrock tunnel will be driven beneath the lava cap to open the channels to advantage. About 2 miles of development work have been already accomplished and large bodies of excellent gravel blocked out. The property is equipped with a good gravel mill and washing plant. The mine is owned by Schuyler N. Warren and associates of New York.

Portola.

The Walker copper mine has been acquired by the International Smelting & Refining Co. and will be operated on a larger scale than originally planned. A flotation plant of 100 tons daily capacity was recently completed and everything is in readiness for a heavy output. The new lower tunnel and shaft are both in ore averaging better than 6% copper, and considerable gold and silver is also present. The new owners will expend at least \$25,000 on further developments.

Smartsville.

An option has been taken on the Campbell gravel mine by eastern people, and an effort will be made to work it by the drift process. A shaft will be sunk to bedrock and the channel thoroughly developed. The Campbell, also known as

the Blue Point, formerly ranked among the greatest hydraulic producers of California, but was closed following enactment of anti-hydraulic legislation. Several unsuccessful attempts have been made to work the mine, including the spectacular failure of the Tarr Mining Co. about 8 years ago, when efforts were made to mine the gravel by a combination dredger-hydraulic elevator system.

Laws.

The Tip Top gold mine has been acquired by the Louisiana Con. Mining Co. and is to be actively worked. A large tonnage of good-grade ore is stated to be exposed, and deeper work will be prosecuted. On adjoining property the company has taken an option for \$35,000. The group is equipped with a 10-stamp mill and it is likely capacity of the plant will be increased.

Grass Valley.

An eastern syndicate, headed by King G. Gillette, has acquired the California mine in the Deadman Flat section for approximately \$75,000. One-fifth of this is to be paid down and the remainder in four equal yearly payments. It is reported the shaft will be deepened, equipment provided and operations conducted along broad lines.

The final payment on the purchase price of the Union Hill will be made in a few weeks, and following this developments will be pressed with renewed vigor. Considerable tungsten has been produced in the past 6 months, and profits from this source have materially aided in development of the gold-bearing ledges. Augustus Cox is superintendent.

The California copper mine at Spencerville has been taken under bond by H. W. Morris and Thomas Benney of Grass Valley. Some high-grade ore has been found, with gold and silver occurring in fair percentages.

Carrville.

Operations have been resumed at the Strode mine after an idleness of 5 years. The ledge has been recovered and has widened to 5 ft., with the ore of excellent character. Seams of the quartz are stated to run into fancy figures. Twelve men are employed under supervision of H. L. Stewart.

Considerable prospecting is reported in the district, and several encouraging gold discoveries are reported. The vein recently uncovered in the Golden Jubilee continues to average around 2 ft. wide, with good ore in evidence. A number of small companies are working quartz deposits in the vicinity of Carrville, Coffee and Trinity Center.

Marysville.

The Yukon Gold Co. has filed suits against several prospectors in the vicinity of Smartsville to prevent further mining on placer ground claimed by the company. A temporary injunction has been granted and defendants have been cited to show cause why injunction should not be permanent. The Yukon Gold Co. is building a powerful dredger in the field and plans to erect two more in the spring. The territory lies in the Yuba River field, adjoining holdings of Yuba Gold Fields Con.

Howland Flat.

Construction of the mammoth restraining dam across Slate creek is progressing, with 25 men at work. The dam will be 50 ft. high, of reinforced concrete, and is expected to impound 4,000,000 cu. yds. of debris the first year. Its height will be increased as conditions justify. It will facilitate operation of numerous hydraulic mines in the Howland Flat, Port Wine, Scales, and other districts. Los Angeles people have secured control of the company and acquired water rights. It is planned to sell water to owners of hydraulic mines for operating purposes.

Angels.

Rich gravel has been encountered in the Rough Diamond mine, 5 miles from Angels. The deposit was intersected at a depth of 62 ft. and is stated to average \$30 to \$40 per ton. The channel is the Central lead, which has produced splendidly. It is planned to install machinery soon and to press work more vigorously. L. J. Hutchinson and David Oard are the owners.

Yreka.

The Spring Gulch quartz mine has been taken under bond by Seattle people and extensive prospecting is proceeding. Ten short tunnels have been extended and all are in ore of low grade. Altogether, about 3000 ft. of development work has been performed.

COLORADO.

Cripple Creek.

The Cripple Creek Deep Leasing Co. loaded out a 35-ton shipment from its lease on the deep levels of the Jerry Johnson mine on Ironclad Hill. The company is mining ore at both the 850 and 750 levels that is averaging close to 2 ozs. gold from the breccia-schist contact lying east of the shaft.

Charles Hill at a depth of not to exceed 30 ft. on his lease in the Ajax Co.'s mine has opened up a huge ore body. Except for dumping the rock over a screen, the ore is shipped as broken, and is returning values in carload lots of between \$15 and \$20. The full width of the ore body has not yet been determined and until a depth of at least 50 ft. is attained sinking will be continued. A drift may be run out from the 50-ft. point, when the dimensions of the ore body can be determined.

A new ore house is being constructed at the Dillon mine. Superintendent McCarthy expects to be using the structure by Aug. 28. The Dillon mine continues to keep two teams busy loading out ore and the daily shipments aggregate 70 tons. With the new ore house completed the tonnage will be raised to 100 tons.

A thorough and successful test is in progress at the Rex Gold Mining & Milling Co.'s Ironclad hill plant, on the low grade ores from the company's properties, on which the mill is located. It has been treating between 60 and 75 tons daily for about 3 weeks, and these tests have proven that the oxidized product taken out from the open cut, some of a value not to exceed \$1.25 a ton, can be treated with a slight margin of profit. Ore above this grade, and the general average to date has been close to \$4 a ton, costs no more to mine or treat, and handled at the full capacity of the mill, 100 tons daily, would be profitable.

Development is progressing at the Shoo Fly mine. A depth of 150 ft. has been attained in the shaft now being sunk on Womack hill, and with 35 ft. additional depth, at 185 ft. it is proposed to cut a station and drift through the Iowana claim adjoining the Shoo Fly on the west. Connection is also projected with the Iowana tunnel, thereby affording exit from and ventilation for the workings of both properties. This tunnel, long neglected, has been found upon examination to be free from caves and in good working condition. All that remains to bring the tunnel into use is to re-lay track. While development work is in progress, shipments will be limited. Manager Gilbert is carrying a filled stope and will ship heavily when the dead work is completed. The values are holding up in the ore broken and the next shipment to be loaded out will, it is expected, average better than 2 ozs. gold.

A good strike has been made in the Little Florence mine, owned by the Argon Gold Mining & Milling Co. and being operated under lease by M. Johnson. The vein as now exposed in the heading of the adit is from 2 to 3 ft. wide, and practically vertical, precluding present determination of the hanging or foot walls of the vein. The depth attained to date will not exceed 12 ft. and the gold is there from the subsoil down. The lode strikes northwest and as the adit is extended into the hill depth will be gained rapidly. Everything taken out to date, excepting some 3 or 4 tons of dump rock, has been shipped. Sampling the supposed waste rock it was a surprise to find a value of \$31 a ton. The "dump" will be loaded out with the next shipment.

Leadville.

The Prince of Wales Leasing Co., operating the Bartlett property on Sugar Loaf, which temporarily stopped developments several weeks ago for the installation of a power line to the property, has now resumed activities. The power line has been completed and all connections made. The lessees plan to sink the winze near the breast of the tunnel several hundred feet. A heavy flow of water was encountered in the winze while the work was being carried on last spring and pumping was necessary before sinking could continue. Electric pumps have been installed in the tunnel and everything is in readiness for extensive development. Rich bodies of high grade silver were found in the Bartlett during the early

days. The last large vein was lost in an expansive cave which partly closed the tunnel years ago. Conditions at the time made it inadvisable to reopen the tunnel in search of the buried ore shoot and it stood idle.

The Colorado Power Co. is constructing two lines. One is to the Mikado property, where G. O. Argall is planning a draining and development enterprise. One line will be brought to the Mikado from the Iron Silver line running to the Tucson on the top of Iron Hill while the other will be extended from the Yak-Waterloo line, which runs through Stray Horse gulch and Graham park. The construction work is progressing, and, according to Manager Morarity of the power company, the lines will be complete before they are required at the Mikado. The transformer will stand in Stray Horse gulch, just below the property.

Boulder.

The Degge-Clark Co., concentrating tungsten ores, formerly purchased outright all satisfactory ores offered. The new plan is to make a straight custom concentrator of the plant, receiving and running a shipper's product and turning over to him the concentrates. Lots of 5 tons and more will be treated separately and the concentrates delivered to the owner or stored for him. A regular schedule of charges for concentrating has been issued. The shipper may pay this charge in cash and remove his ore or Degge-Clark will hold the charge against the concentrates while in storage and will act as agents for the sale of the lot, subject to the approval of the owner. This plan will permit the miners to have their product reduced to commercial material and held in shape for immediate delivery on demand.

IDAHO.

Kellogg.

The July net earnings of the Caledonia Mining Co., which owns and is operating the Caledonia mine, were \$90,000, according to Stanly A. Easton, president and general manager, who states that production is being maintained at the normal rate. He says also that development on the Keating tunnel level so far has failed to locate the ore body, which faulted several months ago, but that the work is being continued. The company on Aug. 24 declared the regular monthly dividend of 3 cts., or \$78,150, payable Sept. 5 to stockholders of record Aug. 25. This will make the payments for the current year \$677,300 and will increase the grand total to \$1,560,031, or approximately 60 cts. per share on the entire capitalization of 2,605,000 shares at \$1 each.

Burke.

The terms of the 10-year lease recently acquired by the Consolidated Marsh Mines Co. on the Mono, O'Neil and Russell claims of the Federal Mining Co.'s Tiger-Poorman group, adjoining the Marsh holdings here, were made public Aug. 24, when the contract was filed with the recorder of Shoshone county. The agreement states that the Marsh Co. is to expend not less than \$40,000 developing the Marsh group and the leased holdings, such expenditures to be made under the control of the Federal Co., but the work to be supervised by the Marsh management. Operations are to begin immediately, and not less than \$2500 are to be expended each calendar month. If the Marsh Co. fails to comply with the provisions of the contract, the Federal Co. retains the right to institute action for alleged trespass of the former corporation on the grounds of the leased claims, and the Marsh officials agree to waive statute of limitations. Under the lease the Marsh shall account to the Federal Co. for milling ore on the following basis: When the milling ore contains 9% lead or less the royalty shall be 35 cts. per ton milled, and for each unit of lead above 9% the royalty shall be increased at the rate of 25 cts. per ton for each unit in excess. This rate is to apply when lead is $5\frac{1}{2}$ cts. per pound New York, and when higher than $5\frac{1}{2}$ cts. the royalty shall be increased at the rate of 30 cts. per ton for each cent above 5 cts. per pound, fractions proportionately. The royalty on crude ore is 15% of the net smelter returns when lead is $5\frac{1}{2}$ cts. in New York, 20% when the price is $5\frac{1}{2}$ to 7 cts. and 25% when the price is 7 to 8 cts. The Marsh Co.

also agrees to pay all taxes and hold the Federal Co. free from loss or damage by reason of personal injuries, liens or other encumbrances. The expenditure of the \$40,000 on development is mandatory, in order to secure the validity of the lease. The Marsh Co. also agrees and has signed an ore contract to sell all the ores to the A. S. & R. Co. Any reorganization of the Marsh Co. is bound by the agreement and lease.

Wallace.

Speculation is rife regarding the plans of the Tamarack & Custer Mining Co. relative to providing facilities for treating its output, but the management seems unwilling to give out any information, and stockholders as well as investors are in the dark as to the corporation's future policy. Since operations were begun nearly 2 years ago, following consolidation of the Tamarack & Chesapeake and the Custer companies, the output has been treated in the old Rex mill, now owned by the Rex Con. Co., but the latter has resumed possession of the plant, and production at the Tamarack & Custer has been suspended. The tramway that connected the Rex mine and mill was removed to provide transportation for the Tamarack ore when the lease was secured, but the carrier now is being restored to its former location, in compliance with the terms of the contract, and it is believed that the Tamarack properties will be idle for an indefinite period. It is rumored that the Tamarack Co. is endeavoring to purchase the Frisco mill from the Federal Mining Co., but that the latter refuses to transfer possession of the plant unless the Frisco mine is included in the sale. It is said also that negotiations are pending for purchase of the National Copper Mining Co.'s 500-tons daily capacity plant at Mullan, Idaho, recently closed down because the National Copper ore could not be treated at a profit. Other rumors are to the effect that the Tamarack Co. is seeking to secure an agreement with the Federal Co. for a permanent easement through the No. 6 tunnel of the Greenhill-Cleveland property. Not to exceed 2000 ft. of work would connect the Tamarack undergrounds with this artery, giving an outlet on both the Northern Pacific and O. W. R. & N. tracks, and eliminating the necessity for tramping the ore. The real reason for suspending operations generally is believed to be that the Northport smelter, constructed to treat the product of the Hercules and Tamarack & Custer properties, is buried with shipments, and that the congestion will not be relieved until the third furnace, now being installed, is in commission. In this connection it is said that the Northport plant's output will not be increased, as the A. S. & R. Co. is exerting its influence in the lead market to prevent the Northport Co. from marketing its product to advantage.

LAKE SUPERIOR.

COPPER.

Houghton.

Michigan is now about 46 ft. beyond the Omigah lode, or 234 ft. from the Butler lode, with its shaft and is meeting with a little copper every few feet. A fault is being encountered on one side of the drift and is consequently at right angles to the formations, which makes it easy for the men to cut out the rock. The western drift is in better rock than for the 10 days previous. The eastern drift is cutting up a stope now 30 ft. high at the top of lode, but will immediately continue the drift. The copper there is both mass and stamp. The mine is yielding a lot of the heavy mass. One piece 3000 lbs. in weight and another of about half that weight were taken out on the 22nd. This territory abounds in copper and it seems that wherever there is a crack or fissure the metal is found. From the present showing it appears quite strongly that a mine will be found here.

North Lake should at any moment enter a lode disclosed in No. 13 drill hole 47 ft. wide, with some copper and with a little in seams above and below the lode at a depth of 392 ft. This lode is the same that was found by the No. 3 hole at the depth of 1137 ft., with good copper values for 10 ft. There was also found in No. 13 hole when 1244 ft. down an amygdaloid 11 ft. thick, with copper over its entire

thickness, one piece being 3 ins. long, of solid copper. This lode will be sought by the crosscut.

Allouez's yield in refined copper is running about 20 lbs. a ton, and its tonnage is about 2000 daily, which, allowing a 9-ct. cost, would make the earnings over \$21 a share. The new ground that is being opened, both north and south, averages as good as that opened previously in these directions. Quite a large amount of new work is being done here all the time, especially at the north, where the drifts are so long, in order that they can be mined in the proper way by drifting to the boundary, with only occasionally a stope up to the level above for ventilation. The broken zone, about 200 ft. in width, a little over half way in from the shaft, is met with regularly on every succeeding level, but the mineral contents are very uniform on both sides, those of the northern side to the Ahmeek line being the better. About all the men that are needed are being secured here.

Keweenaw has been delayed greatly by the non-arrival of the timber for the trestle for the 3000-ft. flume that will bring the water to the launder, and the new wooden rockhouse, 25 by 24 ft., will all be ready to go into commission about Sept. 15. The rockhouse will not be equipped with a large bin for storage, as the mill is only a short haul from the shaft. The mill, which is that of the old Phoenix mine, has one stamp of the Ball type, Woodbury and Hodge jigs, and both Wilfley and Overstrom tables, and is capable of giving a very fair recovery. There is now a large amount of stoping ground available.

Centennial is making preparations to begin sinking the shaft from the bottom level, the 27th, to the 28th. It has been over 3 years since sinking was carried on and drifts have been carried out on every level, including the lowest, and on some at the top of the good ground just under the South Kearsarge, the 29th being the first to advance into the good rock. The drifts have reached the boundary line at the west. This work is for exploration and development, so that when enough is known of the extent of mineralization, which is averaging well under the two mines above mentioned, a large production will be made. No attempt is now being made to earn more than a small balance. About an average of 12 cars is being forwarded to the Centennial mill, as compared with 14 last year.

Hancock, being held back by the lack of men in its stoping, is sending almost 600 tons daily to the Centennial mill from its shaft No. 2. It is mining from lodes Nos. 3, 4, 8, 9, and from the Pewabic, or No. 8, and its three west lodes. All of these are yielding paying rock, but No. 4 and No. 8 are the best; the former, though averaging but 4 to 5 ft. wide, being very good and having a cost less than that of the others on account of this narrowness. An opening from the 44th to the 49th level has just been made by holing down and raising up, thus making ready five levels for sub-levels and drifting.

Copper Range is, as during last year at the Champion, putting out its largest tonnage—something over 3000 tons daily. There are now enough good men to be had, since the pay of men on company account was made \$1.50, and its yield is holding up to the very high figure of over 50 lbs. of refined copper a ton. Consequently Champion is by far the richest mine in the district. On the stretch of 3500 ft. south of No. 4 shaft the ground has been opened down to the 15th level, inclusive, all of a high average. On the 2500-ft. stretch to the north of No. 1, where the upper levels for 400 to 500 ft. had been mined with poor results, then lay dormant until about a year and a half ago, when they were pushed through high grade ground to the very boundary of the Trimountain, and where the lower levels show the same high quality right from the shaft, there is an equally good area. Between these two reaches of territory the rock, though not averaging quite so high, is good. There is no need here of resuming sinking, as so much ground is ready for drifting. The other two mines did not lose any tonnage, as there the number of men employed had varied very slightly.

Isle Royale has just completed the sinking and raising at its No. 7 shaft down to the 7th level and will now start to sink to the 8th. The ground has averaged very good and gives great promise for the south. The tonnage, in spite of the falling off at most of the mines, is still keeping up to

the high figure of over 3000 tons daily. There are being employed about 88 drills, which is about the highest number yet reached.

New Arcadian, which has sunk its shaft 120 ft. from the 1250 level, will establish the next level 250 ft. from the former, or 1500 ft. from surface. The new rockhouse and hoisting engine will not go into commission for about 40 days, from present indications.

Adventure is down 75 ft. below the 80-ft. collar and now the ledge has been cut into one side of the shaft. Every stick of the timber has had to be replaced, and the work has been difficult and slow, as it has been in sand.

Quincy has begun to build the new bathhouse for its employes, the contract having been given to Archie Verville of Hancock. This is the first step in a rather elaborate social service for the men. The building, which is located opposite No. 4 shaft, abandoned some years ago and situated between Nos. 7 and 2, will be of brick and stone 90 by 50 ft. on the ground floor, three stories high and will cost over \$20,000. On the main floor will be the showers and tub baths for the men and women, with lockers in the basement. Quarters will be provided for the caretaker on the second floor and the third will have a large lecture room, a reading room and a smoking room. Large fireplaces are planned for each of these rooms, and there will be a commodious porch for the summer time. While there is no swimming tank planned for, plans have been made so that one can be added at a slight cost.

Quincy is being inspected by President W. R. Todd and his son, Vice-President W. Parsons Todd, who is taking a great deal of the work of management off of his father's shoulders.

Mohawk has just had a survey made by its engineers of its new lands, recently purchased for the purpose of a mill site, on Torch lake, extending south to Dollar bay. This is so as to accurately know their area, and not with any immediate idea of building thereon.

Winona will not construct the proposed leaching plant, with a capacity of 5000 tons daily, for some time, if at all. Labor conditions are somewhat better, as more men are coming.

Cass has found a little copper, which is encouraging as showing that the metal is scattered over this section. The diamond drill work will make a thorough crosscut of the old Norwich, or Copper Crown, and the adjacent properties that are held under option.

Tamarack will sink its North Tamarack shaft, No. 3, to the 24th level, as soon as the loading station is cut at the 23d. The 20th level, which has been very good, with a comparatively short stretch of ground not so good, is now about 2500 ft. toward No. 5 shaft to the south, leaving about 500 more to go. This work is all on the subsidiary shaft, which starts on the 18th level. The good ground which began to extend northerly on the 20th level is widening out on the lower levels. If this stretch continues to No. 5 and to the north with depth, it will increase the profits to a considerable degree.

MISSOURI-KANSAS.

Joplin.

Lee Holden and associates have taken a lease on the old shaft at the Tomkinson land northwest of Joplin and are now sinking a shaft to open up a run of ore that is believed to extend from the Henderson land across to the Tomkinson tract.

One of the richest strikes made in the Joplin camp for some time is that of Kittrell, Jarret and Ramsey at the Yellowstone mine on East 15th street on a lease from the Missouri Lead & Zinc Co. The dirt has milled out 13% zinc over a custom mill. This was the first milling done. The general manager of the company now believes that the ore is running nearer 20%. The strike was made at 110 level, where there is a face approximately 26 ft. high. The width

is not yet determined. The strike was made in old ground which these same men had attempted to work 15 years ago. Another shaft is being sunk in order to open up the ground ahead of some dangerous old workings to not only provide safe ground, but a larger amount of face upon which to work.

The old Condor mine at Chitwood is being reopened by a group of men headed by John Mounce, Robt. Coates and Joe Rosenberg. This property was formerly worked by the Little Martha Mining Co., which had considerable difficulty, due to a hot shaft and considerable water. These conditions have been considerably abated, and the new company expects to be producing within a fortnight.

The E. Z. Eight Co. has opened up a rich run of ore on the Old Silver Dick lease at Thoms Station at a shallower level than was formerly worked. A battery of hand jigs will handle all of the free ore, while the crushed rock will be sent to a custom plant. This mine was formerly equipped with a mill, which was dismantled owing to caving ground, which threatened its destruction.

F. C. Snow and associates of Oklahoma have started up the old Gussie mill at Thoms Station with a view of operating it as a custom mill. While the plant is operated as a custom mill, some prospecting will be done in order to test out the old ground, and if possible find an extension of the run which proved so rich some time ago. This ground is known as one of the richest tracts that has ever been opened up upon the Joplin-Mexico land.

Webb City.

On McCorkle Hill the National Zinc & Lead Co. is planning the erection of another milling plant. The company already had one mill upon a 40-acre lease at this point and the development is such that it is believed another mill will be needed. This company has taken over the lease of Jasper & Wills south of their Lucky Tom plant of Porto Rico, and is now making a production of $1\frac{1}{2}$ cars a week from this property, although it is not completely opened nor fully equipped. Leon Field is the field manager in charge of operations.

The Oronogo Circle Mining Co. installed a tight cable areo-tram from the open cave at No. 9 shaft to the Bunker Hill shaft, a distance of 500 ft., which is the collecting point for the surface railway which handles the ore on this property.

The Bell Mining Co. is sinking a new shaft on its Duenweg lease to open up an ore body discovered at the 140 level. Seventeen drill holes have been put down and considerable ore opened up at one shaft. The company expects to build a 300-ton concentrating plant as soon as the second shaft is completed and the ground broken up. Some of the drill holes put down on this tract assayed as high as 15% zinc. The company has a 17-ft. face of typical sheet ground.

Miami.

The Defender Mining Co. of Miami has taken a lease of 280 acres lying north of the Commerce and south of the Blue Bird and has started an extensive campaign. This company has set aside \$30,000 as an appropriation for this prospecting campaign, and if good results are shown further appropriations for development will be made. J. H. Wright of Joplin is president and general manager.

The Green Zinc Mining Co., operating on the Jones lease southwest of Commerce, is moving the Star concentrating plant to a new shaft just put down on this tract. The company is enlarging the mill and expects to have it ready for production within 90 days.

The Underwriters' Land Co. is slowly lowering the water level in conjunction with the neighboring mines and is milling ore from the upper levels, while the pumping is being done to get into the lower and richer ground.

On an adjoining lease the Lucky Kid mine has completed its concentrating plant and is now milling ores that are yielding 20% recovery zinc and lead. This concern is also adding a large sludge mill to its equipment and expects to have this part of the plant in operation within 30 days.

The Rose Mining Co. has taken over the Squaw mine at Lincolnville and while unwatering the ground is completely overhauling the concentrating plant.

MONTANA.

Butte.

According to the report for the quarter ended June 30 the Davis-Daly has been drifting to the northwest on the 2500 level and is now in about 440 ft. It has been in good ore all the way, averaging 12 ft. wide, the ore assaying between 5 and 7% copper, which is considered high-grade. The breast of this drift is still in ore. To stope this ore body the management intends to open above and below the 2500 level and crosscutting has been started on the 2400 level, where it is expected to encounter the same ore body. Ore has been mined on the 1400, 1500 and the 2500 levels. Foundation for the new hoist and building has been laid preparatory to the delivery of the machinery from the Nordberg Mfg. Co., which is promised for early in September. It is hoped that the new hoist will be in operation by Oct. 1, at which time production should be doubled from a present total of about 135 tons. Shipments for the 3 months amounted to 142 cars, aggregating 6999 tons, producing 402,813 lbs. copper and 35,478.67 ozs. silver.

A report of the Butte & Superior Mining Co., filed in the federal court here, shows that 45,874,287 tons of ore were treated in the company's oil flotation plant during July. The report is filed each month to comply with court order, for evidence in the Minerals Separation Co.'s suit against the Butte & Superior for alleged infringement upon the oil flotation patent. Concentrates recovered during the month amounted to 8,685,416 tons. The cost per ton of concentrates recovered was \$3.64. The value per ton was \$48.83.

Lehigh.

Leschen & Sons, through their Salt Lake office, are constructing an 800-ft. aerial tramway, capacity of 20 tons per hour, for disposal of waste from the coal washer of Cottonwood Coal Co., Lehigh, Mont. The line is being erected on wooden towers and wooden terminals, the discharge of waste to be into an arroyo. Automatic dumping buckets, 24 cu. ft. capacity, are carried by a $\frac{5}{8}$ -in. traction rope on a $1\frac{1}{2}$ -in. track cable.

Helena.

Silver Camp, 50 miles north of here at the head of Big Blackfoot river, is taking on new life with the nearly completed 100-ton concentrator and railroad. Copper, silver, gold, lead and zinc occur in the district, but have not been developed, because of their remoteness. With the railroad all mines will be within 5 or 6 miles of transportation. At present interest is centered in the new mill. It is expected to be in operation by Sept. 1. The concentrates are expected to be shipped by wagon to the Great Northern at Wolf Creek. The mill is being put up by Spokane and Portland capital. Engineer Johns of Spokane is in charge of the work. The new mill will reduce ore from the Mike Horse group, which is well developed and have a large tonnage blocked out. The mill will contain all the crushers, rolls and screens and similar apparatus and will also have installed an oil flotation process. Eleven cars of machinery for the mill have been unloaded at Wolf Creek, 35 miles north of Helena and five 6-horse teams are hauling the material to Silver Camp. The tunnel dumps are very large and contain values which are to be secured by the new mill. The first work of the mill is expected to be on the dumps.

The Eagle Creek property of the Scratch Gravel Mining Co. is showing good. At 176 ft. in the south incline shaft solid galena ore has been encountered that assays high in gold, silver and lead. The ore streak is said to be 1 ft. wide and is easily mined owing to the nature of the ground. The ore is all above shipping grade, assay returns giving values as high as \$150. The company purposes shipping this ore to the smelters as rapidly as possible. The formation is biotite granite and the strike of the leads is north-south.

July saw \$17,000 worth of ore shipped from the Scratch Gravel Gold Co. property. This ore was stoped and shipped during the course of development and resulted in a net profit to the company of \$8500. Since beginning operations about one year ago the company has run 4000 ft. of drifts, cross-

cuts, upraises, levels and shaft work. The main incline shaft is now down 400 ft. on the incline. Good ore predominates. It is mostly of a bunched character, but high grade. At 365 ft. good gold and silver was found which assayed \$96.95 to the ton without counting the copper content, which is considerable. Drifting is now going on in the 200 level west and the 300 east. A drift is being run between the 200 and 300 levels to the west. The quartz found in the main shaft is of the same character as that heretofore mined, but shows more copper than has been encountered. No assay was made of the copper content of the ore.

Basin.

Walter Harvey Weed, in charge of the Crystals group, says: "Conditions are looking good at the mine, as I have cut good shipping ore in the hanging vein up to the stope. Also in the face of the upper tunnel on the vein good ore comes up half way in the face and it looks to me as if this was going to make a good shoot in the bottom of the tunnel, as sulphide ore comes up half way from the bottom of the drift, and it is oxidized on the back of the drift. I am going to put on the night shift of more men stoping out ore, beginning Aug. 29 so that I can get out all the ore possible. The samples taken from the ore in the stope show 4 to 8% copper, 8 to 16 ozs. silver. The new ore cut on the foot-wall side of the vein is better grade. The sample assayed 8% copper and 13 ozs. silver. In the lower crosscut tunnel we have made 65 ft. advance during the month, which is not bad, considering the excessive hardness of the rock. It is a hard, silicious aplite in which talcines are now coming in. I am shipping ore steadily and expect to continue. Am expecting to make new contracts for supplies with a saving of about 20% over prices paid at Basin."

NEVADA.

Goldfield.

Ore averaging around \$30 per ton has been uncovered at an approximate depth of 1000 ft. in the Silver Pick mine, and developments are proceeding to determine its extent. The discovery was made in the shale-latite contact and is considered highly important. The shaft will be continued to the 1200 level and the shale-latite contact prospected. A large pump has been installed to keep the mine clear of water. The Calyx drill has penetrated to a depth of 1500 ft. without intersecting the shale, which apparently dips sharply at this point.

The 1000-ton flotation unit of the Goldfield Con. went into commission Aug. 21 at full capacity. As soon as the machinery has been in operation a few weeks the management expects to maintain a daily output of 1050 tons and to better the gold extraction, which now approximates 92%. Concentrates will be treated at the local plant of the company. Extensive developments have been resumed in the lower levels of several of the mines, where important reserves of copper-gold ore are indicated.

The Jumbo Extension Co. has passed its usual quarterly dividend, and it is stated the company is arranging to acquire another producing property. President Sprague states recent developments have been unsatisfactory and that unless new ore bodies of importance are soon opened the life of the Jumbo Extension will not be long. Some promising ore is showing in the new Velvet workings, but it will require \$100,000 to finance the development campaign outlined by Consulting Engineer J. K. Turner. Cash reserves are stated to exceed \$200,000.

The flotation plant of the Florence-Goldfield Co. is treating in excess of 200 tons per day. A new flotation machine, the Jones-Belmont, is being used with satisfaction. The product now going to the mill averages \$5 per ton, but a higher grade ore will soon be treated. This product is being mined on the 530 level and assays \$25 to \$35 in gold, silver and copper, with gold predominating.

Hornsilver.

The Hardwick-Reid lease on the Orlean mine has opened rich ore at a depth of 100 ft. The shoot averages 2 to 3 ft. wide and assays \$80 per ton in silver and gold. In the foot

wall a seam of ore assaying 1700 ozs. silver and 5 ozs. gold is exposed. Shipments of the rich ore have begun and indications favor development of a heavy tonnage of shipping material.

The Horn Silver Mining Co. has installed a 40-hp. electric hoist and is preparing to sink the main shaft several hundred feet below its present depth of 500 ft. On the 100 level extensive work has been prosecuted during the past 6 months and large reserves of milling and shipping ore exposed. Several distinct veins have been demonstrated and will be opened at depth.

Goodsprings.

The Pocahontas group of 7 claims, located between the Yellow Pine and Red Cloud mines, has been taken under bond for \$50,000 by Fred W. Cole and D. W. Minier of the Azalia Mining Co. The tunnel is in 300 ft. and a 25-ft. shaft has been sunk in ore. It is intended to provide more equipment and to send the shaft deeper.

Lynn.

The Big Six Mining Co. is sending shipments of rich ore to Utah smelters, and is preparing to provide reduction facilities at the mine. A large tonnage of good grade gold-bearing quartz has been blocked out, and the property is showing well with deeper work. W. W. Ruby is manager.

The Bull Moose Mining Co. has granted a 2½-year lease on its holdings to a group of Colorado, Idaho and Montana people, and extensive work will start immediately. The lease covers 4 claims adjoining the Big Six group on the north. The Bull Moose Co. is controlled by Salt Lake people. W. E. Barney is president.

Austin.

At the Austin-Dakota a station is being cut at the 260 level and sinking of the shaft is progressing rapidly with 3 shifts. The Tesora incline shaft is being deepened and several drifts extended from the Double H tunnel. A considerable amount of new equipment has been recently installed and developments are proceeding at low costs. Good ore is stated to be showing at several points. The company is composed principally of eastern people. C. F. Littrell is manager.

The H. M. Byllesby Co. is erecting a tungsten plant at Toulon, where rich deposits of scheelite were recently discovered. An excellent camp has been established and water developed near the mine.

Golconda.

The new 20-stamp mill at the Kramer Hill mine is about to go into commission. A test run of the plant has been made, and ore is being delivered to the bins. Large reserves of excellent-grade ore have been blocked out and the management anticipates a long period of profitable production. The ore is largely gold-bearing.

Developments have been resumed in the Adelaide copper mine, under management of Charles Kirchen. The Adelaide is located in Gold Run basin, 12 miles from Golconda, and is controlled by John G. Kirchen and associates of Tonopah.

Elko.

Representing New York interests Alfred Millard has taken under option the Lucky Girl silver mine at Edgemont, and is preparing for extensive work. The tunnel is in 4000 ft. and is expected to intersect the main ledge within 300 ft. On the 800 level the ore body is 30 ft. wide with values averaging around \$10. The tunnel is designed to intersect the ore at a depth of 1300 ft. Overhauling of the old mill has started and crushing will soon be resumed.

Athens.

Arrangements have been made to install a 50-ton mill at the Royal George mine and it is expected the plant will be in commission early in October. It is estimated ore reserves to the value of \$1,000,000 are blocked out. Fred Siebert is superintendent. Three miles south of the Royal George lies the Turner & Harvey group, which has been purchased by Adams & Miller of Mina. Good ore is exposed and considerable development is going forward.

Winnemucca.

Developments are proceeding at the Wolverine copper-gold-silver mine with encouraging results. The main shaft, equipped with a hoist, is down over 100 ft. and No. 2 shaft is

down 50 ft. Both are in ore of excellent grade. The Wolverine claimed original attention because of its copper deposits, but at depth large bodies of silver-gold ore have appeared. Rich copper ore continues to show at several points.

Dayton.

The Rae Con. Gold Dredging Co. is installing a small dredger to operate on 609 acres in this section. The ground has been thoroughly tested and is stated to average high in gold. It is expected to start operations by Oct. 1.

Luckyboy.

The A. Miller lease on the Lucky Boy mine has struck a shoot of rich ore between the 800 and 900 levels. The shoot forms part of what is apparently a new vein and is 4 ins. wide; 14 sacks of ore assaying around \$1000 to \$2500 in silver have been taken out.

Jungo.

A copper discovery of considerable magnitude has been announced from the Jackson mountains, 32 miles from Jungo. The ore lies in a formation of monzonite porphyry and has been traced for a length of 12,000 ft. and width of 1800 ft. There are two distinct ore bodies, one carrying gray carbonates. Assays range from 1 to 15%. Shipments of selected ore to Jungo have begun, and arrangements made to install a 50-ton reduction plant.

National.

The tramway from the Hatch lease on the Buckskin National to the new mill has been finished and the plant is about ready to go into commission. The lease continues to open excellent grade ore.

NEW MEXICO.

Mogollon.

Work on the Good Luck group was recently resumed by the owners, Messrs. Lauderbaugh & Thorlston. A 250-ft. crosscut tunnel encountered the contact at depth of 170 ft. and it is understood the showing is very satisfactory. The location of the group is such as to give it a promising future, being bounded on the north and east by the Confidence. Last Chance and Leadwood properties, on which are a continuous series of ore channels for about 2 miles in length. These collectively have produced several million dollars. The Gold Dust group lies just south of it and while this latter is one of the newer properties it is well thought of.

During first half of August the Mogollon Mines Co. treated 2013 tons of ore, producing 1600 lbs. of gold and silver bullion and several tons of concentrate. The first section of tailings flume has been completed and is now in commission.

The Oaks Company milled ore from both the Eberle and Clifton mines the past week.

Flotation experiments conducted by one of the local mills indicates that the ores from the northern end of the district will yield a high extraction. Whether or not the balance of the camp will be helped by this method has not yet been determined. Careful tests are being made under various conditions with the hope of improving on the cyanide process.

It is understood that the Pelton Water Wheel Co. has the contract for the new hydro-electric plant about to be installed on Mineral creek by the Mogollon Power & Lumber Co. This is being watched with great interest by the mining operators, and, if it proves a success, other plants will undoubtedly be established in the near future and do away with the long oil haul from Silver City. Water readings are being taken regularly on two other power projects which, when put in, will supply the entire camp with cheap power.

OREGON.

Waldo.

The Sammons-Cameron-Logan mine has recently made a clean-up of 484 ozs. in three bricks valued at \$9000, which

was sent to Grants Pass. It is reported that the balance of the clean-up, disbursed in other channels, will bring the grand total up to \$14,000. Thirty-four days of actual labor are represented in the making of this return. This old hydraulic deep-gravel mine has been a steady producer for over 50 years.

Greenhorn.

The Bi-Metallic mine is in course of examination by Montana parties. The Roberts' mill is running on West Side ore. The Morning mine is milling ore. Assessment work is being done on quite a number of properties in the district. The Psyche is getting out shipping ore and sorting out mill dirt of good grade. S. C. Richardson is doing development work at his Tiger property. A number of outside prospectors are in the hills and are much encouraged by what they are finding.

SOUTH DAKOTA.

Custer City.

The Puritan shaft has been unwatered and work on a large scale will soon be started. It is found that the timbering in the shaft for a depth of at least 75 ft., will have to be replaced, and, it is possible, to a greater depth. After the necessary repairs have been made to the shaft the real development will start. Then it is expected to use two shifts and rush the work. There will be plenty of funds for the new work, which will be done with the object of opening up the vertical vein in the property. The boilers, compressor and hoist have received a thorough overhauling and are as good as new. The work which has been done on the mill has left the plant in good shape and ready to start on the treatment of ore at any time.

Trojan.

Intending to stimulate mining the Trojan Mining Co. is entering into a new plan with respect to customs work at its mill. The mill is situated in the Bald mountain district, and facilities will be installed for receiving ore over any of the railroads entering the camp. This will give the plant an opportunity to bid for the ores of that district, and moderate freight rates now in effect, will make it possible to ship from considerable distances. At the mill is a separate ore bin of large capacity into which the various lots of custom ore will be dumped. After crushing they will be conveyed to an automatic sampler, that by repeated tests has been found accurate. As now outlined the plans of the company will be to examine the ores offered, make preliminary assays and cyanidation tests to ascertain the value and amenability of shipments, and then purchase the consignments. Everything possible will be done to assist the shippers, as the company desires to encourage steady and regular shipments, large or small. The entire staff of the company will be at the service of the shippers and the mining department will consult and help in any way possible.

TEXAS.

Alpine.

An inspection of the Maraposa cinnabar mine in the Terlingua district was recently made with the view of its purchase by a syndicate of Chicago men, headed by Lawrence Sawtelle. This mine was formerly a large producer of rich cinnabar ore, but a flooding of the lower works caused a cessation of operations. It is believed that by installing pumps of moderate capacity the flow of water can be controlled and the work of getting out the ore resumed.

Considerable progress has been made during the last few weeks in reviving quicksilver mining operations in the Terlingua district, situated 90 miles south of here. Under the protection of the large American military forces that are stationed at various points in the Big Bend region the mining of cinnabar ore and its treatment in furnaces has been resumed on a more extensive scale than for several years.

The Colquitt-Tigner mine, which was closed a few years ago, has been taken over under an option and bond by Henry Hill of Clifton, Ariz., Marlow Wells and David Grough. The first run of 10 flasks of quicksilver obtained since the new operators obtained control of the property was recently shipped to market. Considerable machinery, including diamond drills, will be installed and the large area of ground that is embraced in the mine will be thoroughly prospected. An additional furnace will also be installed, it is stated.

The Big Bend cinnabar mine which is owned by the Sangers of Dallas and Waco was also flooded several years ago and has been out of commission since then. It is reported that it is to be equipped with pumps and the mining resumed.

The principal quicksilver production of the district comes from the mine and furnaces of the Chisos Mining Co., which have been in uninterrupted operation for several years.

UTAH.

Cottonwood.

According to J. M. Howell the new power drills enable the Big Cottonwood Con. tunnel to progress at the rate of 8 ft. a day with two shifts, as compared with 8 ins. when the work was by hand. The new boarding house has been completed, giving ample accommodations for the men. The company has raised for 500 ft. in ore and had also sunk 500 ft., making a total of 1000 ft. in ore. At the Howell property of which Howell is a director, they are sinking on a 3-ft. vein of ore in the quartzite that was showing considerable shipping ore. This is showing an improvement as depth is attained. The company has 11 men at work and already has a shipment ready for the market.

The Cardiff is now hauling ore with six Packard trucks. The trucks are used in connection with the caterpillar tractor outfits pulling six trailers each. The Packards are hauling about 5 tons to the load. They make two trips daily. The movements of ore is so irregular these days that one of the directors of the Cardiff would not even venture a guess at the amount of the average daily tonnage going to the Murray smelter.

At the Woodlawn Mining Co.'s property a new tunnel is in 485 ft. From this an incline is being sunk on a good showing of ore. The new adit is being run to prospect a large ore body opened in the old workings. There is one tunnel in 1000 ft. These workings have been for 300 ft. in zinc, where it is 16 ft. wide in places. It has also been sunk on for 180 ft. Some new work is sinking 90 ft. in a winze, where there is a showing of galena. Samples of this carry up to 64% lead and 42 ozs. silver; another 50.9% lead and 14 ozs. silver. In one place there are five small bedding planes showing ore, which look promising for further exploration. In another place is a foot of solid galena in a vein 2 to 3 ft. wide. This work is about 375 ft. vertically from the surface. From the big zinc body of ore a shipment averaged 27% zinc, 16 ozs. silver and 7% lead. A recent estimate of the tonnage was placed at 5000 tons that was thought should hold up to 20% zinc, 15 ozs. silver and 6% lead. The Woodlawn owns nine patented claims. It is mainly on the Big Cottonwood side of Honeycomb gulch and adjoins the old Prince of Wales mine. A lease has been let to miners, who have started opening a surface ore shoot, where they find ore carrying 12.5% copper. Three men are now working there.

Eureka.

Chief Con. has made another strike on the 1200 level. This is considered the most important find that has been made since the opening of the deposits on the 1800 level. The 1200 strike is 300 ft. away from the other ore bodies of the mine and this fact adds greatly to the importance of the discovery because it brings in virgin ground. After drifting through the ore deposit for about 20 ft. stoping operations were taken up and the ore body has all the appearances of permanency. The ore as it is now being broken down for shipment will carry \$35 to \$10 in lead and silver. Down on

the 1800 level there is one of the largest ore bodies that has ever been opened in the property, which is now contributing a good part of the mine's output. The 1800 ore body is a recent discovery and work which has already been done shows that this extends far above the 1800 and below this point. A short distance below the 1800 level water was encountered and no effort has been made to follow the ore below that point.

The Tintic Milling Co. has recently sent out a \$24,000 shipment. It represents a partial cleanup of the mill, which is now running along in a much smoother manner than heretofore. Mining men of the district are of the opinion that the problem of treating the low-grade silicious ores of the district has been solved. The mill is now treating 100 tons of ore per day and as soon as the Holt-Dern roasters that have been ordered arrive from the factory the capacity of the plant will be brought up to 300 tons. The new roasters will replace the Knight-Christensen roaster. With the heavier tonnage, the costs of operations will be decreased. From 170 to 190 cars are being shipped each week from the Tintic district. A recent week's output by cars is given as follows: Dragon Con., 38; Chief Con., 34; Mammoth, 18; Centennial Eureka, 15; Gemini, 14; Grand Central, 14; Iron Blossom, 14; Eagle & Blue Bell, 9; Gold Chain, 6; Bullion Beck, 3; Godiva, 3; New Bullion, 3; May Day, 2; Lower Mammoth, 2; Colorado, 2; Utah Minerals Concentrating, 1; Uncle Sam, 1; Yankee, 1; Colorado, 1; Scranton, 1; Tintic Milling, 1; Minnie Moore, 1; Swansea, 1; Governor Mining, 1; total, 188.

Garfield.

The sulphuric acid plant in connection with the smelter here will start in a few days. The new plant was erected by the American Smelting Co. and Utah Copper interests. The capacity of the plant is 100 tons daily. It is said that the entire output has been contracted for already. It is said by experts that the sulphuric acid issuing from the stacks of the four smelters amounts to 400 to 500 tons daily. Where these and the arsenic acids settle on farm lands in the vicinity of the smelters the farmers claim to have lost crops and many animals feeding upon them, causing many suits in the courts.

Salt Lake.

At Atkinson station, 22 miles from here, the Big Four Exploration Co.'s plant is being brought to capacity and 2 cars have recently been shipped. There is now being treated at the plant approximately 600 tons of tailings per day. It must not be understood that the plant is as yet not working continuously. As with all large concentrating mills, it has been found necessary to make certain changes of a minor character, which changes have resulted, up to date, in closing down the mill from one to two shifts per week and at times for longer periods. It should reach its capacity of 750 tons per day within a very short period. The plant was built to treat a tailings dump that is 3½ miles in length, from 20 to 900 ft. in width, and from 5 to 8 ft. deep. There are approximately 1,030,000 tons of material on which the company has a lease that runs until 1924. Average samples of the dump show it to contain .015 oz. gold, 3.2 ozs. silver, 1.6% lead and 4.1% zinc. Lead-silver-zinc concentrates are being produced. It is believed from the numerous tests that have been made, that better than a 60% extraction of marketable zinc concentrates, 50% lead extraction, 35% extraction of the silver-gold content, and a good silver-lead extraction is being made. Based on silver at 50 cts., lead at 4 cts. and zinc at \$5.40, a profit of \$14.625 per month will be made, assuming the total costs to be \$1.30 per ton. The concentrate produced at present, figured at the low metal prices mentioned, is worth \$1.95 per ton.

WASHINGTON.

Spokane.

The Fern Cliff group is being operated by F. G. Robertson, who is paying attention to the tungsten ores which occur in it in the form of sheelite and wolframite. He is opening up one vein in which the wolframite is from 18 ins. to 4 ft. wide. A shipment of ore from the property a short

time ago netted a good profit, so he is continuing development. There is accumulated considerable rich ore on the dump and he is preparing to make another shipment. The Fern Cliff is one of the first properties in the Black Hills from which tungsten was shipped. From the workings on the ground a 9-lb. crystal was recently taken which gave an assay of 63%. The vein matter is heavily impregnated with tungsten crystals.

The Cuyahoga group, on which Frank H. Gira has been doing considerable work, is now preparing to unwater the main shaft, and has a station cut for a pump, which will soon be installed. He has made arrangements to have shipped to the property some necessary machinery, and when it is installed the work will go ahead fast. Interested in the property with Mr. Gira are a number of Cleveland, O., capitalists.

Chewelah.

An 8-ft. vein has been opened on the 150-ft. level of the June-Echo, and drifts 30 ft. long in either direction indicate an extensive shoot of copper. The vein has been stripped for 100 ft. on surface. Assays run from \$18 to \$132, and the average is \$30. The June-Echo was located 36 years ago by W. E. Imbrie and E. W. Kelly, who developed the holdings at intervals for several years, sinking a number of shallow shafts on two parallel veins that traverse the claims about 400 ft. apart. It was relocated several times before coming into the possession of the June-Echo Co. 2 years ago. Since then development has been prosecuted continuously, and it is said that a 300-ft. shoot has been proven. Equipment consists of a compressor, hoist and a 25-hp. steam plant. The management has announced that the shaft will be continued to the 500 level. Shipments of crude ore will soon begin to the Granby smelter, and plans are under consideration for the erection of a concentrator to handle the low grade.

Boundary.

To Aug. 1 1000 tons were shipped from the Electric Point mine and now are shipping 100 tons daily. Of the product already sent out about 50% was clean galena, averaging 75% lead. The shipments of carbonates were begun only after the shipping bins had been filled and it became necessary to load directly into cars. The 3½-mile wagon road to the mouth of Silver creek is in splendid shape for heavy hauling, and eight 4-horse teams and a motor truck with trailers are employed.

WISCONSIN-ILLINOIS.

Platteville.

Important developments are being made in the zinc mining industry of this field by the Wisconsin Zinc Co. H. C. George, who lately succeeded H. S. Snow as General Manager, has under his charge 450 employees and the full working force by Jan. 1, 1917, it is said, will exceed 600. Five producers and two magnetic separating plants are operating full time. Two new mines have been developed and are now being equipped. In the Platteville district the East End mine has run its course, the supporting pillars are being pulled and the mine will be abandoned. The Empire Separator which operated most successfully for years and was only recently shut down on the completion of the new \$100,000 separating plant at New Diggings, has been sold to the Fields Mining & Milling Co. of Chicago and will be removed to the company's mines at Shullsburg. Two new mining and concentrating plants are well along toward completion in the New Diggings camp for the Wisconsin Zinc Co., one on the C. A. Thompson mine and the other on the Longhorn allotment. The C. A. Thompson mine and mill will be running full head by Sept. 15. The Longhorn it is reported will not be ready for service until about Nov. 1. On the C. A. Thompson, the shaft just completed at a depth of 160 ft. has gone through 40 ft. of solid zinc formations.

In the New Diggings district the Wisconsin Zinc Co. has in operation 10 drilling machine squads the Keystone type of drill prevailing. The Champion mine, owned by the com-

pany and located here, is producing 250 tons of 36% concentrate weekly. At the Skinner Separating Works, more than 1000 tons of green concentrates are refined weekly, sales of the high grade finished product being made in open market. In the Shullsburg district the Winskill mine continues production of zinc in volume shipping an average of 5 to 7 cars weekly. This ore is coming from the lower level in the glass rock strata and was developed about a year ago as the company was on the point of throwing up the mine after several years successful operation. In this district and between Benton and Mill Brig, Ills., 4 miles north of Galena, Ill., 10 more drilling machines are engaged by the Wisconsin Zinc Co. In the Galena district the Federal mine producing indifferently for 2 years is now in prolific soil and has been placed on two shift basis, making 100 tons of 44% zinc per week. The ore is coming from the Andrews land east of the mill. Two weeks ago a new producer was ushered in for the company on the Birkbeck farm. Here a new 200-ton rig is operating with gyratory crushers. The new mine and mill is 1 mile south of Day Siding, Ill., and 75 men are required on double shift. Heavy lead and sprangled zinc is found in the glass rock; disseminated sheet ore in the oil rock and sheet deposits in the blue ground. The output is 150 tons of 50% zinc per week. The initial car assayed 52% zinc content. Mining and milling costs have been brought down at all points to about \$1.50 per ton hoisted. Cost of materials or mining supplies are 25% higher than 2 years ago. The Joplin Separator plant now owned and controlled by the Wisconsin Zinc Co. is turning out an average 60% zinc. The Skinner plant at New Diggings is running at maximum efficiency and is making from 58% to 60% ore. The introduction recently of the Whaley type of electric shovel by the Vinegar Hill Zinc Co. at the Martin mine is meeting with favor and one of the same type will be installed at the Champion mine in September. Others are contemplated for other active producers. The Wisconsin Zinc Co. is now on a sound dividend paying basis of 8% per annum on stock of issue, the 2nd dividend going to shareholders of record July 29th, 2% payable each quarter.

Returns for the entire field for week of August 26th showed deliveries to track of 154 cars of zinc ore, 6271 tons. No shipments of lead ore were reported. Shipments of pyrites for the week totaled 1,550,000 lbs. The gross recovery crude concentrate from all mines amounted to 4851 tons; net to smelters 2295 tons. The Mineral Point Zinc Co. shipped 13 cars high grade refinery ore to smelter at De Pue 533 tons. The base price on zinc ore showed slight improvement top and standard zinc ore going at \$59 per ton basis down to \$53 for medium grades. Platteville district showed light shipments 2 cars coming from the East End mine 88 tons; Hodge mine to Cuba 3 cars 129 tons; Block-House 1 car refinery product (high grade) to Illinois Zinc Co. 44 tons.

Benton.

This district maintains its position as the banner ore producing camp of the field. Returns for Aug. 26 show deliveries to track of 59 cars of crude ore, 5,234,000 lbs. Among new producers the Wilkinson Mining Co. sent 4 cars to National Separators, 166 tons, one week's turn-in. The Champion mine delivered 11 cars to refineries at Galena, 451 tons; Vinegar Hill Co. to Cuba 11 cars, 473 tons; New Jersey Zinc Co. to Mineral Point 12 cars, 576 tons; Fields Mining & Milling Co. to Galena 7 cars, 320 tons; Frontier to Grasselli Chemical Co., 5 cars, 203 tons; Wis. Zinc Co., high-grade refinery ore to American Zinc Co., Hillsboro, Ill., 7 cars, 288 tons; Lanyon Zinc Co., 42 tons; Eagle-Picher Lead Co., 2 cars, 64 tons. Longhenry Bros. reported 1 car. Sally Mining Co., another new producer, 1 car.

Mineral Point.

Receipts of raw ore at the refineries of the New Jersey Zinc Co. last week totaled 42 cars, 1656 tons. Only 6 cars of this lot came from Independent operators. Mineral Point locals delivered 1 car to furnaces, 24 tons. The O. P. David mine at Montfort shipped 2 cars last week to La Salle, 83 tons.

Galena.

Twenty cars out last week, 25 cars the week before, show this district improving. The Sandoval Zinc Co.

shipped 2 cars to the Galena Refining Co., 80 tons; 3 cars to Edgar Zinc Co., 122 tons; Black-Jack mine to Mineral Point, 6 cars, 237 tons; Little Corporal, a new producer, to Grasselli Chemical Co., 42 tons; North Unity to Cuba, 42 tons; Wisconsin Zinc Co. to La Salle, 5 cars high-grade, 200 tons. A number of new producers with new rig and in going shape did not report and several hundred tons of concentrate were carried over.

Cuba City.

The National Separators received 21 cars of crude ore last week, 880 tons; 6 cars of this lot came from independent operators. Shipments of high-grade refinery product were made to Illinois Zinc Co., 267 tons, and to Granby Co., 124 tons. Utt-Thorne Mining Co. shipped 3 cars of crude ore to Benton Roasters, 126 tons. The Big Eight, Anthony, Gritty-Six and Dall mines are all new producers.

Shullsburg.

The Winskill mine, one of the Wisconsin Zinc Co.'s string, delivered in connection with current output last week a large amount of reserve ore, 15 cars in all, 617 tons being delivered to the company's magnetic separating works at Galena.

WYOMING.

Lander.

The Greybull Oil & Development Co. is sinking a well on the south side of the Greybull river. It has purchased of G. M. Booth and A. J. Rankson of Basin, Mont., the 66-acre tract formerly owned by Saul Alderice, which joins the property of the Greybull Co. on the east. The consideration was \$10,000. The big well brought in recently by the Northwest Co. is within 40 rods of the tract purchased by Edwards Bros. of Greybull. The company will sink two test wells on the tract within the next 60 days. If they are successful in bringing in a good well, they will sink a number of wells, possibly 10, on the property, as the ground is in a section that is surrounded by wells. The work of the construction of the addition to the refinery is almost completed. In a week or ten days the entire plant will be in operation. The three power stills are already in operation and the six furnace stills are nearly completed. The workmen are setting up the last of the big boilers that were added in order to supply more power for the increased plant, and the masons have nearly completed the laying of the brick around the stills. The increased number of stills will more than double the capacity of the plant which has been running at high pressure in order to meet the demand that has been made on it for its product.

Nine big storage tanks have been set up by the Greybull Refining Co. since they acquired the refinery from the Big Horn Oil & Gas Co., and two more are to be added. Two are of 55,000 barrels capacity, four of 15,000 barrels, two of 25,000 barrels and one of 33,000 barrels. The tank men are busily employed constructing the other two.

CANADA.

BRITISH COLUMBIA.

Ainsworth.

Rapid progress is being made installing the new equipment at the Florence Silver Mining Co.'s property, and 70 men now are employed in construction and development work, according to Ferd R. Wolfe, president and general manager, who recently returned from a two weeks' visit at the camp. "Grading for the hydro-electric station has been completed, and the concrete foundations have been placed. The equipment for the plant already is on the ground, except the water wheel and the wire for the transmission line, and these will be delivered soon. The building for the 250-ton daily capacity mill is about half completed, and much of the machinery is on hand and ready to be installed. The Broderick & Bascom Rope Co. of St. Louis, Mo., has been awarded the contract

for constructing the 1400-ft. two-bucket aerial tramway that will connect the main lower tunnel and the concentrator. The carrier will cost about \$10,000 and will have a capacity of 20 tons of ore an hour. There are about 200,000 tons of ore available for extraction in the present main workings as soon as the mill is ready to operate, and the new lower tunnel, which is being driven by contract at the rate of 10 ft. daily, now is about half way in to a point immediately below and 390 ft. deeper than the bottom of the winze, with which it will be connected with an upraise. We also are continuing the No. 2 tunnel to get under the Twin ore shoot at a depth of 1200 ft. This working now is in about 2200 ft. and will reach the objective in about 500 ft. more. Recently I received smelter returns from the last 2 cars of concentrates shipped from the Highland mill before we surrendered it to the Consolidated Mining & Smelting Co. of Canada, from which we had it leased. One car went 50% lead and 12 ozs. silver, and the other 59% lead and 18 ozs. silver. The average net value was \$60. We have just shipped 2 cars of crude ore that was extracted in development, the consignment weighing 82 tons that average 65% lead and 25 ozs. silver. We estimate that the net returns of the lot will be approximately \$5500."

ONTARIO.

Cobalt.

Detroit capitalists have secured a lease on the Little Nipissing ground. A company will be formed, but in the meantime work will be commenced. A start will be made right away in pumping out the old shaft and workings. J. W. Wilson is in charge of the work. The old shaft is down approximately 290 ft. and about 2000 ft. of drifting and cross-cutting has been done. The old company during its career shipped considerable high grade and several carloads of low grade, but when their finances ran out the work was suspended and the lease expired. The location adjoins the Nipissing on the east and is close to the Seneca Superior lease.

With Callow machines Nipissing has decided to increase its flotation plant to 500 tons capacity and treat all tailings from the all-sliming cyanide process. The results of experiments showed a profit per ton sufficiently great to warrant enlargement. At the Coniagas a 100-ton plant will be installed. The machinery and other equipment has been ordered and the plant, it is expected, will be in operation in about 6 weeks. The latter plant will be along the lines of the one installed at the McKinley-Darragh and will be operated behind the tables. Tanks will not be put in for the present at least and the slimes will run direct to the mixer and then to the coils. The Coniagas will, it is thought, make an additional recovery of from 3 to 4 ozs. with flotation.

The Dickson Creek Mining Co. are going ahead with mining operations as soon as the compressor arrives. The buildings completed are a transformer house, hoist-house, equipped with a 75 hp. motor, a headframe 30 ft. high, and a general workshop. The shaft is down 84 ft. and is sunk on a vein on an incline of about 80 degrees. The size of the hoist is 6 by 8 ins. It was expected that the plant would be in running shape at a fairly early date but the company has been held up on account of delays in the shipment of machinery. A 2000 gallon water tank has also been installed on the property.

The shaft at the Genesee mine is now down 194 ft. At a depth of 187 ft. a slate sill 18 ins. thick was cut. An assay taken from the vein gave 25 ozs. silver. The vein is from 2 to 3 ins. wide. At the annual meeting of the company the following were elected to the board: President, R. H. Gorsline; vice-president, C. F. Crandall; secretary-treasurer, Alexander Russell; managing director, L. F. Steenman; director, C. D. Van Zandt.

Boston Creek.

R. H. Lyman has let a contract to E. W. Asselstine for the sinking of a shaft on the Boston-Hollinger property. At the same time a large gang will be started stripping and trenching on other parts of the property in order to get a line on the extent, number and direction of the veins. The foregoing property consists of the two claims recently optioned from Ben Hollinger and associates.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

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Brooks, Alfred H.—*Antimony Deposits of Alaska*. [A general review and classification is first made and each district is taken separately, giving a complete review later].—U. S. G. S. Bull. 649; pp 64*.

Brooks, Alfred H.—*Preliminary Report of the Tolovana District, Alaska*. [A description of the country, its geology and placer deposits].—U. S. G. S. Bull. 642-C; pp 9*.

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II. ORES AND METALS

(I) METALS AND ORES

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Jones, Edward L., Jr.—*Reconnaissance of the Conconully and Ruby Mining Dis-*

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Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

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Lee, Wallace.—*Geology of the Kentucky Part of the Shavencetown Quadrangle*. [The economic deposits are composed of coal, oil, lead, zinc and clay].—Kentucky Geol. Surv.; pp 73.

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Canadian Mining Corporation. [Cost and other details of operation].—E. & M. J. Aug. 19 1916; p 348; pp 1¼; 25c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Brooks, Alfred H.—*The Alaskan Mining Industry in 1915*. [Reviews the production and conditions in different districts, with information on coal and metal mining law].—U. S. G. S. Bull. 642-A; pp 71*.

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Tungsten

Gudgeon, C. W.—*Milling Scheelite-Gold Ores*. [Abst. from a paper read before the Aust. Inst. of M. E. Flow sheets and costs are given with description].—E. & M. J. Aug. 19 1916; p 346; pp 2*; 25c.

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Hoyt, S. L.—*The Ternary Alloys of Copper, Tin and Zinc—the Kalchoids*. [A review of the properties].—Trans. American Inst. of Metals Vol. IX; p 364; pp 31*; 35c.

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(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Brooks, Alfred H.—*The Alaskan Mining Industry in 1915*. [Reviews the production and conditions in different districts with information on coal and metal mining law].—U. S. G. S. Bull. 642-A; pp 71*.

Campbell, M. R.—*Half Century Life of Coal Supply*. [Abst. from a U. S. G. S. report].—Coal Tr. Bull. Aug. 15 1916; p 40; pp 2½; 25c.

Crankshaw, H. M.—*Mining and Ventilation Methods in Thick Pitching Beds*. [A paper to be read at the A. I. M. E. Arizona meeting].—Coal Tr. Bull. Aug. 15 1916; p 23; pp 5*; 25c.

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Lupton, Charles T.—*Geology and Coal Resources of Castle Valley in Carbon, Emery and Sevier Counties, Utah*.—U. S. G. S. Bull. 628; pp 88*; 30c.

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Natural Gas

Shaw, Eugene W.; Matson, George C.; Wegemann, Carrol H.—*Natural Gas Resources of Parts of North Texas*. [Describes the geology and the various operating fields, with some of the various methods they employ].—U. S. G. S. Bull. 629; pp 129*.

Wolf, Fred L.; Burr, Robert B.—*Tests of Natural Gas Fired, Brass Melting Furnaces Under Factory Operating Conditions*.—Trans. American Inst. of Metals Vol. IX; p 343; pp 24*; 35c.

(B) STRUCTURALS AND CERAMICS

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—*Six Months of Wonderful Prosperity for United States Mining*. [Reviews the first half of the year's production].—Mg. World Aug. 5 1916; p 229; pp 8¼*; 10c.

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Mason, F. H.—*Synthetic Nitric Acid*. [A general review of theory and practice in manufacturing].—M. & S. P. Aug. 19 1916; p 265; pp 2; 20c.

Parr, S. W.—*The Development of an Acid Resisting Alloy*. [The alloy con-

tains nickel and chromium, with many other ingredients in small quantities].—Trans. American Inst. of Metals Vol. IX; p 211; pp 7*; 35c.

Stander, H. J.—*The Function of Oil and Acid in Flotation*. [Describes tests and theory, bringing out the principles underlying flotation].—Mg. World Aug. 19 1916; p 317; pp 3¼*; 10c.

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Steuart, D. R.—*The Shale Oil Industry in England*.—Jnl. Soc. of Chem. Ind. July 31 1916; p 774; pp 2½; 50c.

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Robinson, Heath M.—*Ozokerite in Central Utah*. [Treats on the geology, genesis and tests for determining the mineral with descriptions of properties and methods used].—U. S. G. S. Bull. 641-A; pp 16*.

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III. TECHNOLOGY

MINES AND MINING

Prospecting

Probert, Frank H.—*Surficial Indications of Copper*. [On the geological and mineralogical peculiarities of ore outcrops].—M. & S. P. Aug. 19 1916; p 267; pp 9*; 20c.

Shaw, Eugene W.; Matson, George C.; Wegemann, Carrol H.—*Natural Gas Resources of Parts of North Texas*. [Describes the geology and the various operating fields, with some of the various methods they employ].—U. S. G. S. Bull. 629; pp 129*.

Supports: Timbers, Props, Stowing

Crankshaw, H. M.—*Mining and Ventilation Methods in Thick Pitching Beds*. [A paper to be read at the A. I. M. E. Arizona meeting].—Coal Tr. Bull. Aug. 15 1916; p 23; pp 5*; 25c.

Watts, A. C.—*Coal-Mining Methods in Utah—II*. [Various methods for working superimposed beds simultaneously].—Coal Age Aug. 12 1916; p 258; pp 5*; 20c.

Telephones and Signaling

—*Electric Signaling in Mines*.—Colly Guard. July 28 1916; p 157; pp 3*; 35c.

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Burchard, Ernest F.—*Cement in 1915*. [Takes up different phases of the market separately and gives curves in some instances, with the production in each case].—Min. Res. of U. S. II:16; pp 24.

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Methods of refining and extracting from other metals is spoken of briefly].—Min. Res. of U. S. 1:6; pp 19.

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Mining Costs

Wagner, William.—*Coeur d'Alene Mining Information*. [Financial statements of the larger companies are given and production and value thereof for the smaller ones. Brief separate accounts of each company in the district are also given].—Wagner, Wallace, Ida.; book; pp 174; \$4.

Canadian Mining Corporation. [Cost and other details of operation].—E. & M. J. Aug. 19 1916; p 348; pp 1¼; 25c.

MILL AND MILLING

Crushing, Grinding, Etc.

Gudgeon, C. W.—*Milling Scheelite-Gold Ores*. [Abst. from a paper read before the Aust. Inst. of M. E. Flow sheets and costs are given, with description].—E. & M. J. Aug. 19 1916; p 346; pp 2*; 25c.

Scott, W. A.—*Operations at Battle Mountain, Nevada*.—Mg. World Aug. 19 1916; p 327; pp 2*; 10c.

Flotation

Scott, W. A.—*Operations at Battle Mountain, Nevada*.—Mg. World Aug. 19 1916; p 237; pp 2*; 10c.

Stander, H. J.—*The Function of Oil and Acid in Flotation*. [Describes tests and theory, bringing out the principles underlying flotation].—Mg. World Aug. 19 1916; p 317; pp 3¼*; 10c.

Concentration: Sorting, Sizing, Washing

Gudgeon, C. W.—*Milling Scheelite-Gold Ores*. [Abst. from a paper read before the Aust. Inst. of M. E. Flow sheets and costs are given, with description].—E. & M. J. Aug. 19 1916; p 346; pp 2*; 25c.

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Cyaniding

Rose, Hugh.—*Mining and Milling Practice at Santa Gertrudis, Pachuca, Mexico*. [A complete detailed description with drawings].—Bull. A. I. M. E. Aug. 1916; p 1295; pp 38*; 35c.

Amalgamation

Smith, Howard D.—*Gold Saving on Dredges*. [Results are tabulated and drawings of jigs, etc., used in saving the gold from the dredged gravel are shown].—M. & S. P. Aug. 5 1916; p 202; pp 2¼*; 20c.

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Chemistry

Clennell, J. E.—*Estimating Metallic Aluminum in Aluminum Dust*. [Deals mostly with gasometric methods].—E. & M. J. Aug. 12 1916; p 309; pp 1½; 25c.

Parr, S. W.; McFarland, D. F.—*The Analysis of Complex Alloys of Chromium, Copper, Nickel Type*.—Trans. American Inst. of Metals Vol. IX; p 218; pp 6; 35c.

Analysis

Parr, S. W.; McFarland, D. F.—*The Analysis of Complex Alloys of Chromium, Copper, Nickel Type*.—Trans. American Inst. of Metals Vol. IX; p 218; pp 6; 35c.

METALLURGY

Electrometallurgy

St. John, H. M.—*Electric Brass Melting from the Central Station Viewpoint*.—Trans. American Inst. of Metals Vol. IX; p 359; pp 9; 35c.

Thermic Metallurgy

Gillett, H. W.—*Melting Aluminum Chips*.—Trans. American Inst. of Metals Vol. IX; p 205; pp 6; 35c.

Hill, James M.—*Platinum and Allied Metals in 1915*. [Reviews production in general, by states and foreign countries. Methods of refining and extracting from other metals is spoken of briefly].—Min. Res. of U. S. 1:6; pp 19.

Pannell, Ernest V.—*Recent Developments in Aluminum*. [A number of recently found properties, both thermic and electrical].—Trans. American Inst. of Metals Vol. IX; p 167; pp 27*; 35c.

Wolf, Fred L.; Burr, Robert B.—*Tests of Natural Gas Fired, Brass Melting Furnaces Under Factory Operating Conditions*.—Trans. American Inst. of Metals Vol. IX; p 343; pp 24*; 35c.

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POWER AND MACHINERY

Electricity

Pannell, Ernest V.—*Recent Developments in Aluminum*. [A number of recently found properties, both thermic and electrical].—Trans. American Inst. of Metals Vol. IX; p 167; pp 27*; 35c.

Portable Electric-Driven Air Compressors for Mines.—Mg. World Aug. 19 1916; p 331; pp ¾*; 10c.

Compressed Air

Portable Electric-Driven Air Compressors for Mines.—Mg. World Aug. 19 1916; p 331; pp ¾*; 10c.

Combustion Engines

Scott, W. A.—*Operations at Battle Mountain, Nevada*.—Mg. World Aug. 19 1916; p 327; pp 2*; 10c.

IV. MISCELLANEOUS

Testing

Rawdon, Henry S.—*Standard Test Specimen of Zinc-Bronze*. [Relations of mechanical properties to microstructure are taken up in detail].—Trans. American Inst. of Metals Vol. IX; p 60; pp 22*; 35c.

Stander, H. J.—*The Function of Oil and Acid in Flotation*. [Describes tests and theory bringing out the principles underlying flotation].—Mg. World Aug. 19 1916; p 317; pp 3¼*; 10c.

Taylor, Guy B.; Cope, W. C.—*Sensitivity to Detonation of Trinitrobenzene and Tetranitromethylaniline*. [Describes method and apparatus for making test, with some results obtained].—U. S. Bur. of Mines Tech. Paper 145; pp 13; 15c.

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Edwards, C. A.—*The Physical Chemical Properties of Steel*. [A treatise on the metallography, properties and nature of steel].—Charles Griffin & Co., Strand, E. C.; book; pp 200*; \$3.

Merica, P. D.; Woodward, R. W.—*The Failure of Structural Brasses*. [Deals with the nature of the failure and properties of brasses].—Trans. American Inst. of Metals Vol. IX; p 298; pp 35*; 35c.

Pack, Charles.—*Aluminum Die Casting a Commercial Achievement*. [Detailed information methods of casting aluminum].—Trans. American Inst. of Metals Vol. IX; p 144; pp 14*; 35c.

Rawdon, Henry S.—*Standard Test Specimen of Zinc-Bronze*. [Relations of mechanical properties to microstructure are taken up in detail].—Trans. American Inst. of Metals Vol. IX; p 60; pp 22*; 35c.

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Brooks, Alfred H.—*The Alaskan Mining Industry in 1915*. [Reviews the production and conditions in different districts, with information on coal and metal mining law].—U. S. G. S. Bull. 642-A; pp 71*.

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History

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General Miscellany

Nickles, John M.—*Bibliography of North American Geology for 1915*. [Besides the bibliography there is a cross index by subjects, states and countries and materials treated on].—U. S. G. S. Bull. 645; pp 144.

Ore and Metal Markets; Prices-Current

New York, Aug. 31.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Aug. 30 were as follows:

		New York, cents.	London, pence.
August	24.....	66½	31½
	25.....	66½	31 9/16
	26.....	66½	31½
	28.....	66½	31 11/16
	29.....	66½	31 13/16
	30.....	67¼	32

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London	
	High.	Low.	Avg.	1915.	1916.
January	67½	55½	56.775	48.890	26.876
February	67	56½	56.755	48.477	27.000
March	60½	56½	57.935	49.926	27.080
April	73½	60½	64.415	60.034	31.375
May	77½	68½	74.27	49.915	34.182
June	68½	62½	65.02	49.072	31.038
July	65	60	62.94	47.619	29.870
August .....	.....	.....	.....	47.178	.....
September .....	.....	.....	.....	48.68	.....
October .....	.....	.....	.....	49.285	.....
November .....	.....	.....	.....	51.713	.....
December .....	.....	.....	.....	55.038	.....
Year .....	.....	.....	.....	49.690	.....

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Business in copper continues to improve. Demand is constantly increasing. Consumers are showing more attention to 1917 requirements. Prices are advancing gradually. The market is being firmly established at each advance. The copper situation, although closely controlled by the large producers, is being conservatively controlled. Price advances are moderate. The hue and cry of manipulation is not heard. The market has already experienced four weeks of activity and is now shaping for some tremendous buying. The outlook is that before the end of September the producers will be almost fully sold over the first half of next year and have large orders for the last half. Solidarity characterizes the copper market. There appears to be no desire to hasten things along. Whatever impetus the market has had arose from consuming demand and not from forcing of the market. The above tells the copper situation in concrete form.

In the past week copper demand showed constant expansion. Each day brought larger inquiries and the price advances were easily sustained. In fact, the higher prices served to stimulate demand from users who were reticent to cover. Electrolytic went up to 28 cts. for November delivery and to 27½ cts. for December. Absorption of copper last week is estimated at 40,000,000 lbs., of which domestic users took 30,000,000 lbs. There was some foreign demand for spot and September copper, but the large producers could not supply the metal. Spot metal is held at 28½ cts., while for September delivery some holders asked 28½ cts. Increased buying of copper for delivery next year furnished the most interesting feature of the market since our last report. Sales for the first quarter were made at 26½ cts. and for the first half at 26¼ cts., but later sellers reported doing business at 27 cts. for the first quarter and 26¼ cts. for the first half of 1917. The forward buying of copper by brass makers and wire drawers serves to draw attention to the growing belief that the red metal will enjoy continued prosperity over next year. Consumers are not hesitant in placing their orders. The situation has finally developed so that the era of high prices will continue irrespective of the termination of hostilities. Copper will be just as urgently needed for reconstruction after the war as it is now required for actual warfare. This viewpoint is responsible for the diminishing view that inflation would bring its reflex.

Based on the law of supply and demand, the prevailing

values in copper are not inflated. Some authorities who formerly held the other view now concede the inherent strength of the market. They agree that production cannot be increased much more while demand is in a constant state of augmentation. While efforts to increase refining capacity are noted, lack of labor, difficulty in obtaining facilities and other kindred affairs tend to prevent further expansion. The additional refining capacity that some of the large companies hoped to have in operation now has been delayed from these causes.

The closing of the big allied order for 125,000 tons is in sight. An important banking official has declared that the matter will soon be settled. It is learned that the price will be around 25@26 cts. When this business is booked producers expect that general demand will take another leap forward. In connection with the order, it is understood that a non-cancellation clause is to be attached. Some fair foreign buying for the first quarter has just been done, while cable inquiries for the fourth quarter of this year are frequent.

At London the situation in standard copper has changed. Advances have replaced declines and the market is gradually regaining its recent losses. Electrolytic copper advanced £3 to £129 last week, while standard at the close held at £110 for spot and £108 for futures.

Exports of copper reported since the first of August total 25,314 tons. As this aggregate only includes shipments from New York, Philadelphia and Baltimore it is apparent that the entire United States exports in August will run above 35,000 tons. These large exports are confirmatory of the heavy buying reported to have been done by the allies last spring.

Quotations for copper per pound at New York for the week ended Aug. 30 were as follows:

(For Fourth Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
Aug. 24.....	27¼ @ 27½	27¼ @ 27½	25¼ @ 25½
25.....	27½ @ 28	27½ @ 28	25¼ @ 25½
26.....	27½ @ 28	27½ @ 28	25¼ @ 25½
28.....	27½ @ 28	27½ @ 28	25¼ @ 25½
29.....	27½ @ 28	27½ @ 28	25¼ @ 25½
30.....	27½ @ 28	27½ @ 28	25¼ @ 25½

Quotations for copper per ton at London for the week ended Aug. 30 were as follows:

Aug.	Standard			Electrolytic.
	Spot.	Futures.		
24.....	£109 10 0	£107 10 0		£129 0 0
25.....	110 0 0	108 0 0		129 0 0
26.....	110 0 0	108 0 0		129 0 0
28.....	111 0 0	109 0 0		129 0 0
29.....	110 0 0	108 0 0		129 0 0
30.....	116 0 0	108 0 0		130 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	18.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August .....	.....	.....	.....	17.472
September .....	.....	.....	.....	17.758
October .....	.....	.....	.....	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	18.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08

August	17.222
September	17.705
October	17.859
November	18.826
December	20.348

Year 17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	1916	1916	1915.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	83.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August					67.350
September					68.560
October					72.577
November					77.400
December					80.400
Year					

Tin.—After a very dull week the tin market is again showing signs of strength, with some fair buying of futures, while spot is inclined to be quiet. To a certain extent it is noted that futures are slowly moving higher than spot and may command a premium before very long. Users last week were out of the market and efforts to stimulate demand by bullish reports failed of success. Spot Straits declined to 38½ cts., but later advanced to 39¼ cts. It is noteworthy that sellers are asking 39@39¼ cts. for September to December arrivals. A few sales of November and December shipments from the Straits were made at 38¾ cts. and on this basis it is figured that nearby arrivals should be worth nearer 40 cts. Less offerings of Banka and Chinese tin were noted. The Dutch government is again conserving supplies of Banka. Foreign markets were easy last week, but closed somewhat firmer. At the opening of the current week London and Singapore came with a fairly sharp advance and the limits indicated that sellers abroad were confident of higher prices. Arrivals of tin since the first of the month total 3557 tons and the stock afloat to this country totals 2735 tons. The August statistics are expected to be bullish, although not extremely so, in view of the large spot stock on July 31.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Aug. 30 were as follows:

Aug.	New York		London.	Singapore.
	Spot.	Sept.	Straits, spot.	shipments.
24.....	38¾c	38¾c	£170 0 0	£171 10 0
25.....	38¾c	38¾c	170 15 0	172 10 0
26.....	38¾c	38¾c	170 15 0	172 10 0
28.....	39¼c	39¼c	173 0 0	173 10 0
29.....	39¼c	39¼c	173 0 0	175 0 0
30.....	38¾c	38¾c	171 5 0	175 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August				34.386
September				33.13
October				33.077
November				39.375
December				38.755
Year				38.664

Lead.—Excitement in the lead market has subsided. Very heavy buying by consumers in this country and in Canada resulted in prices advancing to 6¾ cts. New York and 6.65 cts. St. Louis for spot metal. With the quieting down of demand the market has retained its strength. The American Smelting & Refining Co. declined to follow independents when they went beyond 6.50 cts., this action being attributed to a lack of metal controlled by the principal producer available for sale. Independents are now booked full over September and are not disposed to sell beyond. Consumers, on the other hand, are sounding the market for October, November and December. The spot market is very strong, with little metal to be had. Producers are bare of

spot and what inquiries are coming into the market are being filled by dealers who are securing fancy prices.

The heavy Canadian purchases amounting to over 4000 tons indicate the placing of some small arm ammunition contracts in the Dominion. Cartridge makers in this country have also been buyers of lead. It is reported that the leading interest has taken some very large orders for the fourth quarter on open price contracts, which leads to the belief that an advance will be announced early in September.

Recounting the advance in lead one independent declares that the price would have gone much higher if there were fewer producers who conducted their own selling agencies. He pointed out that some lead sellers were comparatively new in the business and were inclined to be timid, whereas if the business were more centralized, as in the case of copper, the market could have gone up to 10 cts. without trouble. The fact that independents were sold out for all of September before Aug. 22 is taken to prove this point. Although London has not been buying lead in this market, prices abroad have advanced steadily. Last week spot lead at London advanced 12s 6d, while futures went up £1.

Quotations for lead per pound at New York and per ton at London for the week ended Aug. 30 were as follows:

	New York		London	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
Aug. 24.....	6.70c	6.50c	£30 10 0	£29 5 0
25.....	6.70c	6.50c	30 12 6	29 10 0
26.....	6.70c	6.50c	30 12 6	29 10 0
28.....	6.70c	6.50c	30 15 0	29 15 0
29.....	6.70c	6.50c	31 0 0	30 0 0
30.....	6.70c	6.50c	31 5 0	30 0 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	1916	1915.	1916.	1915.	1915.
	High.	Low.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August				4.750	22.150
September				4.627	22.953
October				4.612	23.932
November				5.152	26.240
December				5.346	28.884
Year				4.675	23.099
Month.	High.	Low.	Average.	Average.	Average.

Lead Ore.—The Missouri-Kansas-Oklahoma market for ores remained unchanged during the week ended Aug. 26 and ores were sold at \$65, though some went as low as \$63. Production is still low and during the week there were produced 1,219,380 lbs. of concentrates, which brought the total for the year to date to 68,481,492 lbs. The week's production was valued at \$39,585 and the year's at \$2,925,484.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September				48.25
October				51.80
November				63.00
December				71.375
Year				53.34

Zinc Ore.—Little change was noted, though an easing off of the spelter market in no way encouraged strength. In all but the Oklahoma fields the drouth hindered milling operations some. The production for the week was given out at 9,461,870 lbs. and the total for the year to date at 30,301,224 lbs., which amounts were valued at \$288,766 and \$19,576,633. The prices obtained were from \$70 to \$50, as during the previous week.

Calamine.—The market still remains fast at \$35 to \$45, and the production of 225,700 lbs. was less than 50% of the production of the previous week. The total for the year to date was given at 20,210,310 lbs., and valued at \$728,882, while the week's production was valued at \$1602.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.60	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	58.75	60.25
September				76.75
October				82.40
November				92.50
December				87.00
Year				102.96

Spelter.—Business has again fallen back into a rut. Buyers who were active a few weeks ago are now displaying no interest in the market. Prices have receded slightly and the market is now easy, with sellers willing to take concessions. Some large sellers have been offering futures very freely in an effort to stimulate sales, but users are chary about taking metal in view of the statistical position and the changing situation in world demand. On this basis it is thought that prices will recede still further.

Advices from abroad indicate that England will not be a buyer for 1917 requirements, having by the end of the year increased home output sufficiently to take care of its needs. Added to this the production in Australia, which will come forward in the early part of 1917, creates a surplus output. Thus spelter is suffering from over-expansion, nurtured by high prices. Spot prime western held at 9½ cts. New York and 9¼ cts. St. Louis at the opening of the current week, with some sellers quietly shading a quarter of a cent. For September delivery sellers asked 8½ cts. St. Louis, with October held at 8¼ cts., November at 8½ cts. and December at 8½ cts. These prices are wholly nominal in view of the absence of business and judging from the willingness to sell it would not be difficult to shade them down a quarter of a cent. At London last week spot spelter advanced £4 to £58, while futures receded £4 to £45 on reported larger offerings from this side.

Quotations for spelter per pound at New York and per ton at London for the week ended Aug. 29 were as follows:

	New York.		London.	
	Spot.	Spot.	Futures.	
Aug. 24	9¼c	£58 0 0	£45 0 0	
25	9½c	58 0 0	45 0 0	
26	9½c	58 0 0	45 0 0	
28	9½c	58 0 0	45 0 0	
29	9¼c	58 0 0	45 0 0	
30	9c	54 0 0	44 0 0	

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1916.	Avg.	1916.	1915.	Avg.
January	19.42½	17.30	18.801	6.519	89.840	30.519
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July	10.75	8.75	9.80	20.593	53.00	98.150
August				16.110		68.250
September				14.493		64.400
October				14.196		64.196
November				16.875		88.240
December				16.675		89.153
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—The recent weakness in the metal was designed to force the liquidation of holdings by small sellers, it is now learned. That this aim succeeded is shown by advances in prices. Sellers are now asking \$77 a flask for spot virgin, with an improved demand from regular users. A fair export demand is reported. Some sales to England have been made, while Norway has been in the market.

Antimony.—The recent buying movement was only a flash in the pan. This is proven by the dullness that now prevails and the efforts of some sellers to secure business by shading prices. Spot is now held at 13 cts., while for future

arrivals 11 cts. duty paid has been quoted. The needs of war consumers covering the market has again settled back waiting for inquiries from regular users.

Aluminum.—There has been a fair amount of business transacted recently, with prices higher. Sellers have taken orders for No. 1 virgin ingots at 60@62 cts. a pound in ton lots. Domestic users have taken some metal for the last quarter. It is stated that the leading interest has done a very extensive business for the first half of next year, but has stopped quoting the low prices at which orders were taken.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.	2.00	to	3.00
Muriatic, 20 deg.	1.67½	to	3.25
Nitric, 36 deg.	.07½	to	.08½
Nitric, 40 deg.	.09	to	.09½
Alcohol—U. S. P., gal. grain.	2.70	to	2.72
Denatured, 183 proof, gal.	2.68	to	2.70
Wood, 97 p. c.	.70	to	.71
Alum.—Powdered, lb.	.05	to	.07
Lump, lb.	.04	to	.06
Ground, lbs.	.041	to	.06½
Ammonia—			
Muriate, white grain, lb.	.08½	to	.08½
Muriate, lump	.17	to	.18
Araenic—White, lb.	.06	to	.06½
Red, lb.	.60	to	.65
Barium Chloride—Ton	110.00	to	115.00
Nitrate, kegs, lb.	.14	to	.15
Bismuth—Metallic, lb.	3.15	to	3.25
Subnitrate	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.	4.50	to	5.00
Borax—100 lbs., car lots.	7.75	to	8.00
Coke—Connellsville furnace	2.75	to	2.80
Foundry	3.00	to	3.50
Copperas—Spot, lb.	1.50	to	2.00
Ferromanganese—Spot	175.00	to	.....
Last half	175.00	to	.....
Ferrosilicon, 50%			85.00
Ferrotitanium, per lb.	.08	to	.12½
Fuller's Earth, 100 lbs.	.80	to	1.05
Glaucous Salts, bags.	.50	to	.75
Calcined			2.50
Iron Ore—			
Bessemer, old range, ton.			4.45
Bessemer, Mesabi			4.20
Non-Bessemer, old range.			3.70
Non-Bessemer, Mesabi.			3.65
White crystals	.15½	to	.15½
Broken, cakes	.14½	to	.15
Powdered	.17	to	.17½
Lead—Granulated, lb.	.17	to	.17½
Brown sugar	.14½	to	.15½
Litharge, American, lb.	.09	to	.09½
Mineral Lubricants—			
Black summer	.13½	to	.14
29 gr., 15 c. t.	.14	to	.15
Cylinder, light, filtered, gal.	.21	to	.26
Neutral, filtered, lemon, 29 gr.	.37½	to	.38
Wool grade, 30 gr.	.19½	to	.20
Paraffin—High viscoalty	.29½	to	.30
Naptha (New York)—			
Gasoline, auto	.23	to	.25
Benzine, 59 to 62°, gal.	.28	to	.28½
Nickel Salt, double.	.07½	to	.08½
Single	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.	.15	to	.18
Refined, bbl.			.12
Platinum—Oz. ref.	50.00	to	55.00
Potash Fertilizer Salts—			
Kainit, mln. 16% actual potash.			32.00
Muriate, 80 to 85%, basis 80%, ton.	450.00	to	475.00
High grade sulphate, 90 to 85%, basis of 90%	400.00	to	450.00
Hard salt, man., 12.4% actual potash.	Nominal		32.00
Potassium—			
Bichromate	.39	to	.40
Carbonate, cal. 96 to 98%	1.30	to	1.36
Cyanide, bulk, per 100%	.75	to	1.00
Chlorate	.45	to	.50
Prussiate, yellow	.70	to	.75
Prussiate, red	1.85	to	2.00
Salt peter—Crude, lb.	.12	to	.14
Refined	.25½	to	.26
Soda—Ash, 48% (42% basis), bbl.	2.75	to	3.00
Strontia Nitrate, casks, lb.	.30	to	.31
Sulphur—			
Crude, ton	28.00	to	29.00
Crude, ton	28.50	to	29.00
Roll, 100 lbs.	1.96	to	2.25
Tin—Bichloride, 50°, 100 lbs.	.13½	to	.14
Crystals, bbls., lb.	.29½	to	.30
Oxide, lb.	.43	to	.45
Zinc Chloride	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

Dividends on Issued Capitalization						Dividends on Issued Capitalization					
NAME OF COMPANY	Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest Date Amt.	NAME OF COMPANY	Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest Date Amt.
Acacia, g.....	1,433,989	\$1	\$.....	\$138,194	Dec. 25, '13 \$0.01	Golden Eagle, g.....	480,916	\$1	\$.....	\$98,916	Sept. ... '01 \$0.01
Adams, s l c.....	80,000	10	.....	775,000	Dec. 13 '09 .04	Golden Star, g.....	400,000	6	.....	120,000	Mar. 15, '10 .06
Adventure, c.....	100,000	25	.....	50,000	July 20, '16 .50	Gold Com. Fra. g.....	922,000	1	.....	92,111	Oct. 15, '09 .10
Ahmeeck, c.....	200,000	25	1,200,000	5,250,000	July 10, '16 3.00	Goldfield Con.....	3,559,148	100	.....	23,999,831	Oct. 31, '16 .10
Alaska Goldfields.....	250,000	5	.....	403,250	Jan. 10, '16 .15	Good Hope, g. s.....	600	100	.....	941,250	Jan. ... '03 .25
Alaska Mines Sec.....	180,000	5	.....	3,507,381	Nov. 28, '15 .10	Good Sp. Anchor, z.....	550,000	1	33,000	119,755	June 15, '16 .01
Alaska Treadwell, g.....	600,000	5	.....	90,000	Nov. 1, '06	Grand Central, g.....	600,000	1	.....	1,545,200	Dec. 23, '16 .02%
Alaska United, g.....	200,000	25	250,000	15,780,000	May 29, '16 .60	Grand Gulch, c. s.....	239,845	2,50	9,994	11,992	June 1, '16 .03
Alouez, c.....	180,200	6	64,080	2,045,270	Feb. 28, '16 .30	Granite, g.....	430,000	1	17,200	17,200	May 10, '16 .02
Allouez, c.....	100,000	25	450,000	550,000	July 15, '16 2.00	Gwin, g.....	100,000	10	.....	481,500	Feb. ... '06 .25
Amalgamated, c.....	1,538,529	100	.....	103,444,983	Aug. 30, '15 5.77	Hazel, g.....	900,000	1	.....	1,114,000	Jan. 5, '15 .01
Am. Sm. & R., com	500,000	100	1,500,000	30,833,333	June 1, '16 1.50	Hecia, s l.....	1,000,000	0.25	800,000	4,555,000	July 3, '16 .16
Am. Sm. & R., pf.	500,000	100	1,750,000	56,546,386	June 1, '16 1.75	Hercules.....	1,000,000	1	1,650,000	1,490,000	July 16, '16 .20
Am. Sm. Sec. A pf.	170,000	100	765,000	11,485,000	July 1, '16 1.50	Hidden Treasures, g.....	30,000	10	.....	457,452	Sept. ... '00 .10
Am. Sm. Sec. B pf.	300,000	100	1,125,000	16,535,000	July 3, '16 1.25	Holy Terror, g.....	50,000	1	.....	172,000	Jan. ... '09 .01
Am. Zinc, l. & Sm	193,120	25	2,414,000	3,622,522	June 10, '16 12.50	Hometaker, g.....	500,000	100	1,142,778	36,845,486	July 25, '16 .85
Anaconda, c.....	2,331,250	50	6,993,750	171,251,771	May 20, '16 1.80	Hope Dev. g.....	500,000	1	.....	5,000	Dec. 31, '15 .01
Annie Laurie, g.....	25,000	100	.....	439,561	Apr. 22, '06 .50	Horn Silver, l. s. z.....	400,000	1	40,000	5,182,000	June 30, '16 .05
Argonaut, g.....	200,000	6	40,000	1,680,000	June 27, '15 .10	Imperial, c.....	500,000	10	.....	300,000	June 24, '07 .20
Arizona, c.....	.....	.....	521,164	20,212,164	Apr. 1, '16	Independ'ce Con., g.....	2,600,000	20	.....	281,375	Apr. ... '01 .04
Atlantic, c.....	100,000	25	.....	990,000	Feb. 21, '05 .50	Inspiration Con., g.....	920,687	20	3,091,233	3,091,233	July 31, '16 2.00
Bagdad-Chase, g. pf.	64,819	5	.....	202,394	Jan. 1, '09 .10	Inter'l Nickel, com.	1,673,384	25	6,438,498	30,941,338	June 1, '16 2.00
Bald Butte, g. s.....	250,000	1	.....	1,354,648	Nov. 1, '07 .04	Inter'l Nickel, pf.....	88,126	100	267,378	5,614,824	May 1, '16 1.60
Baltic, c.....	100,000	25	.....	7,950,000	Dec. 31, '13 .06	Inter'n Sm. & Ref.	100,000	100	.....	4,100,000	May 2, '14 2.00
Barnes-King, g.....	40,000	5	60,000	.....	June 1, '16 .02%	Interstate Callahan	464,990	10	1,394,970	3,952,415	June 30, '16 1.50
Beck Tunnel Con.	1,000,000	0.10	.....	940,000	Nov. 15, '07 .02	Iowa, g. s l.....	1,686,667	1	.....	270,167	Dec. 31, '15 .00%
Big Four Expl.....	400,000	1	60,000	.....	July 15, '16 .08	Iowa Tiger, g. s l.....	3,000	1	.....	25,179	Jan. 15, '16 .50
Bingham-N. Haven	228,589	5	.....	228,493	Dec. 20, '16 .20	Iron Blossom, l. s. g.....	1,000,000	1	280,000	2,750,000	July 20, '16 .10
Board of Trade, s.....	120,000	1	.....	75,000	Jan. 15, '11 .05	Iron Cap pf. c.....	33,481	10	5,422	29,003	July 1, '16 .38
Bonanza Dev.....	300,000	1	.....	1,425,000	Oct. 28, '11 .20	Iron Clad, g.....	1,000,000	10	.....	50,000	Nov. ... '06 .06
Booth (Reorganized)	998,295	5	349,949	349,949	June 25, '16 .05	Iron Silver.....	500,000	20	.....	5,050,000	Dec. 31, '15 .10
Boss, g.....	408,500	1	.....	40,850	Dec. 10, '14 .10	Isabella, g.....	2,250,000	1	742,500	742,500	Mar. ... '01 .01
Boston & Colo. Sm.	15,000	10	.....	402,350	Oct. ... '02 .76	Isle Royale, c.....	150,000	25	150,000	300,000	July 31, '16 1.00
Bost. & Mont. Con.	100,000	25	.....	63,225,000	May 16, '11 4.00	Jamison, g.....	390,000	10	.....	378,300	Jan. ... '11 .02
Breeca, l. s.....	200,000	25	.....	220,000	Dec. 15, '13 .10	Jerry Johnson, g.....	2,600,000	.10	.....	187,500	Nov. 5, '14 .00%
Brunswick Con., g.....	300,000	1	.....	203,316	Sept. 15, '16 .06	Jim Butler.....	1,718,020	1	171,802	343,604	Feb. 2, '16 .10
Bullion-B & Champ	100,000	10	.....	2,788,400	July 11, '08 .10	Joplin Ore. & Spelter	400,000	5	62,000	62,000	July 22, '16 .04%
Bullwhacker, c.....	450,000	1	35,000	10,000	July 1, '07 .01	Jumbo Ext. g.....	1,550,000	1	194,000	684,998	June 30, '16 .05
Bunker Hill Con. g.	200,000	1	.....	858,000	July 4, '16 .02%	Kendall, g.....	500,000	6	50,000	1,555,000	Apr. 3, '16 .10
Bunker Hill & Sull.	327,000	10	991,000	17,784,100	July 4, '16 .10	Kenefick Zinc.....	60,000	.....	60,000	60,000	June 30, '16 .10
Butte Alex Scott.....	250,000	10	844,652	1,054,119	Aug. 1, '10 .50	Kennecott, g.....	250,000	10	7,000,000	12,000,000	June 30, '16 1.50
Butte-Ballaklava, c.	1,000,000	15	.....	125,000	Aug. 1, '10 .50	Kennedy, g.....	100,000	100	.....	1,801,001	June ... '00 .05
Butte Coalition, c.....	272,697	10	5,652,993	11,343,017	June 30, '16 10.75	King of Arizona, g.....	200,000	1	.....	396,000	Aug. 2, '16 .12
Butte & Superior, z.....	2,605,000	1	647,060	1,429,781	July 15, '16 .08	Klar Piquet, z.....	20,000	1	.....	167,600	Dec. 16, '12 .25
Caledonia, l. z. c.....	641,923	10	2,565,676	25,714,001	June 20, '16 2.00	Knob Hill, g.....	1,000,000	1	.....	70,000	Aug. 1, '13 .00%
Calumet & Ariz. c.....	100,000	25	3,000,000	132,250,000	June 23, '16 16.00	La Fortuna, g.....	250,000	1	.....	1,200,800	Oct. ... '02 .01%
Calumet & Hecia, c.	1,750,000	25	113,584	10,243,964	Jan. 1, '16 .17%	Lake View.....	500,000	.05	60,000	114,800	June 12, '16 .01
Camp Bird, g.....	600,000	1	125,000	260,000	June 1, '16 .25	Larry Dollar, g.....	1,500,000	1	.....	180,000	Feb. 23, '03 .02
Cardiff, s l.....	600,000	1	.....	60,000	Dec. ... '06 .01	Liberty Bell, g.....	133,551	5	.....	1,752,795	Jan. 31, '16 .05
Carla, g. s. c.....	100,000	25	100,000	4,000,000	Apr. 25, '16 1.00	Lightner, g.....	102,265	1	.....	331,179	June ... '06 .05
Centennial Eureka.	100,000	25	100,000	595,000	July 1, '16 .16	Linden, z.....	1,020	1	.....	11,200	Dec. 31, '15 3.00
Central Creek, l. s.....	100,000	1	40,000	799,169	Mar. 1, '06 .06	Little Bell, s l.....	300,000	1	15,000	75,000	Apr. 22, '16 .03
Central Eureka, g.....	1,000,000	1	44,000	392,687	Feb. 15, '16 .05	Little Florence.....	1,000,000	1	.....	430,000	Jan. ... '08 .03
Century, g. s l.....	100,000	25	4,380,000	14,380,000	July 7, '16 6.40	Low Facker.....	1,000,000	1	.....	37,600	Oct. 23, '13 .25
Champion, c.....	882,960	1	88,175	39,212	May 15, '16 .05	Lower Mammoth.....	1,000,000	1	.....	46,800	Dec. 15, '16 .01
Chief Con.....	869,940	5	3,044,930	974,225	June 30, '16 2.25	MacNamara, g. s.....	734,578	1	240,000	480,000	June 30, '16 .50
Chino Copper Co.....	1,431,908	1	.....	171,829	Nov. ... '04 .01	Magma, c.....	240,000	5.00	240,000	2,380,000	June 30, '16 .06
C. K. & N. G.....	100,000	10	.....	116,000	Feb. 5, '14 .05	Mammoth, g. s. c.....	400,000	.10	50,000	30,248	Aug. 15, '11 .02
CHIF, g. s l.....	300,000	10	.....	90,000	Jan. 1, '13 .10	Manhattan-Hig 4, g.	762,400	1	.....	169,306	July 28, '14 .02
CHIF, g. s l.....	1,000	100	.....	60,000	Dec. ... '08 .30	Mary McKinney, g.....	1,309,282	1	.....	284,000	May 26, '16 .02
Clinton, g. s.....	200,000	10	100,000	425,000	Feb. 23, '16 1.00	May Day.....	800,000	0.25	40,000	95,106	May 1, '16 .07
Colo. G. Dredging.....	1,000,000	0.20	.....	2,609,000	Mar. 15, '13 .03	Mary Murphy, g. s l. z.	370,000	5	25,067	171,360	June 4, '14 .76
Colorado, s l.....	283,840	6	.....	212,623	Oct. 14, '07 .20	Mexican, g. s.....	201,600	3	3,054,563	7,454,442	May 15, '16 1.50
Columbus Con., l. s. c.	320,000	1	.....	873,000	Dec. ... '06 .16	Mine La Motte, l.....	300,000	10	.....	300,000	Jan. 23, '04 .20
Combination, g.....	785,000	1	.....	50,000	Nov. 15, '11 .06	Modoc, g.....	500,000	1	.....	276,000	Oct. 20, '11 .01
Con. Mercur, g.....	1,000,000	1	.....	1,285,000	June 25, '11 .01	Mogollon, g. s.....	100,000	25	700,000	130,000	Oct. 1, '16 .16
Consolidated, g.....	100,000	10	.....	11,430	Oct. 1, '08 .05	Mohawk, c.....	100,000	1	.....	4,670,000	Feb. 1, '16 7.00
Con. St. Gotthard, g.....	22,000	25	22,000	581,000	July 1, '16 1.00	Moh'k Com. Lease	500,000	1	.....	116,000	July 22, '16 .08
Continental, z.....	324,001	100	1,495,203	18,655,052	June 16, '16 2.50	Moh'k Jumbo Lease	710,000	1	.....	568,000	Nov. 28, '07 .30
Copper Range Co., c	600,000	1	.....	187,500	July ... '06 .00%	Mon'ch (Goldfield).	600,000	1	.....	198,000	Nov. 20, '08 .01
Crescent United, g.....	125,000	1	.....	45,000	Jan. ... '02 .04	Mon'ch Madonna, g.	1,000,000	1	.....	40,000	May 15, '11 .01
Cripple Creek, g. pf.	2,000.										

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1918	Total to Date	Latest							Paid in 1918	Total to Date	Latest		
						Date	Amt.	Date							Amt.	Date	Amt.
Petro, g. s.	Utah	600,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04		Success,	Ida. ..	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03		
Pharmacist, g.	Colo.	1,600,000	1	91,600	Feb. 1, '10	.00%		Superior & Pitts. c. Ariz.	1,499,792	10			10,318,568	Dec. 21, '16	.38		
Phelps, Dodge & Co	U. S.	450,000	100	6,400,000	June 30, '16	6.00		Swansea, s. l.	Utah	100,000	6		334,600	Apr. 23, '07	.06		
Pioneer, g.	Alaska	5,000,000	1	2,041,528	Oct. 7, '11	.03		Tamarack, c.	Mich.	60,000	25		9,420,000	July 23, '07	4.00		
Pittsburg, l. z.	Mo.	1,000,000	1	20,000	July 15, '07	.02		Tamarack-Custer, ..	Idaho	2,000,000	1	80,000	80,000	June 1, '16	.02		
Pittsburg-Idaho, l.	Ida.	1,000,000	1	249,104	July 15, '13	.04		Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75		
Pitts Silver Peak, ..	Nev.	2,790,000	1	840,600	Dec. 1, '14	.02		Tighner,	Cal.	100			160,000	Jan. 3, '14			
Platteville, l. z.	Wis.	600	60	179,600	June 15, '07	10.00		Tomboy, g. s.	Colo.	310,000	6	74,400	3,861,555	June 30, '16	.24		
Plumas Eureka, g. ..	Cal.	150,625	10	2,831,294	Apr. 8, '01	.08		Tom Reed, g.	Ariz.	909,655	1		2,555,934	Sept. 6, '15	.01		
Plymouth Con.,	Cal.	240,000	5	58,250	231,050	Apr. 10, '18	.24	Ton-Beimont, g.	Nev.	1,600,000	1	562,600	8,205,527	July 1, '18	.12%		
Portland, g.	Colo.	3,000,000	1	270,000	10,447,080	July 20, '16	.03	Ton-Extension, g. s. Nev.	1,272,901	1	413,660	1,400,856	July 1, '16	.15			
Prince Con., s. l.	Nev.	1,000,000	2	125,000	350,000	July 1, '16	.05	Tonopah, g. s.	Nev.	1,000,000	1	450,000	13,450,000	July 21, '16	.15		
Quartette, g. s.	Nev.	100,000	10	275,000	July 31, '07	.20		Tonopah Midway, g. Nev.	1,000,000	1		250,000	Jan. 1, '07	.05%			
Quicksilver, pf.	Cal.	43,000	100	1,931,411	Apr. 8, '03	.50		Tremnis,	Cal.	200,000	2.50		234,000	Apr. 23, '15	.02		
Quip, g.	Wash.	1,500,000	1	67,000	Feb. 1, '12	.01		Tri-Mountain, c.	Mich.	100,000	25		1,100,000	Oct. 30, '12	3.00		
Quincy, c.	Mich.	110,000	25	770,000	22,647,500	June 30, '16	4.00	Tuolumne, c.	Mont.	800,000	1		495,625	Apr. 15, '13	.10		
Ray Con., c.	Ariz.	1,571,279	10	1,571,279	6,144,406	June 30, '16	.50	Uncle Sam Con., s.	Utah	600,000	1		470,000	Sept. 20, '11	.05		
Red Bird, g. s. c. l.	Mont.	300,000	5	72,000	1,200,000	Oct. 9, '04	.01	Union, g.	Colo.	1,250,000	1		444,244	Jan. 27, '03	.02		
Red Metal, c.	Mont.	100,000	10	1,200,000	1,200,000	Apr. 1, '07	.00	Union Basin, z.	Ariz.	835,350	1		167,070	Nov. 16, '15	.10		
Red Top, g.	Nev.	1,000,000	1	128,176	Nov. 25, '07	.10		United, c. pf.	Mont.	60,000	100		1,500,000	Apr. 15, '07	3.00		
Republic, g.	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%		United, c. com.	Mont.	450,000	100		6,125,000	Aug. 6, '07	1.75		
Richmond, g. s. l.	Nev.	54,000	1	4,453,797	Dec. 23, '00	.01		United, z. l. pf.	Mo.	19,656	25		211,627	Oct. 15, '07	.50		
Rocco-Homes, l. z.	Nev.	300,000	1	152,500	Dec. 22, '06	.02		United Copper, c. s. Wash.	1,000,000	1		40,000	Dec. 21, '12	.01			
Rochester Ld. & L.	Mo.	4,900	100	190,846	July 1, '12	.50		United (Crip. Ck.) ..	Colo.	4,009,100	1		440,435	Jan. 1, '10	.04		
Round Mountain, g. Nev.	889,018	1		363,964	Aug. 25, '13	.04		United Globe, c.	Ariz.	23,000	100	759,000	3,335,000	June 30, '18	18.00		
Sacramento, g.	Utah	1,000,000	6	308,000	Oct. 22, '06	.00%		United Metals Sell. U. S.	60,000	100		11,000,000	Sept. 23, '10	6.00			
St. Joseph, l.	Mo.	1,464,798	10	10,972,631	June 20, '16	.25		United Verde, c.	Ariz.	300,000	10	1,620,000	38,047,000	July 9, '18	.75		
St. Mary's M. L.	Mich.	160,000	25	7,163,000	6,560,000	July 28, '16	2.00	U.S. Red & R. com.	Colo.	69,188	100		41,078	Oct. 9, '03	1.00		
Schoenh'r-Wal'n, z. l.	Mo.	10,000	10	90,000	Sept. 20, '11	.20		U. S. Red & R. pf.	Colo.	39,458	100		1,775,936	Oct. 1, '07	1.60		
Scratch Gravel,	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. R. & M. com.	USMx	351,116	60	965,566	7,590,745	July 15, '16	1.00		
Seven Tro. Co., g. s.	Nev.	1,443,077	1	252,632	Apr. 1, '15	.02%		U. S. R. & M. pf.	USMx	488,360	60	1,288,668	18,084,366	July 15, '16	.87%		
Shannon, c.	Ariz.	300,000	10	750,000	Jan. 30, '13	.60		Utah, c.	Utah	1,624,490	10	41,656,652	41,656,652	June 30, '16	3.00		
Shattuck-Ariz., c.	Ariz.	850,000	10	4,200,000	July 20, '16	1.25		Utah, s. l. (Fish Sps) Utah	93,000	10		293,720	Oct. 21, '10	.02%			
Silver Hill, g. s.	Nev.	108,000	1	89,200	June 24, '07	.05		Utah-Apex, s. l.	Utah	628,200	6	264,100	330,126	July 1, '16	.25		
*Silver King Coal'n	Utah	1,250,000	6	14,147,485	July 1, '16	.01		Utah Con., c.	Utah	300,000	6	460,000	9,600,000	June 26, '16	.75		
Silver King Con., ..	Utah	637,532	1	942,373	July 22, '15	.10		Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00		
Silver Mines Expl., ..	N. Y.	10,000	100	250,000	June 16, '10	2.00		Victoria, g. s. l.	Utah	250,000	1		207,600	Apr. 23, '10	.04		
Sioux Cons., l. s. c.	Utah	745,389	1	872,105	July 20, '11	.04		Victindicator Con., g. Colo.	1,600,000	1	135,000	3,397,600	July 25, '16	.03			
Skidoo, g.	Cal.	1,000,000	5	365,000	Oct. 2, '14	.01		Wasp No. 2, g.	S. D.	500,000	1	109,000	619,466	May 15, '16	.02%		
Smuggler, s. l. z.	Colo.	1,000,000	1	2,235,000	Nov. 22, '06	.03		Wellington, l. z.	Colo.	10,000,000	1	400,000	1,050,000	July 1, '16	.02		
Snowstorm, c.	Idaho	1,600,000	1	1,169,810	Oct. 10, '13	.01%		West End Con.,	Nev.	1,788,486	1		636,546	Jan. 15, '16	.05		
Socorro,	N. M.	377,342	6	177,205	June 1, '16	.05		West Hill,	Wis.	20,000	1	8,000	40,000	June 29, '16	.20		
South Eureka, g.	Cal.	299,381	1	1,388,764	July 15, '18	.07		White Knob, g. pf.	Cal.	200,000	10	40,000	170,000	May 29, '16	.10		
So. Swansea, g. s. l.	Utah	300,000	1	287,800	Apr. 3, '04	.01%		Wilbert,	Ida.	1,000,000	1	20,000	20,000	May 1, '16	.01		
Spearsfish, g.	S. D.	1,600,000	1	165,500	Jan. 7, '05	.01		Wolverine, c.	Mich.	60,000	25	380,000	8,760,000	Apr. 1, '16	6.00		
Standard Con., g. s.	Cal.	178,394	10	5,274,408	Nov. 17, '13	.25		Wolverine & Ariz. c. Ariz.	118,674	15		53,403		.25			
Standard, c.	Ariz.	425,000	1	69,600	Sept. 8, '06	.60		Work, g.	Colo.	1,500,000	1		1,697,685	Apr. 11, '12	.02		
Stewart, l. z.	Idaho	1,238,362	1	2,043,297	Dec. 31, '16	.06		Yak,	Colo.	1,000,000	1	120,000	2,127,685	June 30, '16	.07		
Stratton's Crip. Ck.	Colo.	2,000,000	1	300,000	Sept. 6, '08	.02%		Yankee Con., g. s. l.	Utah	1,000,000	10	15,000	1,675,000	Feb. 1, '13	.01		
Stratton's Ind.,	Colo.	1,000,000	5	5,028,669	Dec. 31, '06	.12		Yellow Aster, g.	Cal.	100,000	10		1,131,750	July 6, '16	.02		
Str'n's Ind. (new), ..	Colo.	1,000,000	30	691,250	Jan. 31, '16	.16		Yellow Pine,	Cal.	1,000,000	1	650,000	1,543,008	July 25, '16	.15		
Strong, g.	Colo.	1,000,000	1	2,275,000	July 9, '05	.02		Yosemite Dredg., ..	Cal.	24,000	10		102,583	July 15, '14	.10		

Corrected to August 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675,000

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1918	Total to Date	Latest							Paid in 1916	Total to Date	Latest		
						Date	Amt.	Date							Amt.	Date	Amt.
Ajuchitan,	Mex...	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.26	Las Cabrilas,	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00		
Amistad y Concordia g.s	Mex...	9,600	50		429,558	July 15, '08	1.23	Le Roi No. 2, g.	B. C.	120,000	25		1,527,320	Dec. 15, '16	\$0.24		
Amparo, s. g.	Mex...	2,000,000	1	200,000	2,132,176	May 10, '16	.06	Lucky Tiger,	Ont.	715,337	10	264,675	3,528,068	July 20, '16	.08		
Bartolo, de Medina Mill	Mex...	2,000	25		103,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,692	1	202,293	4,510,061	July 1, '16	.03		
Basotillas, s.	Mex...	445,268	20		56,870	Dec. 31, '07	.12%	Mexican, l. pf.	Mex...	12,500	100		1,018,750	May 1, '12	2.50		
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.,	Mex...	240,000	10		660,000	Mar. 10, '05	.25		
Belo, g.	Mex...	120,000	20		721,871	May 8, '11	.60	Mexico Mines of El Oro	Mex...	150,000	6		4,478,500	June 26, '14	.96		
British Columbia, c.	B. C.	591,709	5		615,399	Jan. 5, '13	.15	Minas Pedrazzini,	Mex...	1,000,000	1		497,500	Jan. 23, '11	.06%		
Buena Tierra,	Mex...	330,000	5		160,390	Jan. 30, '15	.24	Mines Co. of Am., ..	Mex...	900,000	10		4,958,600	July 25, '13	.12%		
Buffalo, Ont.,	Ont.	1,000,000	1		2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can.	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%		
Canadian Goldfields, ..	Can.	600,000	0.10		237,099	July 15, '14	.01%	Montezuma, l. pf.	Mex...	5,000	100		402,500	Nov. 16, '12	3.50		
Cananea Central, c.	Mex...	600,000	10		360,000	Mar. 1, '12	.60	Montezuma M. & Sm.,	Mex...	500,000	1		100,000	July 20, '09	.04		
Cariboo-Cobalt,	Ont.	1,000,000	1		295,000	Sept. 1, '15	.09	Mother Lode,	B. C.	1,250,000	1	137,500	137,600	Jan. 3, '16	.11		
Cariboo-McKinney, g., ..	B. C.	1,250,000	1		56,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex...	100,300			3,190,000	Oct. 11, '09	\$253		
City of Cobalt,	Ont.	500,000	1		138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	220,000	3,970,000	July 25, '16	.08		
Cobalt Central, s.	Ont.	4,761,500	1		132,845	Aug. 24, '09	.01	Nipissing, s.	Ont.	1,200,000	6	900,000	14,340,000	July 20, '16	.25		
Cobalt Lake, s.	Ont.	3,000,000	1		40,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	633,000	633,000	Feb. 1, '10	.02		
Cobalt Silver Queen, ..	Ont.	1,600,000	1		315,000	Dec. 1, '08	.03	Paloma, g.	Mex...	3,000			99,500	Dec. 1, '12	.05		
Cobalt Townsite, s.	Ont.	199,282	5		1,042,259	Aug. 20, '14	.22%	Panuco,	Mex...	10,000			7,465,000	Nov. 4, '06	5.00		
Conlagas, s.	Ont.	800,000	5	200,000	8,040,000	Feb. 6, '16	.25	Panoles, s. g.	Mex...	120,000	20		6,451,687	Sept. 3, '13	1.25		
Con. Mg. & Sm., g. s. c.	B. C.	63,050	100	420,517	2,740,654	July 1, '16	2.50	Peregina, pf.	Mex...	10,000	100		328,656	Sept. 1, '10	3.50		
Crown Reserve, s.	Ont.	1,999,557	10		6,102,408	July 16, '15	.03	Peterson Lake,	Ont.	2,401,820	1	84,064	340,287	July 1, '16	.01		
Dolores,	Mex...	400,000	5		1,374,885	July 24, '11	.22%	Pinguic, pf.	Mex...	20,000	100		700,000	Apr. 15, '13	3.00		
Dome Mines, s.	Ont.	400,000	10	400,000	600,000	June 1, '16	.50	Porcupine Crown, ..	Ont.	2,000,000	1	180,000	600,000	July 2, '16	.03		
Dos Estrellas, (El Oro)	Mex...	300,000	0.50		15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex...	6,000	15		953,390	Apr. 1, '08	1.00		
El Favor,	Mex...	3,500,000	1		210,000	Apr. 30, '14	.01	Rambler-Cariboo, ..	B. C.	17,500	100	52,500	472,500	June 15, '16	.02		
El Oro, g. s.	Mex...	1,147,500	1		9,136,842	July 11, '13	.24	Rea Mines, Leasing	Ont.	200,000	1		12,750	June 15, '16	.06%		
El Rayo, g. s.	Mex...	280,000	2		40,410	Apr. 24, '11	.15	Right of Way,	Ont.	1,655,500	1	16,555	6,654	June 15, '16	.00%		
El Triunfo, c.	Mex...	2,000,000	1		20,000	Aug. 24, '11	.01	Rio Plata,	Mex...	374,513	5		345,744	Feb. 1, '13	.06		
Esperanza,	Mex...	450,000	5		12,521,250	Dec. 31, '15	.50	San Francisco Mill, ..	Mex...	2,000	25		446,056	Oct. 15, '08	2.00		
Oranby Con., c. g. s.	B. C.	149,985	100	449,985	6,060,341	May 1, '16	1.50	San Rafael,	Mex...	6,000	25		6,798,260	Jan. 11, '12	1.00		
Oreneo-Cananea, c.	Mex...	474,411	100	1,458,627	5,894,432	May 29, '16	2.00	San Toy, s. l.	Mex...	6,000,000	1.00		540,000	July 24, '13	.01		
Oreneo Con., c.	Mex...	1,000,000	10	2,500,000	12,544,000	July 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex...	1,500,000	6	354,500	2,819,772	June 16, '16	.24		
Oreneo Gold-Silver, pf.	Mex...	300,000	10		194,871	Mar. 28, '07	.40	Sta. Gertr. Guadalupe, g. s.	Mex...	60,000			3,960,000	Mar. 27, '09	1.00		
Quanaquato Con.,	Mex...	540,000	6		600,000	Oct. 8, '06	.07%	Sta. Marie del Paz, ..	Mex...	9,600	12%		5,500,000	Jan. 2, '13	2.50		
Quanaul Dev. pf.,	Mex...	10,000	100		274,356	Jan. 1, '11	.30	Seneca-Superior, ..	Ont.	478,844	1	478,884	1,400,096	July 15, '16	.30		
Quangenhelm Explorat.,	Mex...	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.85	Soledad, s. l.	Mex...	960	20		4,439,340	Oct. 17, '11	8.00		
Haleybury, s.	Ont.	60,000	1		60,000	Apr. 6, '11	.60	Sorressa, g. s.	Mex...	19,200	20		3,979,240	Jan. 6, '11	34.00		
Hedley,	B. C.	120,000	10	120,000	1,913,200	Aug. 30, '15	.02	Standard, s. l.	B. C.	2,000,000	1	350,000	2,150,000	July 1, '16	.02%		
Hinds Con., g. s. l.	Mex...	5,000,000	1		88,000	Feb. 27, '08	.03	Temiscaminc, Hudson Bay	Ont.	761	1		940,250	Nov. 1, '16	.06		
Humber,	Ont.	600,000	6	220,000	5,130,000	July 14, '16	.20	Temiskaming, s.	Ont.	2,500,000	1	75,000	1,534,156	July 22 '16	.03		
Jimulco, c.	Mex...	10,000	100		975,000	Feb. 27, '11	1.00	Tezintlan, c.	Mex...	8,000	100		1,955,000	Jan. 1, '09	1.50		
Kerr Lake, s.	Ont.	600,000	5	300,000	6,420,000	June 1, '16	.25	Tough-Oakes,	Ont.	551,500	6	199,311	265,750	July 3, '16	.12%		
La Blanca,	Mex...	140,000	20		2,775,700	Mar. 31, '13	.90	Tretheway, s.	Ont.	1,000,000	1		1,061,988	July 15, '16	.06		
La Republica, s.	Mex...	400,000	5		110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.,	Ont.	1,416,590	1		656,386	Oct. 20, '13	.06		
La Rose Con., s.	Ont.	1,498,627	5	224,793	5,811,913	July 20, '16	.06	Yukon, g.	Y. T.	3,500,000	6	525,000	8,108,110	June 30, '16	.07%		

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SILVER KING COALITION MINES CO., PARK CITY, UTAH. UPPER TERMINAL OF TRAMWAY IN FOREGROUND.

Operations of Silver King Coalition Mines Co., Park City, Utah

W. A. SCOTT.

The Silver Hill underground hoisting and compressor station, of the Silver King Coalition Mines Co., Park City, Utah, was completed a year ago, and installations have since been made. This station, situated at the interior terminus of the 9400-ft. Alliance tunnel, is 1650 ft. vertically below the surface, and is central to a large territory of the company's undeveloped ground. The main working shaft of the property, near the collar of which the shops, mill and offices are situated, opens the mine to a depth of 1300 ft. It is connected to the Alliance tunnel by a 2200-ft. crosscut, driven from the shaft's 500-ft. level. In all operations at the Silver Hill station, the waste is hauled out through the Alliance tunnel, and all the ore is taken to the main working shaft and hoisted to the surface, where the mill and upper terminal of the tramway are accessible. The space cut out for the Silver Hill station was divided into two arch-roofed chambers. One of these, 50x35 ft., contains the hoist and steel headframe; the latter, set upon concrete piers, 8 ft. high, reaches a height of 46.5 ft. to the center of the 6-ft. sheaves. The other chamber, 44x25 ft., is the compressor room. These chambers are protected by concrete walls, and supported in their centers by 18-in. I-beams.

The larger chamber contains a Wellman-Seaver-Morgan double-reel, first-motion, electric hoist, oper-

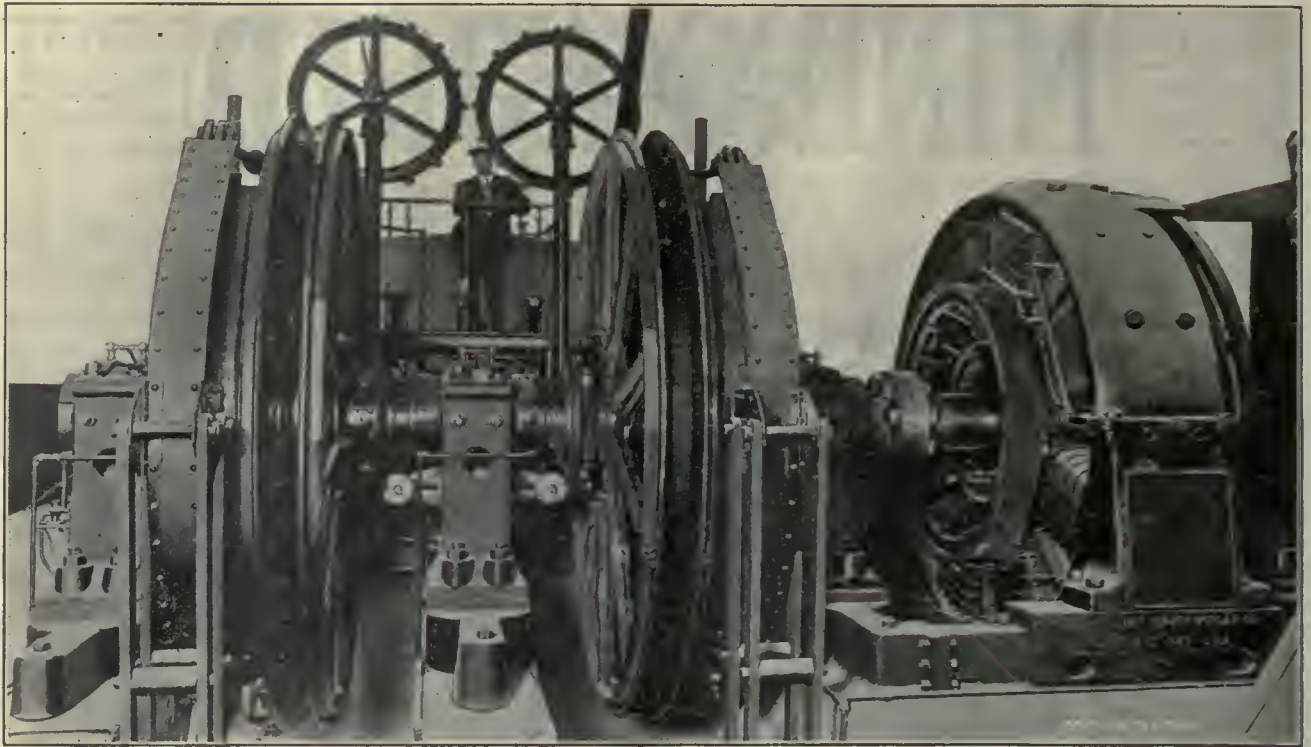
ated by a 400-hp. motor. The hoist cables are the flat-rope type, $1\frac{1}{2} \times 4\frac{1}{2}$ ins., having a length of 1600 ft. Each cable is attached to a skip of 52-cu. ft. capacity, operating in the Silver Hill interior shaft. This type of skip was designed by James Humes, manager of the property, and they were made in the Silver King shops.

The other chamber contains two Sullivan air compressors, 2-stage, angle type. One of them is rated at 147 hp., having a capacity of 704 cu. ft. per minute, and is belt-driven by a synchronous motor-generator set; the other machine has a capacity of 873 cu. ft. per minute, and is direct-connected to a synchronous motor. These compressors supply air for operating the shaft pumps and drills used in shaft sinking, which has been in progress several months.

Included in the electrical equipment at this station is one direct-current generator driven by a synchronous motor; one direct-current motor, direct-connected to hoist shaft; and other accessory equipment. In the main hoist room is a 10x12 double-cylinder, single-drum hoist for handling shaft pumps.

Pumping Equipment.

Sinking pumps are used, as sinking progresses, to raise water from the bottom of the shaft to cement tanks at each 200-ft. station. A Jeanesville pump, of



SILVER HILL STATION, SHOWING ELECTRIC HOIST AND HEADFRAME.

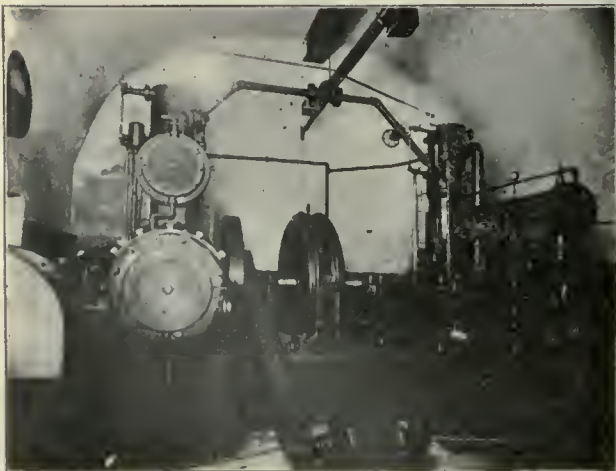
600 gals. capacity, is stationed at each of the station tanks. At the 600-ft. level is stationed a 750-gal., 4-stage Worthington pump, operating against a head of 600 ft., delivering water at the tunnel level.

In sinking this shaft, the skips are too large to load quickly in the bottom of the shaft, so provision is made to hang a large mine bucket under the skip, as shown in one of the accompanying illustrations. The bucket, hung below each skip, is loaded, raised, and dumped into pocket chutes at the several levels. This material is afterward hoisted in the skips and dumped into pockets at the collar of the shaft. These skips have valves in the bottom, so they may be used as bailers of water when occasion requires it.

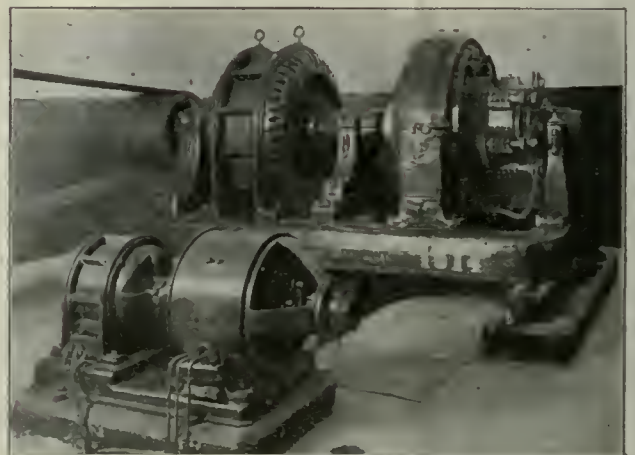
In the old workings, tributary to the main shaft, there are as strong ore bodies and as high-grade ore on the 1300-ft. level as was formerly mined in the

higher levels; and development and production proceeds on levels above the 1300 in a direction toward the Silver Hill station.

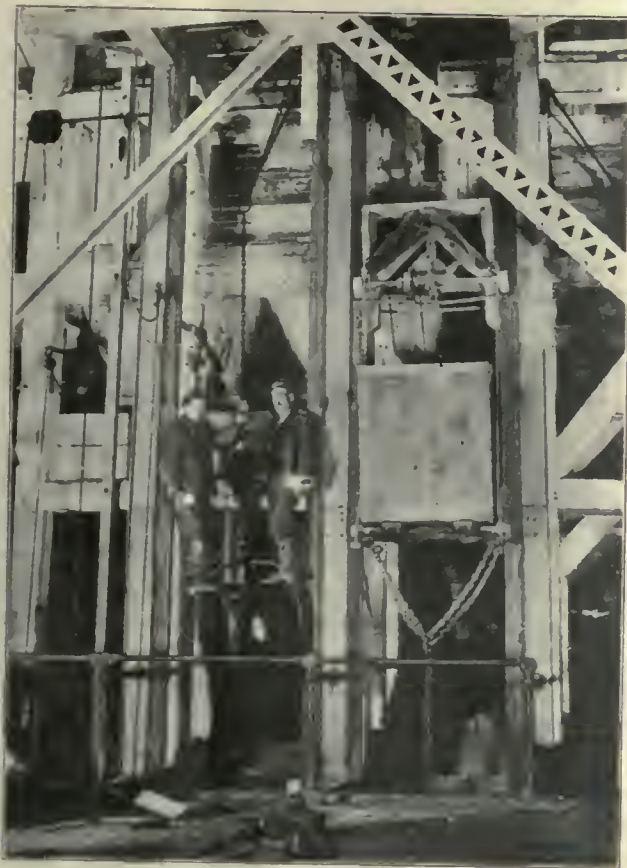
The mine is producing 100 tons per day of smelting ore, averaging a value of \$60 per ton. The mill is handling about 200 tons per day, the sulphides and carbonates coming to the mill in about equal amounts. The mill treatment of the two classes of ore are the same down to the place of handling slimes. Double-deck Deister tables, made by Deister Concentrator Co., have been installed to handle slimes from the carbonate ores, about 85% of the metals being saved. The first product is made on Hartz jigs, the reject all being reground in a Marcy mill, the pulp from which is concentrated on Wilfley coarse tables. The sulphide slimes are treated in Callow flotation cells. The carbonates, from the old workings, run 7.2 ozs. silver,



AIR COMPRESSOR AT SILVER HILL STATION.



MOTOR GENERATOR SET AT SILVER HILL STATION.



SHAFT, SILVER HILL STATION.



BACK VIEW OF SKIP CHUTES.

5.5% lead; the sulphides, from the 1300-ft. level, average 10 ozs. silver, 7% lead; the Alliance tunnel sulphides average 5 ozs. silver, and 6.9% lead. In milling the carbonates, a recovery of 85% is made, and about a 90% recovery is made on the sulphides. The concentrate products are worth about \$50 per ton. W. F. Devlin is mill superintendent. Information furnished and courtesies extended by James Humes, general manager, are hereby acknowledged.

Carnotite is a mineral containing vanadium and uranium in varying proportions. Commercial grades run about 4% vanadium oxide and 2% uranium oxide.

Foreign Copper Visible Supply.

The copper visible supply in England, France and afloat thereto increased 492 tons from Aug. 15 to Sept. 1, being 13,062 tons on latter date. Recent figures of visible supply compare:

	1916.	1915.	1914.	1913.	1912.
Jan. 1.....	20,064	30,309	21,034	40,380	57,283
Feb. 1.....	17,646	30,002	16,865	38,228	55,570
Mar. 1.....	16,734	29,252	18,559	36,176	51,507
Apr. 1.....	12,201	23,883	17,923	32,291	50,175
May 1.....	16,046	26,314	20,360	30,467	49,771
June 1.....	15,310	28,917	24,352	29,634	44,618
July 1.....	15,376	32,868	25,698	28,172	41,623
Aug. 1.....	13,188	35,063	26,739	28,374	45,026
Sept. 1.....	13,062	34,064	27,933	26,536	45,666
Oct. 1.....		28,933	29,671	22,583	44,238
Nov. 1.....		24,835	31,443	21,380	43,330
Dec. 1.....		20,895	30,626	21,514	40,746

Explosives and caps or detonators should not be left in the mine or anywhere else where they cannot be protected from shock or accidental ignition.



TWO ELECTRIC 3-TON MOTORS IN FOREGROUND, SILVER HILL STATION.



FRONT VIEW OF SKIP CHUTES.

The French Electrolytic Process.

The French process consists in the use of a solution of bisulphide of soda, and a small quantity of manganese. Bisulphide of soda rapidly dissolves the zinc from the roasted ore. Along with the manganese in solution, it completely prevents the anodes from being affected. This solution has little resistance to the passage of the electric current in the electrolytic vats, and the consumption of current is thus lowered. It has also the peculiarity of throwing out of solution practically all the impurities which usually contaminate the zinc. A demonstrating plant erected at Silverton, on Slocan Lake, by the Standard Silver-Lead Mining Co. proved that the process would work on a large scale. It comprised two completely equipped dissolving vats, each capable of dealing with 2500 lbs. of liquor at a time and about 1000 lbs. of ore. The zinc-depleted liquor containing bisulphate of soda from the electrolytic vat is pumped into the upper of these two vats. There is then added 700 to 1000 lbs. of roasted ore from which the zinc had been partly extracted in a previous operation. In about an hour, solution of the zinc is finished, and when the liquor has settled for a short time it is allowed to run down into the second dissolver, placed at a lower level. The sludge remaining in the bottom of the dissolver is then pumped through a filter press to remove the water and the residue contains all the silver and lead. As the sulphur to the extent of more than 20% has been driven off in the roasting operation and zinc to the amount of about 40% has been extracted, the residue of the ore only weighed about 45% of the original ore used. As it contained all the silver and lead originally in the roasted ore, the percentage of these metals was more than doubled. For instance, the ore treated assayed 31% zinc, 3.5% lead, and 32 ozs. silver. The zinc-depleted residue contained 76 ozs. silver and 8.7% lead, and 92% of the zinc had been taken out, that is, 2.7% of the zinc counted on the original ore used was left in the residue. This residue is now ready for smelting or other treatment for the recovery of its lead and silver in the usual way. To the liquor which has been run down into the second dissolver, a quantity of roasted ore is again added to neutralize the bisulphate of soda. As soon as this has taken place, the liquid settles rapidly to a clear solution, which is pumped through a clarifying filter press, and is then ready to have its zinc deposited in the electrolytic vats. At the plant only one electrolytic vat was used, as the dynamo power at disposal was limited. Nine anodes were used and eight cathodes of the largest size, each with an area of 8 sq. ft. Although 4000 kilowatt-hours were allowed for the deposition of one ton of zinc, only 3000 kilowatt-hours were actually required, the lowest reading over a period of 48 hours having been 2680 kilowatt-hours. As the zinc is deposited from solution in the electrolytic vat, the bisulphate of soda with which it was combined is regenerated and is used

again in the next dissolving. The working costs vary with the ore, but they are now well defined. The plant is expensive, but much less than that required for a zinc smelter of similar capacity. Ores of almost any grade above 10% can be treated equally well, but naturally the cost of treatment for an ore with a larger zinc content is less.

Bonds for building a new plant have been guaranteed by the Canadian government and work is rapidly going ahead.

International's Canadian Nickel Smelter.

The proposed new refinery to be erected in Canada for the refining of Canadian nickel to supply the needs of Great Britain and her foreign possessions will call for an expenditure of \$8,500,000.

A subsidiary concern has been formed in Canada to own and operate the new plant and its \$5,000,000 capital stock will be owned by the International Nickel Co.

Nickel prices have shown comparatively little advance beyond the normal level except where desired in the fine arts. On nickel sold for such requirements a premium has been demanded. At the present time the company's quotation ranges from 24 to 42 cts. a pound according to specifications; where higher than normal prices, they do not exceed 5%.

It is the general belief that there will develop after the war a greater demand than now exists for the products of the International Co. Shipyards all over the world have been straining every effort to get out new vessels. The construction of marine equipment promises to continue at a record breaking pace after peace has been established and this alone augurs well for the world's largest producer of nickel.

At the Copper Cliff mines there has been installed hoisting equipment capable of raising 4000 tons of ore in 8 hours. This, operated one shift a day, will more than care for the present milling and smelting requirements of about 3500 tons daily and enable the company to build up a reserve in bins against the day when a greater tonnage will be needed.

The company's operations now result in an output of approximately 5,000,000 lbs. of nickel and 3,000,000 lbs. of copper monthly or a total of 60,000,000 lbs. and 36,000,000 lbs. respectively per annum.

Krupps Buy Copper Mine.—A recent dispatch from The Hague stated that the Arthur Krupp Metal Co. had purchased the Mitterberger Copper Mine Co., thus placing the Krupps of Essen "independent of the copper market." The Mitterberger is an old property opened in 1827. It is located in the Austrian Tyrol, and for years the output averaged something over 1,000,000 lbs. of copper a year. It was 1,254,000 lbs. in 1905, 1,059,000 in 1906, and 1,730,000 in 1910. The 1911 output was estimated at 3,300,000 lbs. The mine employs about 200 men.

Notes on the Chemical Assay of Tin Ores

A. M. MATHESON.*

The object of the following notes is to show the difference between fire and chemical assays carried out on a highly pyritic tin ore, and to show the impossibility of estimating mill losses by the vanning and fire method.

The tin occurs in the ore under consideration as cassiterite (SnO_2), the sulphur being mostly combined with Fe, As, Sb, Cu, Pb, etc.

Stannite may occur very sparingly, but, being soluble in the preliminary acid treatment, it would not play a part in either the fire or chemical assay. The preliminary treatment this ore receives is the usual crushing and concentration with jigs, Wilfley tables, and vanners. The whole of the pyritic concentrate is calcined, and a secondary treatment of the same kind follows. The resulting concentrate for sale averages about—Sn, 71.00%; Pb, 0.29%; S, 0.31%; and As, 0.10%.

The writer carried out numerous experiments to determine the mill losses, both by fire and by chemical assays, and a few are here quoted. The fire assay used is that of vanning after digestion, and fusion with cyanide method. The chemical assay is the Pearce-Low method, as follows: 0.5 gm. finely-ground ore is digested with aqua-regia and filtered, the filter paper and contents ignited, and fused in a nickel crucible with NaOH.

The cake is dissolved with water and about 30 cc. HCl, transferred to a conical flask, and 50 cc. excess HCl added. A strip of nickel is inserted, and the solution boiled for 1½ hours; the stannic chloride is then reduced to stannous chloride. The nickel is then removed, and a piece of carbonate added to prevent oxidation, the assay cooled and titrated with standard iodine solution with starch indicator.

The three products under consideration in the following assays are: (1) battery pulp, (2) tails from primary treatment, (3) tails from secondary treatment.

(1) Battery Pulp— Fire assay. Per cent.	Chemical assay. Per cent.	Ratio of chemical to fire.
1.29	2.48	1.92
1.20	2.10	1.75
1.70	3.14	1.84

The above assays are taken from a number done on the same product, but from different samples, and it will be seen that the fire-assay result is a little over 50% of the chemical-assay value. In the fire assay 100 grm. ore were taken.

(2) Primary Tails— Fire assay. Per cent.	Chemical assay. Per cent.	Ratio of chemical to fire.
.10	.84	8.40
.19	1.03	5.42
.12	.96	8.00

*Proceedings of the Australasian Institute of Mining Engineers.

The above assays are taken from a number done on the same product, but from different samples, and it will be seen that the recovery by fire assay (about 14.5%) is very much lower than would be expected. However, in making a comparison between this recovery and the recovery of 50% in the pulp product, it must be remembered that all the easily recoverable oxide has already been taken out by the plant, and only the very fine slime concentrate left for vanning. In the fire assay 100 grm. ore were taken for vanning. Although quite an appreciable amount of oxide was obtained, the resulting tin button was very small indeed (in some cases only about 20% of the oxide obtained), showing that a further loss took place in the fusion, the tin oxide probably going into the slag in combination with the silica as stannous silicate.

In vanning this tail product it is not possible to get rid of all the silica without making a very great loss of oxide. It becomes questionable, however, whether the loss made in thoroughly cleaning the oxide would be greater than the loss in the fire when smelting in the presence of silica. The writer came to the conclusion, after numerous experiments, that a 100 grm. charge of this product was much too large to handle without a great loss, so a 10 grm. charge was tried, with the following results:

	Per cent.
Chemical assay	0.84 Sn.
Oxide obtained	0.60 Sn.
Metal estimated at 70%	0.42

This shows a recovery of 50% of the chemical value by vanning. The oxide obtained in this case was considered too small a quantity to smelt, and was estimated at 70% metal.

Considering the loss that must have taken place in vanning this oxide clean, and the subsequent loss that would have taken place in the fire if smelted, it seems reasonable to suppose that the oxide actually weighed should equal 70% metal or more. It seemed almost impossible to reach anything like finality in vanning this tail product, a fair proportion of the tin oxide always remaining in suspension even after long settlement. A grading analysis carried out on this product resulted as follows:

Bulk Chemical Assay, 1.24%.					
Sieve.	Grade.	Assay.	Product.	Tin.	Percentage.
+20 .....	.....	.....	.....	.....	.....
+40 .....	.....	.....	.....	.....	.....
+40	29.8	1.00	29.8	29.0	.....
+80	22.5	.80	18.00	17.60	.....
+100	7.0	.60	4.20	4.10	.....
+120	17.30	.60	10.40	10.20	.....
—120	23.40	1.72	40.30	39.10	.....
Total	100.00	1.24	102.70	100.00	1.03

The result of this grading analysis does not check with the bulk assay as well as might be expected, but the low result is most probably due to the mechanical

(filtration) loss that takes place, more especially in the finer grades.

(3) Secondary Tails— Fire assay. Per cent.	Chemical assay. Per cent.	Ratio of chemical to fire.
.24	.68	2.84
.15	.48	3.20
.18	.52	2.90

The above assays were taken from a number done on the same product but from different samples, and also show a very low recovery by fire assay (about 33% of the value as shown by the chemical assay). A 100 grm. charge was used in vanning for the fire assay. This was also a very difficult sample to van, and the same remarks apply as to vanning and fusion losses as in the case of the primary tail sample. When a 10 grm. charge was used in vanning the results were as follows:

Fire assay. Per cent.	Chemical assay. Per cent.	Ratio of chemical to fire.
0.40	0.80	2.00
0.36	0.60	1.66
0.30	0.56	1.87

These assays show a much better recovery by fire, but the vanning and fusion losses are still considerable.

In order to find out what extraction might reasonably be expected from a slime table operating on these two tail products, the following vanning experiments were carried out, the conditions being as near as possible to those obtaining in actual work:

(1) Vanning primary tail for 15 minutes without acid treatment, and in dirty water.

(Chemical assay value, 1.24% Sn.) The pyritic concentrate obtained was acid treated, resulting in oxide equal to 0.70%, estimated metal 0.49%, showing that the table might be expected to save about 40% of the tin contents.

(2) Vanning secondary tail for 15 minutes without acid treatment, and in dirty water.

(Chemical assay value, 0.88%.) Oxide obtained 0.60%, estimated metal 0.42%, showing that the table might be expected to save about 48% of the tin contents. It might be mentioned here that a Cornish round table is now operating on this tail product, and has made an average saving of 50%. In these products under consideration it will be noticed that the tin values vary very much indeed; but such is the case, and this condition seems to be consequent on physical changes being encountered in the ore in the mine. The more pyritic the ore becomes the greater are the losses in the tails from primary treatment. The chemical assay records these physical changes very faithfully, while the vanning and fire assay—even if carried out very carefully—fails almost completely to show these changes. Before the introduction of the chemical assay by the writer, these mill losses were estimated by fire assays, and it would appear that they were carried out with more regard to speed than to accuracy. Records taken over some years show little or no variation. The extraction by the plant estimated by these fire assays would be anything from 90 to 97%, which is altogether too high to expect from even the most up-to-date plant on this class of ore. The extraction estimated by the

chemical assays is very much lower, and certainly much nearer the truth, but does not necessarily show that the plant is not doing good work.

When nickel became unprocurable owing to the war iron in the form of horseshoe nails had to be used as a reducer in the chemical assay. The results occasionally were low and unreliable probably due to oxidation taking place. HCl acts much more readily on iron than on nickel, consequently less iron had to be used. Apparently all the acid of the assay was used up in the formation of ferrous chloride none being left to form CO₂ with the carbonate and oxidation appears to have taken place.

The following assays were carried out, varying the number of nails used to test this suspected oxidation. These assays were carried out on a pulp sample, the correct assay of which was 3.08% Sn:

1.—4 nails.....	1.48% Sn.
2.—4 nails.....	2.52% Sn.
3.—2 nails.....	3.08% Sn.
4.—2 nails.....	3.08% Sn.

Oxidation did not always take place with four nails, but the results were low and unreliable. A considerable number of tests were carried out on different samples of a similar product, and a few are here quoted: Nos. 1, 2, 3 and 4, 3.28%, 3.24%, 3.00%, using two nails each.

Using two nails only the results became constant and reliable, there being sufficient free acid left in the assay to form CO₂ with the carbonate and prevent oxidation. A further test was made on sale concentrates assaying 70.00 Sn by the fire assay; (1) one nail gave 63.07% and (2) two nails gave 69.74%.

The following assays on the pulp and tailings show the results of using too much iron:

- 1.—Mill pulp—4 nails, 0.74%; 2 nails, 1.26%.
- 2.—Primary tails—4 nails, 0.52%; 2 nails, 0.70%.
- 3.—Secondary tails—4 nails, 0.36%; 2 nails, 0.78%.

According to some authorities, the chemical assay gives high results, and certain impurities tend to make results high; however, that has not been the experience of the writer. Sale concentrates, which must necessarily contain all the heavy impurities of the original ore, concentrated, invariably give slightly low results as compared with the fire assay. These impurities must have, therefore, little effect on the assay of the pulp and tail products.

The Effect of Wolfram.—In particular it has been stated that wolfram interferes with the chemical assay and gives high results. The following test was made on an ore assaying 30% WO₃ and 4% Sn. This was treated as an ordinary tin-ore assay, using iron as a reducer, with the result that the assay assumed a deep blue color shortly after reduction commenced, owing to the formation of a tungsten tungstate. Titration with iodine was impossible. However, the obvious thing to do with an ore carrying any

tungsten would be to extract the H_2WO_4 with ammonia, evaporate the ammonium-tungstate, and estimate as WO_3 , then proceed with the residue on the filter as a tin assay.

The writer does not contend that the chemical assay should take the place of the vanning assay in estimating mine samples. The latter is shorter, and certainly serves as a guide as to what should reasonably be expected from the mill; however, the estimation of the oxide obtained after acid treatment and careful vanning should be near enough, taken at 70% metal, without going to the extra trouble and expense of smelting, knowing that a further loss in the fire is almost sure to take place. For instance, in the case of the Cornish table previously referred to, where vanning assays gave an expected extraction of 48%, the table, when installed, actually saved 50%. It is evident, therefore, that as a guide to mill work the vanning assay has its uses.

Tin Mining in the Federated Malay States.

Details regarding the tin mining position in the Federated Malay States are given in the 1915 report of the Senior Warden of Mines just issued which states that the most serious effect of the war upon the industry was the rise in freights and insurance, and the consequent increase of cost of placing the output on the London market. In the beginning of 1915 freight from Singapore to London was £1 10s per ton; by the end of the year it had risen to £4. The following comparative table is given of the output and value of tin from the four States composing the Federation:

	1915. Tons.	1915. £
Perak	27,776	4,255,603
Selangor	13,938	2,135,236
Negri Sembilan	1,244	189,699
Pahang	3,808	584,430
	46,766	7,164,968
	1914. Tons.	1914. £
Perak	28,557	4,110,530
Selangor	15,103	2,173,999
Negri Sembilan	1,697	244,292
Pahang	3,685	530,433
	49,042	7,059,254

It is estimated that mines under Chinese management produced about 72% of the total output, against 76% in 1914.

When the Mines Department census was taken at the end of the year the total labor force was 164,457 (all of whom, with the exception of 1228 men, were employed on tin mining), as against 171,689 in 1914 and 225,405 in 1913. Chinese are chiefly employed in the mines, the total of this nationality being 156,514 as compared with 5313 Indians and 2372 Malays, while the number of Europeans has increased from 184 to 205, probably on account of the steady increase in the use of machinery for mining purposes. A notable

change during 1915 was the alteration in the proportions of laborers on tribute, contract, or wages, the comparison for two years being as follows:

	1915.	1914.
Tribute	85,589	101,909
Contract	45,070	40,110
Wages	32,131	27,309
Individual licenses	1,667	2,361

In spite of war conditions, the expansion in the use of machinery has continued, though the increase is mostly due to existing plants being again brought into use and to the completion of installations that have been in progress for some time. In Perak a large steam electric plant that has been closed down in 1914 was again brought into operation, and the Gopeng Consolidated hydraulic plant came into use. Taking the local average of eight laborers per horse power, the aggregate is equal to a labor figure of 449,576 in 1915 against 332,984 in 1914 and 206,048 in 1913, a point to be borne in mind when considering the drop in the manual labor supply. At the beginning of the year three bucket dredges were at work; at the close the number had increased to 10 (all in Perak), capable of handling about 30,000 cu. yds. per diem, exclusive of the small dredge used in Tronoh for treating tailings. A dredge was under construction in San Francisco for a company operating near Bentong, in Pahang.

The Senior Warden of mines concludes his report with the following remarks: "The industry was carried on steadily throughout the year, and notwithstanding the decreased output, the rise in prices enables a satisfactory position to be reached; and if the demand keeps up the following year should, with cautious management, show a similar result."

Alloy From Slag.

The reclamation of ferro-alloys of manganese and silicon from bessemer and open-hearth furna e slag by a profitable process is reported to have resulted from research work at present carried on by two undergraduate students of the Carnegie Institute of Technology, Pittsburgh. The slag has hitherto been relegated to dumps in many cases, and used in various ways—crushed, as ballast for railroad tracks and granulated, in the manufacture of Portland cement. Now comes its entrance as a valuable by-product. An electric furnace has been developed whereby it is claimed the high priced ferro-manganese and ferro-silicon can be extracted from the slag at a reasonable cost.

After the first of the year, when the stocks of ferro-manganese in Germany were believed to have been exhausted and no more ore was likely to be imported, much speculation was encountered as to the course Germany would take in employing a substitute. Now it is generally conceded that the huge slag piles in the vicinity of Westphalia are being worked to give up their manganese.

Method of Mining Talc.

F. R. HEWITT.*

The methods of mining talc are simple, and in western North Carolina are almost entirely by open cut and quarry. The larger part of the talc of this section lies in various-sized "veins" inclosed in quartzitic walls, the majority of which have by folding been thrown into a perpendicular position, or nearly so, and the exposed edges of which have been covered by debris from erosion of the mountain above. This covering of loose rocks and earth is from 5 to 25 ft. thick, and in most cases has to be removed because it is difficult to support. Sometimes the covering is heavy enough to "catch" and timber successfully, and in this case the talc can be worked out by the usual method of following the "vein," using stulls for holding up the walls until the vein is worked out, and then allowing the cut or drift to fall in.

In some cases it proves more convenient to sink shafts and run drifts, following the talc "veins" until exhausted. The talc deposits of this section are badly broken and faulted both laterally and perpendicularly, and in some cases are found many feet below the level of drainage, necessitating pumping at considerable expense.

My own experience in mining talc has been that the chief point is to get a reliable "vein," and that then the mining is not as difficult, or any more so at least, than that of any common ore. If the veins are pure talc it is simple; if the talc is admixed with foreign matter, such as tremolite in excess, or stains of iron or manganese, as is often the case, one had better abandon the deposit.

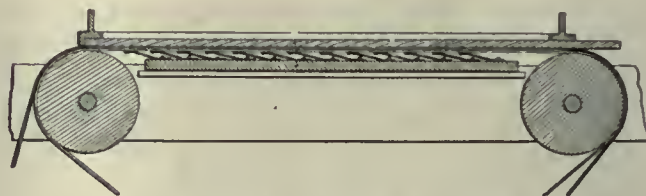
Talc, being a soft mineral, is not difficult to reduce to the condition desired by the trade. Powdered talc is admitted under low duty from France, Italy and Austria, and some is being imported from Asiatic points. Talc is usually ground and bolted in any simple reduction mill. That mined in this section is hand-sorted and the quality that will make good powdered talc is ground for use in the manufacture of talcum powder, cosmetics, etc., while all that is hard enough and has sufficient strength is used for crayons and blanks for gas burners and electrical work, being sawed into the shapes desired. The rest that is clean and pure is ground in mills, of which many different kinds are used. Some people like the mill stone, while others prefer the many kinds of high-speed beater mills for grinding.

The manufacturing process can be summed up as follows: More or less hand-sorting may be necessary, and in grinding the talc must be reduced sufficiently to pass through a 170 to 200-mesh sieve, silk cloth reels being commonly used. Among the objectionable impurities which it is almost impossible to remove are lumps of tremolite and pyrite. They destroy the value of the talc by changing the color and making a coarse and hard gritty product which is not saleable.

Most of the talc sold is used in the paper, rubber and paint trade, while the lower grades go largely into roofing. About one-quarter of the production goes into talcum powder. Not a little is employed as a body or carrier of medicinal chemicals used in tablet form. Much of the talc or soapstone is cut with small saws into crayons of various sizes for use in the iron-working trades and on blackboards. A growing business is the manufacture of gas burners and small blocks for electrical work, which, after shaping and burning, are known as lava goods. The two last, crayon and burner manufacture, are the most important uses of talc, but the greatest difficulty is to find mineral of the proper quality, as it has to be solid, firm, and free from grit and other foreign matter.

Flat-Glass Blue-Print Machine.

In most blue-print machines, the sensitized paper passes from the roll under a curved glass and in close contact with the latter. If, thus glass is broken, as it often is, there is difficulty in replacing it. It is desirable, therefore, that the printing be done through a flat glass, which can be obtained anywhere upon short



FLAT-GLASS BLUE-PRINT MACHINE.

notice. Roy T. Giles, of Charleston, W. Va., has invented such a machine, which is shown in the sketch. The vertical glass plate is shown in section. The paper is carried through the machine and in close contact with the flat glass by a traveling apron. The two are held flat against the glass by means of a large number of horizontal, resilient pressing strips, also here shown in section.

Rand Gold Mines Close Contract for Cyanide.—

It is learned on good authority that a contract has been entered into whereby a majority of the Witwatersrand gold-mining groups will draw all of their cyanide supplies during the period of the war and for 5 years thereafter from the Cassel Cyanide Co., of Glasgow, a minor portion of this supply to be furnished by the British Cyanide Co. It is also stated that the Rhodesian mining companies will probably enter into a similar contract for their cyanide supplies. South Africa's imports of cyanide of sodium for mining uses amounted in 1913 to \$1,931,075.; in 1914, to \$1,812,430; and in 1915, to \$2,453,015.

The borax deposits of the United States are of great extent and there seems to be little danger of their exhaustion.

*Bulletin American Institute Mining Engineers.

Improved Multi-Stage Centrifugal Pump

The development of the steam turbine and the high efficiency multi-stage centrifugal pump have gone hand in hand, but up to the present it has not been entirely practicable to reconcile the speeds of the two machines so that each would work at its best efficiency.

It was necessary, heretofore, to reduce the speed of the turbine and sacrifice much of its efficiency or else speed up the pump with similar results. To overcome this difficulty the Cameron Steam Pump Works, 11 Broadway, New York, have designed and built a multi-stage centrifugal pump known as the "B-T" type.

Fig. 1 clearly shows the construction of one of these three-stage pumps. The high speed feature is a virtue of impeller design. With the ordinary impeller the diameter cannot be reduced sufficiently to get high speed without sacrificing vane length, and consequently efficiency for a certain vane length is very necessary

the pump and for displacing the air when starting. Inlet and outlet nozzles can be arranged either on the same or opposite sides—an important advantage where pumps are installed in limited space.

The shaft is made of high-grade forged steel accurately machined and ground, and wherever it comes in contact with the fluid being pumped, it is thoroughly protected by bronze sleeves, which prevent the stuffing box packing from scoring the surface of the shaft.

Each impeller is cast solid in one piece and is of the enclosed type. Surrounding each impeller hub is a pair of rings—one stationary, attached to the casing, and one revolving, attached to the impeller. By the use of double rings instead of a single ring it is possible to restore the initial tightness of the joint between the low and high pressure sides of each stage without any fitting whatever, whereas a new single ring would have to be of special diameter, and then fitted to the impeller hub, or the casing to make a tight joint.

The diffusion ring surrounds the impeller at its periphery, although it is not in contact with it. It contains a series of openings, which receive the water

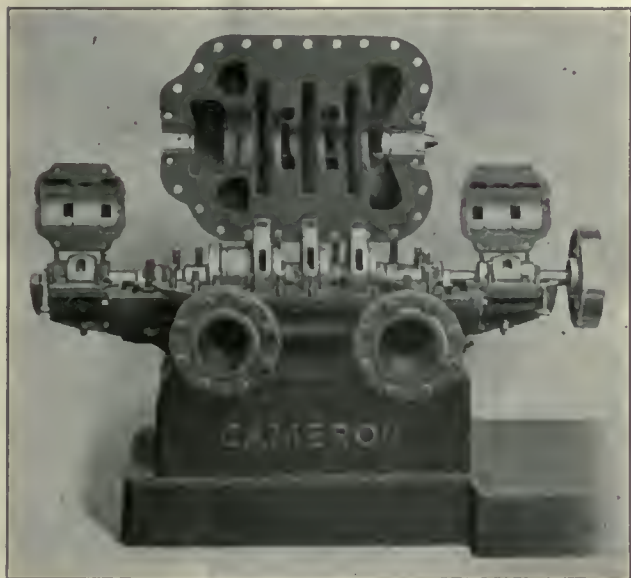


FIG. 1.

in order that the impeller may perform its function without excessive loss. Small external diameter and adequate vane length are obtained in this pump, by bringing the vanes well down into the impeller hub, at the same time so turning them that the incoming water is guided smoothly, and with little loss into the outer portion of the vanes where the velocity is generated that is finally converted into useful pressure by means of the external diffusion vane. Additional advantages in the small impeller are light weight and low fibre stresses in the material.

The casing is divided along the horizontal center-line. Both the suction and discharge connections are in the lower half of the casing. The upper half is readily removable, giving full access to the revolving element. There are suitable openings for draining

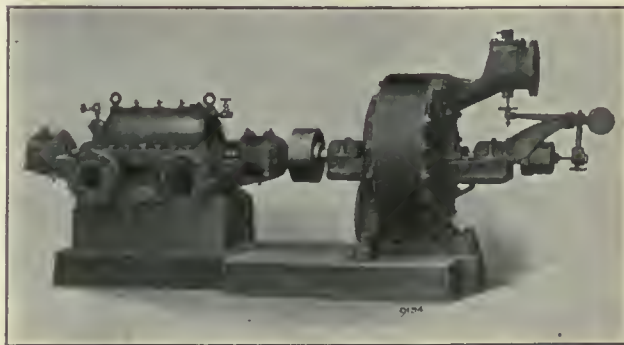


FIG. 2.

from the impellers at high velocity and by means of gradually increasing area toward the periphery, reduce the velocity into pressure and enable it to advance to the entrance to the next impeller with much less loss of energy than would be the case if the high velocity of ejection were maintained.

To take care of thrust, which manifests itself in all multi-stage pumps, this pump is equipped with a simple internal hydraulic balancing device, consisting of a revolving disc attached to the shaft at the inboard or high pressure end. Opposite this disc is a stationary drum of the same diameter. Water at high pressure connects with the space between the disc and the drum, causing the disc to react against the opposing thrust, neutralizing it and holding the rotor in proper relation to the casing. The slight leakage involved in this process is piped back to the suction.

On this pump, there are two ring-oiled bearings, self-aligning, one located on each side of the casing.

The bearing bodies are horizontally split, with removable caps, and the bushings are also split and lined with high-grade bearing metal. Bushings and bearing bodies have a spherical fit, automatically maintaining the alignment of the shaft. The bearings are of ample proportions to prevent heating, and the oil chamber is of liberal capacity. The bearings are supported by strongly ribbed brackets, cast integral with the lower casing, thus counteracting any possible tendency towards even slight vibration. These brackets are located sufficiently distant from the stuffing boxes to permit of adjustment of the glands. Felt washers are provided to prevent oil escaping from the bearings.

The stuffing boxes are deep and provided with water seals, consisting of a lantern gland in each box, connected to the water from the discharge side of the pump, through a concealed passage, so arranged that it can be readily cleaned. The stuffing box gland is fitted with swing bolts to give quick and easy access to the stuffing box.

When the pump is direct-connected, it is supplied with a shaft coupling of the flexible type, to compensate for slight variation in alignment.

The bedplate under the pump is of one piece box construction heavy enough to give a rigid support, and with cross ribs to prevent distortion.

Fig. 2 shows this pump entirely assembled, and it is claimed by the manufacturers that it occupies less space than the ordinary boiler feed pump of this general type, and that it will give a much higher degree of efficiency.

World's Petroleum Output.

That 1915 was the most successful year of production in history of the petroleum industry is shown by statistics just compiled under supervision of the Geological Survey.

The total quantity of crude petroleum entering the world's markets in 1915—426,892,673 bbls.—exceeds former record, established in 1914, by 28,194,307 bbls, or 7%.

The bulk of the increase in 1915 came from the United States and Mexico, though Russia, Argentina and Japan recorded significant gains.

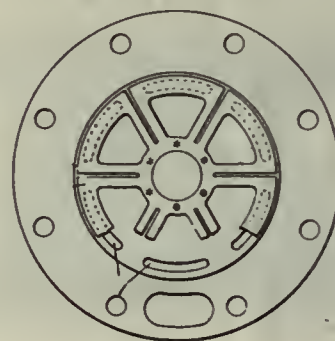
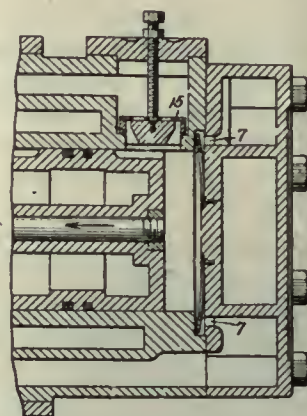
Distribution of this production is shown in the following table:

Country:	Quantity, '15, barrels of 42 gallons.	% of total.	Quantity, 1857-'15, barrels of 42 gallons.	% of total.
United States	*281,104,104	65.85	*3,616,561,244	60.10
Russia	68,548,062	16.06	1,690,781,907	28.10
Mexico	32,910,508	7.71	123,270,377	2.05
Dutch East Indies†.	12,386,808	2.90	148,999,921	2.48
Roumania	12,029,913	2.82	130,012,387	2.16
India	7,400,000	1.73	80,789,711	1.34
Galicia	4,158,899	.98	136,032,500	2.26
Japan and Formosa	3,118,464	.73	30,169,622	.50
Peru	2,487,251	.58	16,794,223	.28
Germany	995,764	.23	13,961,333	.23
Trinidad	750,000	.18	2,819,430	.05
Argentina	516,120	.12	1,033,121	.02
Egypt	221,768	.05	1,308,496	.02
Canada	215,464	.05	23,709,974	.39
Italy	39,548	.01	842,020	.01
Other	10,000	.01	372,000	.01
Total	426,892,673	100.00	6,017,457,366	100.00

*Marketed production. †Includes British Borneo. ‡Estimated.

Flexible Disk Valve for Air Compressor

Air compressor valves are subjected to rapid vibrations, and it is essential that they shall open quickly under the action of the suction strokes and close just as quickly under the action of the compression strokes. A very simple valve embodying this characteristic consists of a disk of metal cut through along six radii part way to the center as shown in the accompanying illustration. There are six segments to this disk, which are free to flex to a certain extent, but without buckling action. The segmented disk is mounted in the end of the cylinder head as shown in the sectional view, the segments covering the inlet port (7). Upon



FLEXIBLE DISK VALVE FOR AIR COMPRESSOR.

commencement of the suction stroke, the segment, under its own spring action and the air pressure from the outside, flexes as shown, so that the air is admitted. The action is extremely quick and snappy. The outlet valve is shown above, being built on the same disk principle, although smaller. Upon commencement of the compression stroke, this outlet valve (15) raises and allows the compressed air to flow into the system, the inlet valve closing at the same time under air pressure. A patent (No. 1,189,969) has been allowed on this invention to William F. Meister of Marietta, O., who has in turn assigned it to the Pattin Bros. Co. of the same city.

Gem imports to New York in August were valued at \$5,535,714, the highest in history. Total for 8 months of 1916 is about \$36,000,000.

Quarter's Operations of the Butte & Superior

Due to increased wages and cost of supplies, costs of the Butte & Superior Mining Co. were higher in the quarter ending with June than in the previous quarter. The grade of ore and of concentrates produced and the mill recovery were about the same as for the previous quarter.

The following shows the principal operating

new shaft as well as that of foundations for new shaft house and equipment progressed satisfactorily and will be finished well in advance of the delivery of machinery and steel building material which will commence within a few weeks. Good progress was also made in sinking the new No. 2 or new manway shaft and on construction of the new crushing plant



MILL OF THE BUTTE & SUPERIOR CO. AT BUTTE, MONT.

factors for the quarter as compared with those of the preceding quarter:

	Second Quarter.	First Quarter.
Dry tons of ore milled.....	161,270	164,500
Average zinc contents (%)	15.9709	15.692
Average silver contents (ozs. per ton)..	6.7041	6.844
Zinc concentrates produced (tons).....	45,194	45,121
Average zinc in concentrates (%).....	52.9956	53.122
Total zinc in concentrates (lbs.).....	47,901,445	47,938,580
Average silver in zinc concentrates (ozs. per ton)	21.8757	22.018
Mill recovery (% zinc recovered in con- centrates)	92.989	92.855
Mining costs per ton	\$4.4971	\$4.0341
Milling costs per ton	\$1.7610	\$1.5763
Total cost per ton, mining and milling.	\$6.2581	\$5.6104

According to Managing Director D. C. Jackling, about the end of the quarter the No. 3 or new main hoisting shaft was connected through to the series of raises from the 1400-ft. level, thus providing a continuous and permanently timbered shaft from the surface to that level. Construction of stations for this

and improvements in ore bin facilities. Active development work was commenced on the 1700 and 1800-ft. levels and while the extent of this work is not great as yet, the size, character and grade of the ore bodies disclosed are fully as favorable as those of the levels above. Most of the work on these lower levels was confined to drifting, but even with the limited amount of cross-cutting that was done the addition to ore reserves was substantial and taken together with the additional reserves blocked out on the 1600-ft. level and above, constitute a total addition to reserves for the quarter about 30% in excess of the tonnage mined for the quarter. Developments to the east and beyond the end of the Black Rock claim have been especially gratifying and the outlook is that for some time in the future the additions to ore

reserves resultant from the usual amount of development work done in connection with mining operations will be much more rapid than the reduction of these reserves through ore extraction. Owing to the urgent necessity of rapid progress in the construction of the new shafts and the large tonnage of waste necessary to be handled, it has been impossible to do any exploratory or extraordinary development work, and consequently such work as has been and is being done is confined to that necessary in regular mining operations.

The financial results of operations for the second quarter as compared with those of the first quarter, are as follows:

	Second Quarter.	First Quarter.
Net value of zinc concentrates (at mill)	\$2,879,568.45	\$4,337,412.99
Net value of lead concentrates (at mill)		
and of residues	246,341.54	264,302.75
Miscellaneous income	22,772.34	21,427.21
Total net value	\$3,148,682.33	\$4,623,142.95
Operating costs, taxes, etc.	1,086,653.00	1,068,203.27
Profits	\$2,062,029.33	\$3,554,939.68

After the payment of the regular quarterly dividend of 75 cts. per share and an extra dividend of \$10 per share payable to stockholders on June 30, the company had net quick assets of approximately \$3,900,000.

Sales of spelter have been made for future delivery covering a substantial portion of the production for the balance of this year. These sales have been made at a lower price than that applying to the second quarter.

Treating Crude Petroleum.

A method of treating crude petroleum in a manner to secure the largest possible percentage of gasolene or vaporizable contents is described in a patent (No. 1,189,083) recently issued to Chauncey B. Forward, of Urbana, O. In the accompanying diagrammatic sketch the essential features of the system are shown.

The inventor employs no retort but relies upon outside heating sources, in this case a steam boiler being shown. The crude oil is pumped from the reservoir into the separator, passing first through a heater. The steam also is passed through a superheater, so that the two enter the separator together at superheat and

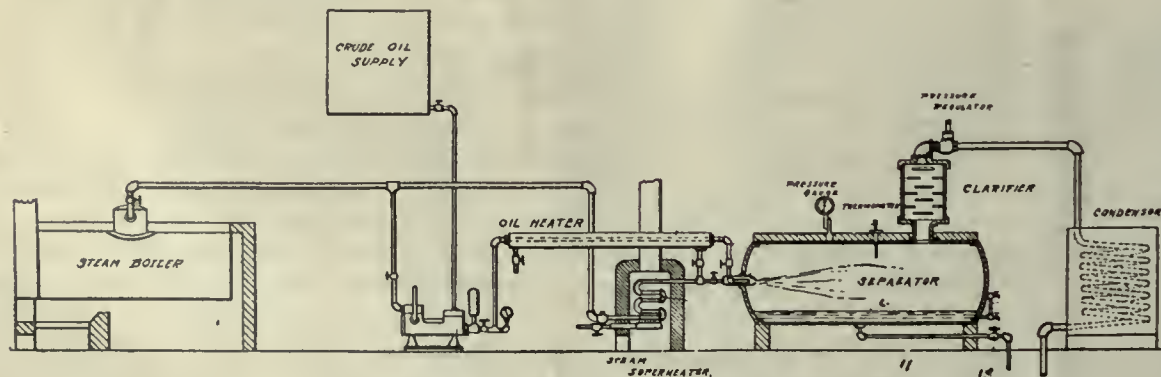
under pressure, which is variable to suit the conditions.

In the separator, the injected crude oil is vaporized and expands, the heavier products being precipitated and the oil vapors and steam being separated and flowing out together into the clarifier.

The inventor has operated this apparatus on a commercial scale at a sustained temperature of 400° F. in the separator and a pressure of 100 lbs., and claims to have secured approximately double the quantity of gasolene that is possible by any other method of treatment familiar to him. In the experimental period he made scores of runs at lower temperatures, and pressures, but as he gradually increased both and at last reached the maximum of 100 and 400° F., respectively, found that the volume of gasolene gradually increased also with the increased separating or converting conditions obtained in the separator by the higher temperatures and pressures.

While not attempting to fix definite limits, he is confident that the volume or proportion of gasolene would be profitably increased with the more intense conditions in the separator, say up to about 250 lbs. pressure, and 650° F.

Zinc Resources of the British Empire.—According to the "Bulletin of the Imperial Institute," zinc ores have been mined in many parts of the United Kingdom, notably in Cumberland, Northumberland, Durham, Derbyshire, Shropshire and the Isle of Man, but a large proportion of the production has for several years past been shipped to the Continent for smelting. By far the most important zinc deposits in the British Empire are those of Broken Hills mines, New South Wales, the output of which alone is sufficient to supply the entire demands of the United Kingdom for metallic zinc. The Broken Hill ore before the war went mainly to Germany for smelting, but the Australian government has adopted measures which will prevent this in the future. Zinc is also found in South Australia, Queensland, Tasmania, New Zealand and Newfoundland. Canada contains a number of workable zinc deposits, particularly in British Columbia, and there is every prospect of Burma becoming an important producer. In Africa there are zinc deposits which more information is needed.



METHOD FOR TREATING CRUDE PETROLEUM.

Myron A. Folsom Locates in San Francisco.

Myron A. Folsom, for the last 17 years counsel for the Bunker Hill & Sullivan Mining Co., will remove about Oct. 1 to San Francisco, where he will take charge of the marketing department of the Bunker Hill & Sullivan's new \$1,000,000 smelter, now under construction at Kellogg, Ida. He will continue to handle the company's legal business also, and the new department will combine this branch of the corporation with all business not controlled by the executive and operating departments.

It was largely through Mr. Folsom's efforts that the Bunker Hill & Sullivan Co. was enabled to engage in the smelting business, and to him more than any one else should be credited the location of the smelter at Kellogg. In fact, he was commissioned by President F. W. Bradley to overcome the transportation difficulties and solve the other problems that were factors in the situation, and that he succeeded in his efforts the construction now under way at Kellogg testifies.

In recent years Mr. Folsom has established a reputation as one of the ablest mining attorneys in the west, and he has been engaged in some of the most important cases that have been tried in the state and federal courts. He possesses a rare combination of business and professional ability, and it is in recognition of this that he has been placed at the head of the Bunker Hill & Sullivan Co.'s commercial and legal department.

Latest California Dredge.

Illustration shows the latest dredge built by the Union Iron Works, San Francisco, for Lawrence Gardella, which is in operation on Clear creek, near Redding, Calif. The dredge is equipped with $7\frac{1}{2}$ cu. ft., close connected buckets, arranged to dig 35 ft. below

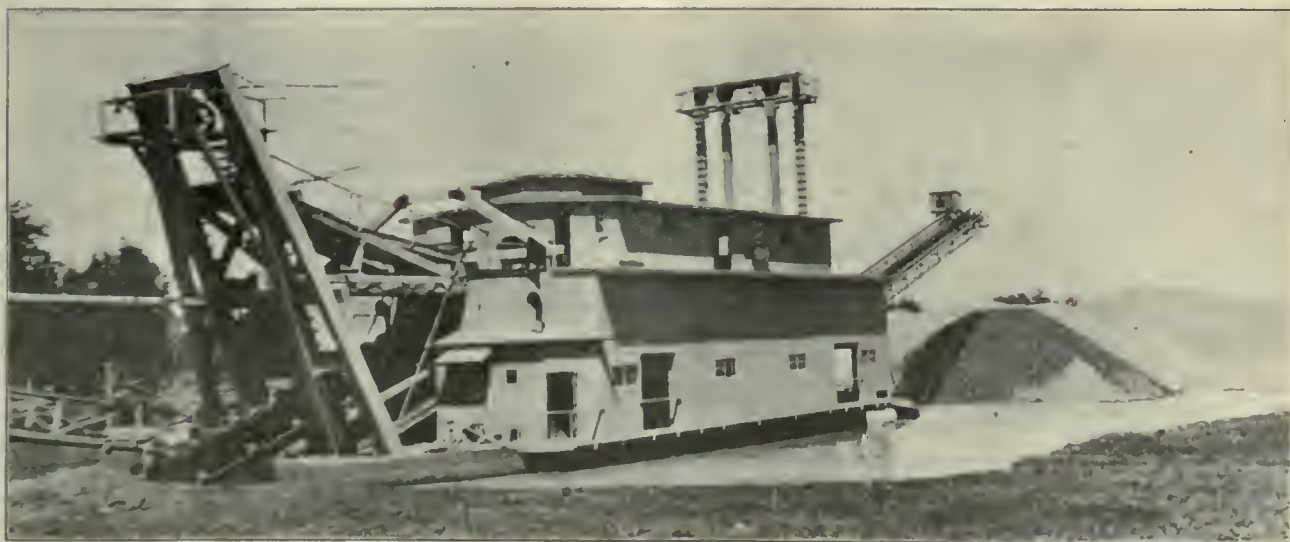
the water level, and is electrically driven. The buckets are all manganese steel and have four eyes in the back. This dredge is very successful and is handling about 125,000 yds. per month.

Sulphuric Acid Plant.

The Garfield Chemical & Manufacturing Co., with principal office in Salt Lake City, has under construction a plant for making sulphuric acid at Garfield. The plant, which will have a capacity of 150 tons of acid per day, is expected to be ready for operation in October, and is costing close to \$500,000. The lead-lined acid chamber being constructed is 300 ft. in length, 100 ft. wide and 80 ft. high. The two Herreshoff roadsters to be used have been supplied by the Pacific Foundry Co., San Francisco. In these the necessary tonnage of copper sulphide ore will be roasted to liberate the sulphur, which as sulphurous fumes will be carried into the lead chamber. It is proposed to manufacture three grades of acid—60° and 66° Baumé, and a 98% acid. The main purpose in view is to manufacture acid to supply the Utah Copper Co. for its copper leaching plant, and for this purpose the 60° acid will be used. The following persons constitute the officers of the company: President, C. W. Whitley; vice-president, C. M. McNeil; second vice-president, R. G. Gemmil; secretary and treasurer, J. M. Bidwell; manager, Edgar L. Newhouse. The foregoing, together with John M. Hays, constitute the directors.

Wolframite is to be considered more in the nature of a basic phase of the refractory siliceous ore than as a separate and distinct deposit, for it always occurs in connection with them.

Copper exports from Atlantic ports for week ended Aug. 31 were 6955 tons; for August, 32,160, against 16,289 a year ago.



THE LAWRENCE GARDELLA DREDGE NEAR REDDING, CALIF.

What the Mining Companies are Doing

The Porphyry Production.

In the following tables is given the production of four leading porphyries for July, and comparisons for previous months and for the years 1915, 1914 and 1913:

UTAH COPPER CO.

	1916.	1915.	1914.	1913.
January	11,999,910	8,009,646	10,649,036	7,560,521
February	11,849,972	8,202,467	9,492,898	7,819,900
March	12,714,651	10,203,882	12,704,220	8,504,040
April	14,557,282	12,015,148	13,133,779	9,834,894
May	15,950,215	14,053,765	13,616,993	10,312,695
June	17,877,432	14,730,912	13,268,106	11,637,949
July	20,302,228	14,641,009	13,768,958	9,849,043
August		15,966,543	8,245,520	10,620,981
September		14,159,289	6,672,194	11,817,428
October		16,004,607	7,765,396	10,236,575
November		13,722,723	6,668,049	11,121,078
December		14,497,485	6,795,567	10,762,490

NEVADA CON. COPPER CO.

	1916.	1915.	1914.	1913.
January	6,157,862	3,069,919	5,791,122	5,169,708
February	6,533,412	3,210,569	4,598,243	4,798,537
March	6,565,559	4,535,192	5,218,227	5,555,320
April	7,716,101	4,710,684	4,880,043	5,650,608
May	7,723,148	5,271,756	4,959,589	5,933,275
June	8,651,772	5,124,480	4,483,175	6,344,863
July	8,537,231	6,292,413	5,477,313	5,403,919
August		6,201,858	3,062,637	5,989,973
September		6,021,850	2,718,471	4,441,671
October		5,880,083	2,801,507	5,898,046
November		5,495,487	2,612,071	5,443,047
December		6,201,247	2,651,658	5,343,862

CHINO COPPER CO.

	1916.	1915.	1914.	1913.
January	5,316,975	3,563,618	6,131,840	3,440,274
February	4,617,220	3,722,803	5,769,948	4,018,789
March	6,333,255	4,446,087	5,566,819	4,602,809
April	4,496,270	5,027,548	6,109,888	4,046,813
May	6,359,294	6,442,977	5,666,881	4,067,456
June	7,243,618	6,984,977	5,656,102	3,876,533
July	6,883,403	6,650,429	5,087,750	4,893,325
August		6,640,923	3,165,501	6,650,867
September		5,254,286	2,957,704	4,435,873
October		6,319,194	3,060,000	4,914,944
November		6,939,006	3,047,694	4,402,909
December		6,302,045	2,827,891	4,525,792

RAY CON. COPPER CO.

	1916.	1915.	1914.	1913.
January	4,263,440	4,053,147	5,705,000	3,869,006
February	5,767,087	4,830,553	5,600,000	4,007,918
March	6,379,581	5,579,513	6,223,617	4,422,872
April	6,294,033	5,303,213	6,277,693	4,514,565
May	6,278,611	5,016,048	6,495,719	4,405,217
June	6,598,594	4,206,119	6,226,536	4,392,612
July	6,834,492	4,352,571	2,962,000	2,526,000
August		5,581,734	3,300,000	4,401,566
September		4,997,083	3,180,000	4,470,551
October		5,894,441	3,278,348	4,871,566
November		5,576,083	3,196,457	4,900,994
December		5,725,009	3,126,538	5,232,167

Alaska Gold Mines.

President Hayden of the Alaska Gold Mines Co., who has recently visited the property in Alaska, says that while results have been disappointing there is no occasion for concern. In a recent interview he stated that he had never seen a mine more perfectly equipped in every detail—mill, power plant, transportation system, and that the low costs being obtained are something that any mine management might be proud of.

According to Mr. Hayden: "There has been but one disappointment, both to the stockholders and the officials of the property, and that is that the assay value of the ore has not been as high as that shown in development of the property before its purchase, and which was actually being obtained at that time.

"When the property was purchased the mine had been opened up by what was most natural, rational and normal method of development, viz.: the driving of a crosscut tunnel from the Silver Bow basin, where water power was available and where there was a natural mill and townsite, to that point in the middle of the mountain where such a tunnel driven perfectly straight would cut and cross the vein. Im-

mediately on passing into the vein the property was opened up along it both to the east and west for a distance of some 2000 ft. and stoping operations were begun and continued without any attempt towards or possibility of selection; and from 1907, in a small mill which could only run during summer months on account of inability to get power, nearly 400,000 tons of ore were treated which had an average grade of \$1.80, corresponding to a recovery under our present methods of milling of better than \$1.55 per ton.

"Summing the whole situation up, it is fair to say that the results up to date have been somewhat disappointing, but viewing it in the light of the more perfect information we now have, the financing, development and equipment of the property on its present showing and to the present extent is fully justified from every viewpoint, and the same people who have been responsible for these things would do the same thing if they saw the property as they see it today instead of as they saw it at the beginning."

Shattuck-Arizona.

The following is a summary of the mine and smelter production and costs for the quarter ending June 30, 1916:

	Copper ore.	Lead ore.
Dry tons mined.....	42,174	643
Dry tons shipped.....	42,338	634
Dry tons smelted.....	42,625	511
Pounds copper recovered.....		4,196,873
Ounces gold recovered.....		1,047
Ounces silver recovered.....		70,350
Pounds lead recovered.....		192,459
Net operating cost per pound of copper.....		10.09c
General office expense and taxes paid.....		.35c

Total net cost per pound refined copper..... 10.44c

Earnings for the quarter were as follows:

Gross value of all ores.....	\$1,205,741.26
Miscellaneous receipts	1,307.30
Interest received	731.81

Gross earnings	\$1,207,780.37
Operating expense	\$502,725.31
General office expense and taxes paid.....	15,139.12

Net earnings \$ 689,615.94

During the quarter dividends amounted to \$437,500.

No. 15—April 20th, 1916.....	\$175,000
Extra, No. 3—April 20th, 1916.....	262,500

A total of.....\$437,500

Miami Copper Co.

During the first half of the calendar year 1916 there was mined 856,550 tons of ore and there was treated in the concentrator 859,485 tons, which produced 32,213 tons of concentrate having a copper content of 41.80%.

The gross production of copper contained in the concentrate for the half year amounted to 26,931,915 lbs., divided as follows:

	Lbs.		Lbs.
January	4,097,333	April	4,330,882
February	4,141,286	May	4,978,243
March	4,459,783	June	4,924,388

From the above the smelter deduction of 5% gives the net production of merchantable copper as 25,585,314 lbs. The average assay of the ore treated during the period was 2.086% copper. The concentrator extraction was 71.44%, this being the copper contained in the concentrate, as compared with the copper contained in the ore. The saving of copper in the concentrate was 31.38 lbs., or in final merchantable copper after smelter losses, 29.81 lbs. per ton of ore treated. The grade of the concentrate produced, as above noted, was 41.80% copper.

In the concentrator continued improvements have been made along the line of fine grinding and increased tonnage. The three Chile mills in Sec. 5 are to be replaced by two large Hardinge mills using steel balls and it is expected that

the capacity of this section will be well up to 1000 tons per day.

With finer grinding and the expected increase of production up to 5,000,000 lbs. of copper per month, comes the need for more power and the company has ordered three Nordberg Carls Freres Diesel engines, each of a capacity of 1250-hp. sea level rating. These with our three Nordberg steam engines will give ample power and a spare unit. A high degree of economy is expected from the Diesel engines.

The average cost of copper for the period, after deducting miscellaneous income, is 8.9526 cts. per pound. The estimated profit and loss figures for the period are given as follows:

Gross income	\$5,510,257.45
Cost of plant operations.....	\$1,624,972.40
Smelting, refining, selling, etc.....	628,341.19
Administration, legal expense, interest, taxes	57,303.37
	<u>2,310,616.96</u>

Balance being estimated profit 6 mos. ended June 30, 1916.....	\$3,499,740.49
Less: Dividends Nos. 14 and 15.....	2,054,563.50
Surplus for half year.....	<u>\$1,445,176.99</u>

West End Con. Co., Nevada.

The report of the West End Con. Mining Co. for the year 1915 shows as follows:

Receipts—	
From ore reduction.....	\$880,642.05
Loans and accounts collectible.....	23,433.45
Interest collections	8,512.78
Dividends from Nevada Mill Co.....	30,000.00
Dividends in trust for Tonopah Ext. Mill and Mining Co.'s shareholders	1,332.50
	<u>\$943,920.78</u>
Disbursements—	
Advances to superintendent.....	\$510,000.00
Legal expense	780.95
Office expense	6,431.10
General expense	2,272.26
Ore purchases	44,073.76
Taxes	1,677.86
Dividends	178,848.60
Prospecting	3,182.71
Loans receivable	34,022.97
Mill rental	30,000.00
Deposit in escrow of net proceeds derived from Jim Butler and West End Con. Co.'s disputed ore.....	76,230.63
10,000 shares Alcyone Mg. Co.'s stock.....	500.00
Mason Valley mines.....	1,335.30
Halifax Tonopah Mg. Co.'s stock.....	38,727.15
	<u>\$928,083.29</u>
Balance Dec. 31, 1915.....	<u>\$123,329.50</u>

Miscellaneous Company Notes.

The Copper Range Co. has secured an option from the St. Mary's Mineral Co. on approximately 6 square miles of territory south of the Globe tract. A general exploration of this territory will be made. The land has a heavy overburden with no outcrop and no particular lode will be sought, but the mineral contents will be sought through diamond drill operations.

Now that Shannon's treasury has been strengthened it is expected that a dividend will be paid soon. Under present conditions the company is earning over \$3 per share annually. In the 7 months ended July 31 Shannon produced 5,364,570 lbs. of copper and earned \$490,000 net, or about \$1.60 per share on 300,000 shares. In that period net working capital increased from \$580,000 to \$1,070,000.

The property of the Ohio Copper Mining Co. has been sold for \$750,000 to a representative of the bondholders' committee. Not for 6 weeks, however, will the Federal Court in Salt Lake City confirm the proceeding or order it vacated, as a stay for that period has been granted by the Federal Court in New York on petition of stockholders not satisfied with the bondholders' proposed plan of reorganization. The New York court has ordered the Ohio trustees to give to stockholders' representatives a complete list of registered holders of both stock and bonds in order that their views on reorganization may be secured. From present indications two stockholders' committees will come into the field. The stock can be assessed \$2 per share should it be found necessary to have been so profitable that trustees and receivers are under-

stood to have about \$400,000 cash on hand, against about \$60,000 unsecured liabilities.

It is understood that the profits of the American Zinc, Lead & Smelting Co. for the month of July were better than \$900,000. This compares with \$871,784 for the two previous months. It is predicted that for the 12 months to the end of Dec. 31, American Zinc will show profits of \$10,000,000. This sum would be equal to \$46 per share on 193,000 shares of common stock after interest on \$2,000,000 bonds issued in connection with the Granby purchase and \$6 per share on 100,000 shares of American Zinc preferred.

The Anaconda Copper Mining Co., through its subsidiary, the International Smelting & Refining Co., has purchased the raise new working capital, but operations during the past year old Walker copper properties in Plumas, Cal., paying, it is reported, \$670,000. The property is developed only to a very limited extent. It consists of 16 claims, heavily timbered, with good water power available 18 miles northeast of Portola, Cal. The ore carries 6% copper, 3 ozs. silver, and \$1 in gold to the ton. It is considered a very promising property. The ore will be shipped to the International smelter at Tooele, Utah.

The 60 days' time given by the Michigan law in which mining company stockholders have the privilege of paying an assessment has expired on the Algoma Mining Co. assessment of \$1 per share which was due May 18. Under the Michigan statute stockholders now wishing to pay the assessment are chargeable with interest from the date the assessment became due. Under the terms of the underwriting agreement the company will soon be obliged to advertise all delinquent stock for sale. After notice of sale is published stock can be redeemed until date of sale only upon the payment of costs incurred in addition to the assessment and interest due.

The Nevada Con. Copper Co. is spending about \$500,000 to increase its mill capacity. Some additions will be made to the crushing department and some of the rolls will be discarded. The average mill run during July is reported to have been 12,000 tons daily and the average of the ore 1.9% copper. This is one of the highest yields ever made from this property and it is due in a measure to the fact that 2000 tons of the ore daily were produced from the Ruth mine. The average of the Ruth ore is given as 2.2%. This is some of the best ore that has ever been mined in Nevada Con. ground. The mill extraction is now 73%, which is an increase over former operations.

The Arizona Commercial Copper Co. produced in the 6 months ended June 30 2,251,000 lbs. of copper and earned approximately \$334,000 net, or \$1.25 per share on 260,000 shares outstanding. The company consequently had on June 30 net working capital of over \$550,000 compared with \$262,000 on Dec. 31, 1915. Production continues to be maintained at 300,000 to 400,000 lbs. per month, any increase being dependent upon the completion of the power plant a month or two hence. Deliveries of this equipment have been delayed, but are now commencing to come forward. Underground conditions show steady improvement. The 14th level, the deepest in the mine, is developing more ore and of higher grade than any other level in the property.

A. E. Carlton, Cripple Creek, has been elected president of the new Cresson Con. Mining & Milling Co. The deal for the purchase of the Cresson from its Chicago owners was recently consummated by Mr. Carlton, whereby the majority of the stock was taken over by the new company formed mostly of Colorado men. The remainder of the stock will soon be in the hands of the new company, it is said. Mr. Carlton is also president of the Golden Cycle Mining & Reduction Co. The other officers of the new Cresson Co. are: Claude Boettcher, Denver, vice-president; A. F. Zang, Denver, secretary, and E. P. Shove, Colorado Springs, treasurer. The officers, with the following, comprise the board of directors: T. B. Burbridge, Denver; Charles M. MacNeill, Spencer Penrose, Colorado Springs; Irving T. Snyder, Adolph Zang, Denver; L. G. Carlton, Cripple Creek, and Richard Roelofs, Cripple Creek.

THE MONEY-MAKERS.

I

Owning a block of mining stock,
To the uninitiated
Means no one home within the dome
Where intellect is crated.
Just why it's so I hardly know,
But I have heard repeated
That mining schemes are wiley dreams—
Air bubbles, super-heated.

2

When sharpers thrive, and so derive
A bank account unlawful,
They seek the fools to be their tools,
And put it over awful.
It's my surmise, 'till all are wise
The sharpers won't be grieving,
But everywhere, will do their share
Of plain and fancy thieving.

3

Now as to facts, I wouldn't tax
Your mind with figures tiring,
But in the end, the dividend
Is what we're all desiring;
And if perchance you ever glance
Where mining stocks are listed,
You'll recognize, with some surprise
You've been a bit close-fisted.

4

Those figures that I hinted at
Were dividends in mining,
For to July the year gone by
In profits has been shining.
You multiply a million by
At least one hundred fifty
And you will say the miners pay
Disbursements truly nifty.

—Frank Adams Mitchell.



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*Illustrated.

Dividends of Mines and Works Con- - tinue of Record Proportion.

August proved an exceptionally good month for holders of stock in American mines and works, for, according to reports made to Mining & Engineering World, \$16,983,721 in dividends were disbursed. Quite a number of new companies entered the dividend-paying list, among them being the United Verde Extension Copper Co., First National Copper Co., Mass Con. Mining Co., Utah Metal & Tunnel Co. (which absorbed the Bingham-New Haven), and the South Hecla.

During the 8 months of 1916 ending with August, 143 companies have paid dividends totaling \$169,716,-976. Since incorporated these 143 companies have divided among shareholders no less than \$1,171,935,-237. The combined issued capital of these companies amounts to \$890,251,861.

Of the above 143 companies 36 operate copper properties which have enriched shareholders so far in 1916 to the extent of \$65,024,878, the August copper disbursements totaling \$8,698,141. To date these 36 companies have to their credit in dividends paid, \$635,-932,570. This is on an issued capitalization of \$332,-209,078.

Gold-silver-lead-zinc properties divided among shareholders in August \$7,652,391. For the 8 months of 1916 holders of stocks, with 107 companies participating, received \$61,599,989. To date these companies have paid dividends totaling \$382,311,072, on an issued capital of \$332,209,078.

Eighty-four of the above 107 companies operate properties in the United States and they have paid dividends so far in 1916 amounting to \$55,595,257. August dividends total \$6,861,499. The total for these companies is \$254,510,556. Twenty Canadian companies in this class disbursed during the 8 months of 1916, \$6,302,722. August disbursements total \$633,-665. But three Mexican companies report as having paid dividends in 1916, these amounting to \$986,402.

Metallurgical companies, six in number, have paid dividends for this year totaling \$13,481,113. Since incorporation these companies have shared with stockholders \$207,139,683.

In addition to the above dividends are those of the companies classed as securities-holding corporations, eight of these dividing among shareholders during 1916, \$29,293,022. Since incorporation these companies have paid dividends totaling \$146,744,136.

Then might be added the dividends paid by corporations giving out no reports of disbursements, which would add several million dollars to the month's disbursements. Privately owned properties, which are yielding goodly profits to their owners, would add as much more, making total disbursements for the month easily in excess of the \$20,000,000 mark.

In the following table is listed the companies pay-

ing dividends in August, giving the date of payment, amount per share and total amount paid:

	Aug.	Amt. per share.	Amount paid.
American Z., L. & S., Mo.....	1	\$1.50	\$342,180
Amparo, Mex.	10	.05	100,000
Anaconda, Mont.	23	2.00	4,662,500
Big Four Expl., Utah.....	5	.05	20,000
Bunker Hill Con., Calif.....	4	.02½	5,000
Bunker Hill & Sullivan, Idaho.....	4	.40	163,500
Caledonia, Idaho.....	5	.03	78,150
Center Creek, Mo.....	1	.15	15,000
Champion, Mich.	8	6.40	640,000
Chief Con., Utah.....	2	.05	44,148
Coniagas, Ont.	1	.25	200,000
First National, Calif.....	10	.25	150,000
Golden Cycle, Colo.....	10	.02	30,000
Grenby Con., B. C.....	1	2.00	299,970
Greene-Canaan, Mex.	23	2.00	972,418
Hecla, Idaho.....	3	.15	150,000
Hercules, Idaho.....	15	.20	200,000
Hollinger, Ont.	11	.05	240,000
Homestake, S. D.....	25	.65	163,254
International Nickel, pfd.....	1	1.50	133,689
Jim Butler, Nev.....	1	.10	171,802
Lucky Tiger, Mex.....	24	.08	57,227
Mass Con., Mich.....	15	1.00	100,000
Miami, Ariz.....	15	1.50	1,120,671
Mohawk, Mich.....	1	10.00	1,000,000
National Z. & L.....	31	.05	25,000
New Jersey Zinc.....	10	14.00	4,900,000
Plymouth Con., Calif.....	15	.24	53,250
Rambler-Cariboo, B. C.....	15	.01	17,500
St. Mary's M. L.....	8	2.00	320,000
Seneca-Superior, Ont.	15	.30	143,665
Socorro, N. Mex.....	1	.05	18,867
South Eureka, Calif.....	15	.07	20,990
South Hecla, Idaho.....	10	.15	39,450
Standard, B. C.....	10	.02½	50,000
Tamarack-Custer, Idaho.....	30	.02	35,525
United Verde, Ariz.....	9	.75	225,000
United Verde Ext., Ariz.....	1	.50	500,000
Utah Metal & Tunnel, Utah.....	15	.50	325,000
White Knob, Calif.....	25	.10	20,000
Wilbert, Idaho.....	15	.01	10,000
Yellow Aster, Calif.....	6	.02	2,000
Yellow Pine, Nev.....	25	.10	100,000

The Copper Market.

The copper market is reported firm with leading producers and sellers asking 28 cts. a pound for November-December delivery, and 27 to 27¾ cts. a pound for delivery in the first quarter of 1917. Small producers and sellers, while asking 28 cts. for November delivery, continue to shade the December quotations to 27¾ cts., but they hold first quarter deliveries firm at 27 cts.

Announcement of the suspension of negotiations in the big Allied copper order amounting to 300,000,000 to 400,000,000 lbs. for delivery next year was made last week. The information did not cause any weakening in the copper situation. The Allies had simply missed their market by procrastination. Efforts to haggle over the price asked by the producers failed of success, in view of the heavy general buying of the red metal which not only acted to sustain the quotations given to the warring powers, but caused the producers to withdraw the option given to the purchasing agents without extension of the time.

The Allies *must* buy copper and their orders *must* be placed here. This, in sum, is the situation. Producers of copper have shown no desire to press this sale of copper. The market is not a buyer's one and it is either a matter of conceding the price asked or going without. On this basis the producers have refused to solicit orders for the red metal.

In fact the situation for this year is one where producers are experiencing great difficulty in supplying the wants of their favored customers. Thus with the current market extremely tight and the prospect

that the hostilities will continue into the summer of next year producers are maintaining a solid front on future business.

Manufacture of Electrochemical Products Increase Largely.

Electrochemical and electrometallurgical products enter into almost every phase of our industrial life and their manufacture has been increasing by leaps and bounds. The chief products made by the aid of the electric current are aluminum, phosphorous, silicon, sodium, graphite, chlorine, oxygen, hydrogen, ferro-alloys, copper, titanium, vanadium and other alloys, calcium carbide, carborundum, and other abrasives, caustic soda, caustic potash, sodium, peroxide, chloride of lime or bleaching powder, carbon bisulphide and muriatic acid.

According to a report issued by the U. S. Bureau of Census, the value of electrochemical products has increased from \$18,450,000 in 1909 to \$29,600,000 in 1914, an increase of over \$11,000,000. This does not include iron and steel made in the electric furnace, which also falls under this class. The extent to which we are dependent on electrochemical products is little realized. The manufacture of these products has been steadily increasing but today the supply is far short of the demand, due in many instances to the inability to obtain permission from the Government to use more power at Niagara Falls, the great electrochemical center. Of 36 establishments reporting in 1914 manufacturing electrochemical products, 18 were located in New York, four in Michigan, three in California, two each in Pennsylvania and West Virginia and several other states having one each. Most of the plants in New York state are at or near Niagara.

Portland cement has made possible the easy solution of some troublesome problems in underground mining operations as well as on the surface. Sinking shafts through wet ground, for example, has always been a troublesome and expensive operation, but this has been greatly simplified by the use of Portland cement to shut off the inflow of water that percolates in through fissures in the rock being penetrated. As this water may be under considerable pressure the difficulty of sealing the fissures at once becomes apparent. A method of closing these water channels by forcing cement into the rock in advance of the drills by means of a powerful pump is said to effectually accomplish the desired object.

Rates on iron ore from lower Lake Erie ports to Ohio, Kentucky, West Virginia, and western Pennsylvania have been pronounced generally unreasonable by the interstate commerce commission. Carriers were directed to make separate charges for dock, storage and switching services.

PERSONAL.

F. E. Wormser is with the Snake River Mining Co., Huntington, Ore.

Noel Cunningham, consulting metallurgical engineer, has opened offices in New York.

Charles Harrington is now general manager of the Over-all Mining Co., Dove Creek, Colo.

H. H. Miller, managing property in El Callao district, Venezuela, has returned to Los Angeles, Cal.

A. Chisholm, Ironwood, Mich., has been appointed assistant superintendent of the Newport mine.

Roscoe Edyvean will leave the Transvaal, South Africa, about Sept. 16 and return to Calumet, Mich.

Arthur Redner has been made superintendent of the Anvil mine of the Newport Mining Co., Bessemer, Mich.

G. L. Sheldon, Salt Lake, Utah, and Ely, Nev., is examining property in San Bernardino county, California.

R. B. Lamb, mining engineer, New York, will return from a trip to Nevada and California about Sept. 15.

H. K. Najarian is now engaged in designing work for the smelter of the Missouri Cobalt Co., Fredericktown, Mo.

F. A. Kroll, chief mining engineer at the Eighty-Five mine near Lordsburg, N. M., is visiting his old home at Houghton, Mich.

W. D. Manchester, Rocky Hill, Conn., has been appointed crushing superintendent for the Chile Exploration Co.'s plant at Chuquicamata, Chile.

A. G. De Goyler, New York, has been appointed general manager of the Vernon Mining Co., and will remove his headquarters to Ironton, Colo.

W. F. Jahn, formerly with the Honduras Rosario Co., Honduras, is now mill superintendent for the Tough-Oakes Mines Co., Kirkland Lake, Ont.

John M. and Hamilton W. Baker, formerly general manager and superintendent of the Baker Mines Co., Baker, Ore., have resigned and removed to Denver, Colo.

J. Parke Channing of New York, managing director of the Miami and president of the Naumkeag Copper Co., is in the Michigan copper country inspecting operations at the latter.

N. H. Emmons, former assistant manager of the Tennessee Copper Co., Copperhill, Tenn., has been appointed manager to fill the vacancy made by the resignation of J. B. Risque.

W. E. Greenough will engage in a consulting mining engineering practice with offices in Spokane, Wash. He was formerly managing director of the Marsh Mines Con., Wallace, Ida.

J. L. Bruce, general manager of the Butte & Superior Mining Co., has returned to Butte, Mont., from Rochester, Minn., where he underwent an operation for appendicitis. He has fully recovered.

Frank M. Estes, northwestern representative of the American Smelting & Refining Co., Spokane, Wash., is now in Alaska and on returning will be made general manager of the company's interests in Chile, S. A.

C. F. Sherwood, formerly metallurgist for the Butte-Superior Mining Co., and later general manager of Butte-Duluth mines, Butte, Mont., has opened an office and metallurgical laboratory at 222-23 Dooly building, Salt Lake, Utah, for ore testing and practice as a metallurgical engineer. Mr. Sherwood more recently worked out the process for sulphidizing and treating by flotation the carbonate mill tailings of

the Prince Con. at Bullionville, Nev. Many Montana operators will remember Mr. Sherwood.

William and Thomas P. Walters, Jr., left the employ of the Jones & Laughlin interests Sept. 1 and will be in Ishpeming, Mich., for the present.

E. B. Grant, assistant professor of the Physics and Mathematics department of the Michigan College of Mines, has had conferred on him the degree of doctor of philosophy by the University of Chicago.

J. Lebarthe, metallurgical engineer, San Francisco, Cal., is in charge of smelter construction for the Bunker Hill & Sullivan Co., and has been in Spokane, Wash., on his way to Homestead, Ore., where his company is erecting a mill.

G. H. Abeel of Ironwood, recently with the Pabst mine, and Garret F. Johnson, of Hancock, recently instructor in the department of mining at the Michigan College of Mines, have become members of the engineering staff at the Quincy.

SCHOOLS AND SOCIETIES.

Minnesota Joint Engineering Board.—The Engineers of Minnesota believe that through the co-operation of the various engineering societies that they can be more useful to their communities and are attempting to bring about closer co-operation through the formation of the Minnesota Joint Engineering Board. The constituent societies represented on the board are the Northwestern Association of the members of the American Society of Civil Engineers, Minnesota Section of the American Society of Mechanical Engineers, the Minnesota Section of the American Institute of Electrical Engineers, the Minnesota Surveyors' and Engineers' Society, the Engineers' Club of Minneapolis and the Civil Engineers' Society of St. Paul. It is hoped that through this central organization the activities of the engineers of Minnesota may be more closely correlated and more accomplished for the public welfare. Geo. W. Rathjens of St. Paul is the secretary of the board.

American Electrochemical Society.—At the coming convention of the American Electrochemical Society, which will be held in New York Sept. 27 and 30, one of the sessions will be devoted to "Made in America" products of the electric furnace and electric cell. These products include many of our most important staples, such as copper, aluminum, abrasives and many more. It is an interesting fact that whereas other chemical industries, such as the coal-tar dye industry, are distinctly European, the electrochemical industry is decidedly American. It is here in America where the production of aluminum was invented and put on a commercial basis. The first plant for the electrical synthesis of the elements of the air and the production of artificial fertilizer nitrate was erected at Niagara Falls. Here at the falls, also, tons of abrasives are produced in large, powerful electric furnaces. The importance of these abrasives can best be appreciated by the fact that if the supply from the falls were to cease today practically every mill and factory in the country would have to shut down within 3 months' time. Other electrochemical products of decided economical importance and value are graphite, phosphorus, hypo-chlorite of lime, magnesium, metal, carbon bisulphide, calcium carbide, hydrate of sodium, ferrosilicon and other iron alloys which are indispensable to the steel trade.

American Chemical Society.—The fifty-third meeting will be held in New York city Sept. 25 to 30, inclusive. The meeting will be held in conjunction with the Second National Exposition of Chemical Industries. The American Electrochemical Society and the Technical Association of the Pulp and Paper Industry will hold meetings in New York city during the same week. It is expected that 2000 to 2500 chemists will be in attendance during the week's exercises, and that this meeting of the American Chemical Society will be the banner chemical meeting of the world. No comparative opportunity for reviewing the progress in the nation's chemical industries has ever been offered.

TRADE PUBLICATIONS.

Oil Filtration Systems and Equipment. S. F. Bowser & Co., Inc., Fort Wayne, Ind. Booklet; pp. 51; illustrated.

With the ever-present call for efficiency and conservation the question of re-using lubricants should not be ignored. In this booklet many different styles of filtration and circulating systems are described, the redeeming features and uses of the system being spoken of. The operation and construction of the system is given a concise explanation and some of the accessory parts are described. Drawings showing oil connections on engines and an isometric view of a complete oil filtration and circulating system, including the machinery to which the oil is circulated, are reproduced.

Spraco System for Cooling Condensing Water. Spray Engineering Co., Boston, Mass. Booklet; pp. 16; illustrated.

An account is given in tabulated form of results obtained by a test on the Spraco system. One of the tests was made on a typical winter day with the temperature at from 16 to 30 degrees; a second on a spring day, with the temperature from 56 to 70 degrees; a third on a summer day at from 90 to 102 degrees, and the last on a power plant in southwestern United States in July with the temperature at from 85 to 93 degrees. With illustrations of installations the remaining pages are confined to a description of the system, its operation, installation and superior points. The superiority of condensing operation of plants in a general way are also brought forth.

Appliances for Burning Fuel Oil. Tate, Jones & Co., Inc., Pittsburgh, Pa. Catalog; pp. 31; illustrated.

This catalog gives considerable practical information as to general oil-burning practice and a comparison brings out the superior points of the use of oil for fuel instead of coal, etc. Oil is superseding coal in many mining districts because of its greater abundance in the immediate vicinity. This, however, is stated as being of minor importance in view of the fact that oil is cheaper, because 25% more heat units are procurable from it, the reasons for the discrepancy being brought out in the catalog, with other reasons for the superiority of oil. Part I is confined to listing different types of oil-burners and in connection with each an illustration is given accompanied with description and detail information. In this connection drawings and views are given showing complete metallurgical and boiler furnace installations using oil burners. Part II is on equipment for pumping oil to the burner. Systems are described as well as different types of pumps and equipment, and are illustrated and accompanied with tables of details.

INDUSTRIAL AND TRADE NOTES.

The Colorado & Eastern R. R. Co., a line running out of Denver to Scranton, Colo., was recently purchased by the Morse Bros. Machinery & Supply Co., of Denver. They will dismantle and ship all the rail, locomotives, etc., to Denver for resale. Twenty years ago this railroad was sold to a New York syndicate for over \$1,000,000.

COMMUNICATIONS.

[This department is for the exchange of ideas bearing on all branches of the mining and metallurgical industries. Mining and Engineering World will not be responsible for the statements made nor opinions expressed by correspondents.—Ed.]

Acetylene Trust.

The Editor: We have recently been confronted with a raise in price of acetylene for lighting purposes, with the statement that "on account of the war, etc." I am wondering what the "war" has to do with this commodity, made entirely in the United States. There seems to be no doubt

but what the acetylene trust has the industry by the throat. While the government is doing its investigation, why not look into this branch, so vital to our industry? Who is the trust composed of anyway?
MINER.

A Vanadium Monopoly.

The Editor: Under the headings of "Realization of Vanadium Co.," "Vanadium Co. Sold for \$7,000,000," etc., notices have lately appeared in the daily press, in which the American Vanadium Co. claims to control about 92% of the known vanadium deposits of the world, through ownership of mines in the Peruvian Andes.

This statement is hardly convincing to anybody conversant with the existing extensive technology on this metal. It is only necessary to consult the recent publications on this subject, besides the series of articles I have contributed to the Mining and Engineering World since 1904, to be aware that vanadium is an element widely distributed, forming large deposits in several of the geological formations in the American continent, in Europe, in Australia and elsewhere.

To own about 92% of the actually known vanadium in the world appears to be a rather large order, quite as good as controlling 92% of the copper or zinc deposits of the United States, not to say of the world. A vanadium monopoly is out of the question, as there exists large areas in which this element is found in large quantities.

In this country there are several other interests working vanadium independently from the American Vanadium Co., without mentioning outside interests, which are also well known.

The high prices of vanadium, due to actual conditions in the metal market, are not likely to continue in normal times. The extraction of the vanadium pentoxide used in the manufacturing of high-grade ferro, of steel vanadium with an average of 0.25% vanadium, is now a simple metallurgical operation which can be performed at a reasonably low cost and will allow the sale of vanadium alloys at a price far below the prices ruling before the European war.

It is not wise to base the earning capacity on actual abnormal, inflated prices, which are always temporary and which will fall considerably, like many other industrial commodities, at the termination of the present war.

BAXERES DE ALZUGARAY.

New York.

NEW PUBLICATIONS.

Some Manganese Mines in Virginia and Maryland. By D. F. Hewett. Washington, D. C., U. S. Geological Survey. Bulletin 640-C; pp. 35; illustrated.

The nature and genesis of the deposits with a general geological description of the country is brought out in the first few pages. Descriptions of some of the properties then follow in which some details are given on the methods and results of their operations.

The Underground and Surface Water Supplies of Wisconsin. By Samuel Weidman and Alfred R. Schults. Wisconsin Geological Survey, Madison, Wis. Bulletin No. 35; pp. 664; illustrated.

General conditions affecting water supplies and their chemical contents is first dealt with. The second part deals with the water supply by separate counties. Under each county a description of the geological formation, water supply for cities and villages, and quality of water and analysis is given.

Boston Creek Gold Area and Goodfish Lake Gold Area. By A. G. Burrows and P. E. Hopkins. Ontario Bureau of Mines, Toronto. Bulletin No. 29; pp. 24; illustrated.

These two areas are located in the Temiskaming district, about 45 miles northwest of Cobalt. A description of the general geology and nature and occurrence of the ore deposits is given for each area. This is followed by a brief description of the genesis of the ores and some of the more important prospects and mines.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Seward.

In reviewing part of his trip Ben Bernard, general manager of the American Dredge Building & Construction Co., says the McKinley district looks good from a dredging point of view because as the gravels contained in many of the gold-bearing streams of the district were entirely free from boulders and hard pan, and particularly favorable for handling by means of the smaller sized dredges which with transportation facilities make it advisable to install. "We now have a crew of men drilling several of the properties and if the results show sufficient values a dredge will be installed. The rapid advancement of the railroad to its present terminus from Seward will greatly facilitate shipments of material for construction enabling shipments to be made from Seattle to Seward during the winter months, and after transporting by rail to the end of the railroad the material can then be taken over the winter trails at less cost than is possible during the summer."

Iditarod.

In considering the recent finds on the Boob and Mastodon creeks it is stated by some that the Tolstoy district is perhaps not worthy of all its praises. A brief review shows that Strandberg made pannings on No. 2 below, Boob creek, taking 3 pans from the dump and 3 from the bottom of the shaft. They gave a total of \$1.80, which would indicate a value of \$2.50 per ft. The gold is coarse and there is 3 to 4 ft. of gravel. J. S. Pitcher has pay in two shafts, one on the upper end of discovery and one near the upper end of No. 1 below. On the Emmet fraction they have better than \$3 per ft. It is getting better, but nearly all prospecting is at a standstill. Schwartzdahl exhibited gold panned from his claim which was flat and heavy and had run through 3 ft. of gravel. His pannings show results from 10 to 50 cts. This was on shallow bench ground averaging 10 ft. deep. The creek bed is wet, and there has been little or no prospecting there. Geer & McNulty, on Boob creek, have struck pay. They had 3 ft. of gravel that panned 6 to 35 cts. There are about 20 men on that creek, with 3 small boilers. The ground is said to be all frozen, and there is a depth of 35 ft. to bedrock. Some reports state that a small gasoline boat can get within 4 miles of the strike. A townsite, known as Cooper, has been located at the mouth of Mastodon creek, and supplies will be taken there when navigation opens. Two large scrapers will be operated next season, one by the Kuskokwim Commercial Co. and the other by Al Poormeister. The ground has been thoroughly prospected, and there is little doubt that they will make a showing. Cook & Co., in the Poorman district, near Ruby, have 6 ft. of dirt on the dump that will average 75 cts., per pan. Kickbush & Davis are working on ground that will go \$3 per ft., and good pay has been found on Spruce creek.

Juneau.

Alaska Gold Co.'s reports show that in the year ended Dec. 31 the company treated 1,115,294 tons averaging \$1.15, with losses in tails of 21.9 cts. It so happens that for the 8 months ended July 31 (including the month of December, 1915, when monthly statements were begun) the tonnage treated and the average grade of ore were practically the same as for the period covered by the annual report. For the 8 months referred to ore treated was 1,176,097 tons of an average grade of \$1.17. If losses in tails be estimated at 22 cts., the net recovery is found to have been 95 cts. In 1915 average mining, milling, smelting and miscellaneous costs were 71 cts. This does not include the entire cost of development,

as on Dec. 31 last there was a charge of \$574,690 for this work which had not been absorbed into operating expenses.

ARIZONA.

Oatman.

Two new important strikes have been recorded in the district during the past week. One of these is in the west drift of the Oatman Gold Mining & Milling Co., on the 500 level, where Chas. T. Arkins of Chicago reports average values for the length of the drift of better than \$15 gold. The ore shoot was encountered a little closer to the shaft than had been expected, and the operators believe that values will increase as the central part of the shoot is neared.

In the Lexington, at a vertical depth of 100 ft., a 6 ft. vein has been encountered which is reported to show $2\frac{1}{2}$ ft. of ore averaging \$14.50. A complete sampling of the vein exposures shown in the five shafts on the Lexington property has just been made. The shafts tap the vein at depths varying from 100 to 165 ft. along a stretch of 4000 ft., and the values and conditions revealed are very favorable. Work of continuing the main shaft down to the 500 point is now in progress.

The Black Range has suspended operations for a few days. Future development plans are now being perfected in Chicago by the syndicate which recently assumed control of the property.

Pending the completion of arrangements being made by the Lucky Boy Co. work has not been resumed on the property, but the operators state that there is little doubt that work will be started within a few days.

Development work is steadily progressing in the Big Jim on both 400 and 485 levels, and official statements as to the results of this work indicate that the property is developing into one of the important gold mines of the southwest. The last advice as to values covers the work of the past 30 days. It is stated that 69 mine samples, representing 160 ft. of new drifting on the 400 level and 180 ft. on the 485 level, gave an average value in excess of \$20. The ore shoot has been opened for a distance of about 375 ft. on the two levels, and all ore exposures on the two levels are stated to show average values of \$20, free milling gold. Sometimes the average runs a little below \$20, and again it will run a little above that figure, but it is well maintained. Upraises from the two levels are planned and have already been started from the 400 level with a view to finding the apex of the ore shoot. It is notable that in the Tom Reed mine, adjoining, the highest values were found at about 300 ft., then they decreased until about 500 ft. was reached, and then increased to 750, when they exceeded those at the 300, and thereafter remained very constant. Similar conditions appear to prevail in the Big Jim mine, and assay maps of corresponding levels in the Big Jim and Tom Reed mines show apparently identical values and conditions.

News of the final consummation of the transfer of the control of the Carter to an eastern syndicate is expected this week. In the meantime work on the property is not extensive.

The United Eastern has completed its retaining wall, 18 ft. in height, extending the entire length of the site of its cyaniding plant. The mill is being constructed. The new 3-compartment shaft is now down 435 ft., and has been connected with one of the laterals from the old working shaft, affording an air connection. Machinery for the mill is arriving daily.

Negotiations for the refinancing of the Gold Range Co.

are under way, and the officials state that they hope to resume work in the near future. It is intimated that money for a broad development campaign has already been pledged. This is one of the most attractive looking properties in the central part of the district and resumption of work on it will stimulate development in adjoining properties.

United Northern is crosscutting on the 400 level, and because of the stringers of highly oxidized hematites and quartz showing, Engineer Goldsworthy believes that the cut is very close to the vein and that good values will be found when it is penetrated.

Officials of the Tom Reed Mining Co. state that bullion valued at \$65,000 has just been shipped to the mint as the result of 2 weeks' clean-up. The mill is steadily running at full capacity, and insiders are predicting a resumption of dividends in the near future.

Esperanza and Lazy Boy are now working three shifts, sinking, after having been inoperative for some time.

Adams, Nellie, Murdock, Arizona Central, Hi Henry, Jerome Oatman, North Star, United Western, Midway, Oatman United, Sun Dial, Oatman Amalgamated, Oatman Syndicate, Arizona Tom Reed, Pioneer, Arizona Rex, Blue Bird, Boundary Cone, Chicago Syndicate, Ivanhoe, Iowa, Oatman Combination, Oatman Crescent, Telluride, Tipperary, and Wrigley Exploration are steadily operating.

Gold Reed is drifting and crosscutting on the 500 level and is reported to be opening satisfactory bodies of \$10 to \$18 ore. Mill tests of some of this ore are now being made.

Gold Ore is steadily developing, although milling operations have been checked by labor troubles at the Gold Road plant, which has been treating the ore from this property.

Gold Dust is steadily blocking out ore on two levels, while Gold Key, adjoining, is also reported to be placing a considerable tonnage of pay ore in sight.

Although it is reported that the Times Co. is well financed, operations have been discontinued. It is intimated that some change in the personnel of the company officials is pending, and that by the first of October operations will be resumed.

By the middle of September the hot weather will have been broken, and mining operations throughout the Oatman district will be materially increased. Already many operators who left on account of the hot weather are returning and preparing to resume work.

Jerome.

Sampler and smelter returns show 3,500,000 lbs. of copper from United Verde Extension (Little Daisy) during August. These figures correspond closely with the copper matte figures for July. The ore tonnage shipped during August was considerably less than July, showing that the average copper content of the ore was higher. The winze being sunk on the 1400 level is down better than 80 ft. in ore which carries from 20 to 50% copper. Native copper is a feature in the winze and the level above.

With the pump on the 700 level of the Jerome Victor Extension shaft, it is only a question of days now until the workings are completely drained and the work of sinking is started on the 1200 level. The officials of the company authorize the statement that there is no truth in the rumor to the effect that legal action has been taken in the matter of the purchase of the property by the Monarch Co. and its subsequent transfer by the latter to the Jerome Victor Extension Co. So far as can be learned, no legal step affecting title to the ground is contemplated as there is nothing upon which such an action could be based. With the unwatering of the shaft, therefore, it is probable the troubles of the management will be of the past.

Control of the Venture Apex property adjoining the Venture Hill Co. in the Jerome copper belt, will within a few days be vested in H. E. Schumate and other mining men of Prescott and Jerome. The first payment was made about 10 days ago and will be followed shortly by payment in full and a change in control as stated. The deal covers 85 acres. Development work in a tunnel 600 ft. long has exposed copper ore of commercial value and apparently in place. On the dump there are about 150 tons of ore that samples well.

Another tunnel has a length of 300 ft., but is not yet in the ore. A number of shafts from 25 to 50 ft. deep have also been sunk at various points.

The shaft on the property of the Jerome-Portland Co. is down better than 75 ft. in a schist formation that shows strong copper indications. A compressor and other mine machinery have been installed, and the necessary camp buildings are being erected. The working force numbers 15 men.

Montana capital, represented by George D. Case, formerly of the Anaconda Copper Co.'s smelter, is back of a plan to finance and develop a group of claims south of Jerome. Several prominent mining men of the Jerome field are likewise interested in the project, among them being C. V. Hopkins, chief engineer of the United Verde Copper Co., and George Mitchell, former superintendent of the United Verde Copper Co.'s smelter.

Miami.

Inspiration Needles Copper Co., owning 35 claims, 500 acres is acquiring Miami Needles group of 11 adjoining claims. This will give Inspiration Needles 720 acres, a compact tract lying one-half mile west of Inspiration Con. Nearly 500 acres of the Pinal schist ore-bearing porphyry formation of the Miami Copper belt underlie the Inspiration Needles tract. This is traversed throughout its extent by the contact between the Pinal schist and the overlying Schultze intrusive granite. This contact zone produces the ore bodies in the Miami district. John S. Cook, Globe, is financing the development by churn drilling. Two drills are down about 400 ft., showing patches of oxidized copper. Two more drills are contracted for and should arrive the last week in August. Ultimately 7 drills will be in operation. Sulphide ore is expected at about 600 ft., judging from its occurrence in the tunnel on the Standard No. 5 claim.

Wenden.

The mines near Wenden are attracting capital and many new companies have been formed and are now doing development work. The "Critic" mine is shipping one car per week of copper-gold ore that yields \$3000 per car net. The Desert mine is now equipped with gasoline hoist and air and Black Reef mine is installing a plant of a like nature. Both of these properties will be producers as soon as the necessary improvements can be made.

Crown King.

Eastern capital has taken over the leasehold on the Tiger Gold property in the Crown King country, hitherto held by C. C. Cowan and R. W. Runnels. The latter returned here a few days ago from the East where negotiations for the transfer were consummated and plans for the future development of the property were made. Under the new regime the main-working shaft is immediately to be unwatered and development of the ore bodies taken up. In former years the Tiger Gold produced a large tonnage of high grade gold ore. As the shaft was deepened values fell off somewhat and base minerals made their appearance. The milling appliances then in use proved inadequate to handle the base ore and the mine was closed down. Modern methods of mining and milling make possible the profitable reclamation of the mineral contents of the refractory ore. A considerable tonnage of the latter is exposed on the various levels of the mine.

CALIFORNIA.

Copperopolis.

At a depth of 15 ft. an 8-ft. ledge of gold-copper ore has been encountered in the Napoleon mine. A new shaft is going down in ore and the vein is steadily widening. The old mill is being overhauled and will be placed in commission soon. It is likely a small flotation plant may be installed.

Woody.

The Weringer Mines Co. is constructing a flotation plant of 100 tons capacity at its copper mine here. It is planned to start production within 90 days. Developments have been in progress about 5 years and it is stated sufficient ore is

exposed to keep the plant in steady operation for 2 years. High-grade chalcocite has been exposed in the crosscut from the 200 level and the winze is going down on a strong body of 4% material. Shipments of rich sulphides are being made at the rate of a car load weekly.

Auburn.

The Pacific Dredging Co., a subsidiary of the Yukon Gold Co., has contracted for the thorough prospecting of gravel deposits along the north fork of the American river from Auburn to Colfax. Prospecting of the Grottilan ranch is proceeding with a large drilling outfit. Codfish canyon and Manhattan bars, both famous producers, will be given principal attention. Satisfactory results will be followed by the building of one or more dredges.

Oroville.

Natomas Con. has started re-dredging of the first land successfully worked by the dredging practice in California. On the tracts formerly worked by dredges, Couch No. 1, 2 and 3, the company has installed Feather River dredge No. 1, provided with the latest gold-saving appliances. The boat is expected to not only profitably work the old tailings, but to restore much of the land to a state of fertility. Successful culmination of the experiment will be followed by the placing of several boats in operation.

Daggett.

Arrangements have been made to convert the 200-ton mill of the Daggett Reduction Co. into a custom plant for treatment of ores from the Goldstone district. The mill will operate in the interests of lessees and is expected to stimulate developments in the new gold camp. Shipments of rich ore continue to be made from the leading mines and deeper work indicates some of the ore bodies will probably persist to considerable depth. A considerable percentage of the ore is free milling.

Jackson.

A general strike of miners along the Mother lode is threatened by labor leaders unless a further advance in the wage scale is granted. The operating companies state it will be impossible to meet the demands, as many are operating on small margins of profit, and another advance would mean actual losses. The scale ranges from \$2.75 to \$3.35, depending on the property and the class of labor. A few of the leading concerns recently adopted a scale of \$3 to \$3.25, and it is thought will not be affected by the trouble.

Construction of the new mill of the Argonaut Co. is nearing completion and the stamps will start crushing soon. The plant contains 60 heavy stamps and numerous departments calculated to lower costs and increase the gold recovery. The old mill has 40 stamps. From the final set of tables tailings will flow into an impounding pond, served by a dam 400 ft. long and 40 ft. high at the lowest point.

Additional rolls and concentrators are being added to the mill of the Bunker Hill Con., near Amador City. Recent developments have materially augmented supplies of visible ore, and the plant is operating at capacity. Dividends continue to be disbursed at the rate of \$5,000 per month.

Carrville.

The Pacific Dredging Co. has completed the hull of its massive dredge in Morrison gulch, and is installing the machinery. Within 60 days the dredge is scheduled to go into operation. A large acreage of excellent ground has been proven and the company is still prospecting broad areas along the Trinity river and its tributaries with Keystone drills.

Nevada City.

The bed and banks of the South Yuba river for a distance of 2000 ft. below the junction of Humbug creek and the river have been taken under bond by W. W. Kirkham, R. L. Plummer, and L. R. Kirkham of Nevada City, and leased to E. W. Kay and associates of San Francisco. It is planned to divert the river from its course and to shovel the gravel and sand into sluices for extraction of the gold.

Darwin.

The Darwin Development Co. is operating the Columbia Lane, Jim and Promotory mines with good results. On the 600 level of the Jim a 2-ft. ledge of \$125 ore has been cut, and rich ore has also been opened in the Promotory. From the latter a tramline is being constructed to the mill. The

mill practice is unique. After being finely crushed the ore is mixed with small quantities of oil and magnetite and rotated with a number of small steel balls. The minerals concentrate on the balls from which they are removed by friction on a screen. Tests show a recovery of 85 to 87%.

Big Pine.

The Bunker Hill mine, east of Big Pine, has been acquired by J. F. Fitting, the Nevada operator, and arrangements made for extensive work. Some good ore is blocked out and further satisfactory work will be followed by the building of a mill.

Sonora.

Unwatering of the Omega mine has progressed to a point beyond the 300 level and mining has been resumed at the 200 and 300-ft. points. As soon as the 600 level is cleared of water extensive drifting will start to seek the big ore body which formerly yielded well; 20 men are employed.

A bond has been taken by Boston capitalists on the Bell mine, near Tuttletown, and unwatering of the shaft will start as soon as equipment can be assembled. The mine has produced well and contains wide ledges of good-grade quartz. It is a typical Mother lode property. Operations will be in charge of Paul S. Bernard.

Mokelumne Hill.

Rich gravel has been uncovered in the lower channel of the Stockton Ridge mine and the gravel mill is running at capacity with good results. The mine has been developed by a 3000-ft. tunnel and comprehensive lateral workings, and is well equipped. George Chapman is superintendent.

Ubehebe.

The Lost Burro gold mine, 4 miles from Ubehebe, has been taken under option by the Montana-Tonopah Co. and is being examined by company engineers. The principal vein has an average width of 4 ft. and assays \$19 to \$21 in gold. Tests indicate 85% of the metal can be recovered by amalgamation. A good flow of water has been developed within 2 miles of the mine.

Folsom.

A new jig has been invented by Emory Oliver, L. D. Hopfield, F. W. Griffen and Edward Strous of the Natomas Con. Co., that has proven its ability to recover 90 to 97% of the fine gold formerly lost in gold dredging. All the Natomas boats will be equipped with the new device, which is expected to save the company thousands of dollars daily.

COLORADO.

Cripple Creek.

Supt. McDonald has temporarily suspended sinking at the main shaft of the Strong mine in Victor, where a depth of approximately 1500 ft. has been attained. He is now engaged in cutting out the station for 1400 level. The elevation at the collar of the Strong shaft is 9756 ft. so that the station will be located at an elevation of approximately 8256 ft. As compared with the Portland No. 2 shaft, the Strong mine is now the deeper. The Portland No. 2, is 10,244 ft. above sea level at the collar of the shaft, and 1900 ft. deep, so that the bottom level station is located at an elevation of about 8344 ft. as compared to 8256 ft. for the Strong. If the depths are correct the Strong is 88 ft. deeper, but it is possible the laterals from the Strong may be carried out at the same approximate elevation for possible connection at a future date.

W. F. Kendrick, Denver, president and director of the Anona Mining Co., owning in all about 26 acres adjoining the Isabella Mining Co., and old Victor Co., on the eastern slope of Bull Cliff, has visited the property and arrangements are being completed for the resumption of work.

Progress is being made with the drive from the 1000 level of the Vindicator Con. Co.'s main shaft to a point directly under the main shaft of the Hondo Co. south from the Vindicator. This lateral will be approximately 900 ft. in length, when the objective point is attained. Of this distance about 450 ft. has been covered. The lateral is now well within the boundary lines of the Hondo Co.'s estate, and important developments are anticipated. The lateral has crosscut several

minor cross leads and is now entering a section where the northwestern extensions of the veins of the Golden Cycle system, known to traverse this territory should be encountered. Machine drills are used, and in addition there are two machines on development and exploitation work in the main workings of the Hondo shaft.

A 35-hp. electric hoist and a 6-drill electric compressor installed at the main shaft of the W. P. H. mine have been brought into commission. The power line is from the Arkansas Valley Railway Light & Power Co. The mine is owned by the United Gold Mines Co. and is operated under lease. With the hoisting plant in operation, ore already broken will be brought to surface and shipments will be shortly resumed.

Returns received from a recent shipment from the Queen Bess mine show the 16 tons screenings returned \$91.40 a ton, and 11 tons of coarse quartz brought \$64 a ton. The lessees are operating through the 750 level of the Mollie Kathleen shaft, and ore is hoisted by the Mollie plant. The shoot has been proven by drift for 60 ft., and while the values in the north heading have fallen the south heading is showing up richer. The lessees have another shipment ready. The Queen Bess is owned by C. L. Tutt, Colorado Springs, and is operated by present lessees under lease and bond. The bond calls for the payment of \$17,500 during the life of the lease and it is expected that the lessees will lift the bond and own the property before the lease expires.

Leadville.

Four new furnaces have been brought in by the Western Zinc Oxide Co. The addition gives the plant 12 furnaces with a capacity of 5 tons or a total capacity of 60 tons a day. A wood fire is now burning in the new furnaces heating them preparatory to charging for continuous service. The plant has been operating continuously for several months, opening a market for the low-grade zinc carbonates that have been practically worthless. From this carbonate a high-grade zinc oxide is manufactured, a product that has a permanent demand. The manufacture of zinc oxide has been successful and it is planned to increase the capacity as soon as possible. The addition of a roasting plant for the treatment of sulphide ores is contemplated and undoubtedly will be undertaken during the present year. Some months ago, difficulty in securing enough ore for the operation of the plant was experienced. This shortage has now been overcome and large reserve stocks are being crushed and piled. It is stated that the reason for the change in conditions is due to the drop in the spelter market during the past few months. When spelter was high, low-grade carbonate of zinc found a profitable market in the large zinc smelting concerns. Ore from 12 to 20% is being shipped to the company, instead of to Oklahoma, Kansas and other centers. The following mines are the principal shippers: Tip Top, Baby, La Plata, Robert E. Lee, Little Silver and the Yak tunnel, with occasional shipments from other properties. The finished product is being shipped to an eastern market at the rate of 50 tons a week. This oxide is stated to be between 75 and 80% zinc. The output will be increased 25 tons a week as soon as the new block of furnaces are operating permanently.

IDAHO.

Wallace.

Reports emanating from reliable sources state that the O. W. R. & N. Co. has decided to build a branch line up Beaver creek in the Coeur d'Alenes, connecting with the Murray branch near the Idora spur, and that the construction contract already has been let. Spokane officials profess to be in ignorance of any contemplated extensions to the system in that region, but last week executive and traffic officers of the corporation, together with Harry L. Day and Eugene R. Day and representatives of the construction firm said to have secured the contract, made a trip of inspection over the proposed route, and it is said that members of the party announced that the line would be built as soon as possible. The survey has been established for some time, and a water grade from the connecting point on the Murray branch to the terminus has been secured. The line would

serve the Ray-Jefferson, Interstate-Callahan, Idora, Tuscumbia and Virginia, all producing properties, and the Friend, Toughnut, Parrott, Sunset and several other properties that will be able to ship as soon as transportation is provided. A minimum monthly tonnage agreement is said to have been entered into with the companies that will benefit, the deficit, if any, to be subscribed pro rata. The proposed line would enable the Interstate-Callahan Co. to deliver its output through the Amazon-Manhattan workings to within about 3700 ft. of the tracks, while the shipping bins of the Ray-Jefferson can be located within a few feet of its main tunnel. It will bring transportation within a mile of the Idora mill, which treats the product of both the Idora and Tuscumbia mines, and undoubtedly will result in greater development in the Beaver creek district than ever before. The Ray-Jefferson and the Interstate-Callahan will be the chief beneficiaries if the line is built. The former now has its 400-ton daily capacity concentrator almost ready to operate, and probably will be able to produce to the limit by the time the branch is in service, and the latter will be able to reduce transportation costs materially. At present its output is transported to the Mullan branch of the Northern Pacific over a 10,000-ft. aerial tram, but if shipments are diverted to the Beaver creek line through the Amazon-Manhattan workings, now connected with the Interstate-Callahan under of the Rex, accompanied by Raymond Guyer, consulting engineer of the Rex mill and tramway which have been operated for several years past by the Tamarack & Custer Con. The tramway equipment, which had been transferred so as to connect the Tamarack-Custer workings with the mill, is being re-transferred to the Rex, and the Tamarack-Custer has closed down. Directors L. E. Whicher and Robert Sweeney, grounds, a carrier of not to exceed three-fourths of a mile will convey the product to the shipping bins.

The Rex Con. Mining Co. has terminated the lease on neer, are completing a thorough inspection of the Rex property, and report tramway reconstruction and mill improvements proceeding satisfactorily, and the mine being put in readiness for early ore production.

The management of the Independent Mining Co., whose holdings adjoin those of the East Caledonia Co., on Silver creek, is installing a compressor plant and hoisting equipment, and sinking the main shaft will be resumed as soon as the electric power line from the East Caledonia station, about a half mile distant, is completed.

The Federal Mining & Smelting Co. will pay the regular quarterly dividend, \$1 a share, or \$120,000, on the preferred stock on Sept. 15. This will make the payments for the year \$360,000 and will increase the grand total to \$15,645,545, of which \$2,708,750 was paid on the common stock prior to 1909.

Kingston.

The Hypotheek Mining Co., which owns and is operating the Hypotheek mine and mill, shipped 4 cars of crude ore and 6 cars of concentrates in August, according to the official report of Manager Otto A. Olson. Total operating expenses for the period were \$7,000, and the net earnings are estimated at not less than \$35,000. The crude shipments averaged about 77% lead and 10 ozs. silver, or about \$80 a ton above freight and treatment charges, and the concentrates ran about 64% lead, \$5 in gold and 15 ozs. silver, netting about \$73. The mill now is treating about 175 tons of ore daily, producing approximately 15 tons of concentrates, and about 4 tons of crude ore daily is being sorted.

LAKE SUPERIOR.

COPPER.

Houghton.

The production of the Lake Copper mines for August was somewhat less than for July. There may be a slight loss in September as there is one less working day, but on the other hand there are likely to be some small gains from somewhat improved labor conditions.

There is a rumor in circulation that when the Adventure mill starts up Mass will secure the use of one of the Allis-

Chalmers stamps for the rock that it can mine in excess of that treated at its own mill, which has only one stamp. The two properties have the same superintendent, E. W. Walker. Another rumor is that the Isle Royale may, when the Michigan begins milling some time in the fall or winter, utilize a stamp there.

Tamarack gas fallen off somewhat in output of rock as it is hoisting at the rate of about 30,000 tons monthly as compared with that of a few weeks back of 37,000. Shaft No. 5 as No. 3, is working wholly on the Calumet conglomerate, while No. 2 is taking its rock from the Osceola amygdaloid, and is getting its tonnage from the 32nd to the 38th levels, inclusive, of about the average grade.

Copper Range Con. has secured from the St. Mary's Mineral Land Co. an option 6 miles of territory south of the Globe tract, which stretches from the Champion boundary 6000 ft. along the strike of the mineral-bearing formations. It will be explored by the diamond drill.

About 3500 ft. south of No. 4 shaft at the Champion—stretch of ground that averages the best of any amygdaloid in the district—an almost vertical fault was encountered beyond which the ground was broken and almost barren and resembled very closely that opened at the Globe 6 years ago.

Naumkeag is working on the Old Pewabic which is an east branch of the main Pewabic or Quincy lode, and has quite a promising occurrence of the metal.

Indiana has considerable copper of commercial values with some all the way for the 9 ft. that have been so far opened on the lode thought to be the Butler, by blasting into the outcrop. The vein has the regular amygdaloidal characteristics and gives indications of being quite wide.

New Arcadian will soon begin to sink the shaft which is now down 50 ft. to the lode discovered 265 ft. west of the exploratory shaft, 1800 ft. south of the first shaft, and which is supposed to be the old Arcadian lode, down 50 ft. further and then drift.

Michigan continues to disclose on the Butler lode at the 6th level a large amount of mass copper, though the west drifts are very much better than the east just at present. The western drift is running south 65° west and is in 180 ft. from the shaft; the eastern is in almost as far. The mining is very irregular. It will be some time before the exact nature of the bed is fully understood, but its future looks very promising. The main crosscut which passes through all the lodes of the Evergreen and Knowlton series has reached a length of 130 ft. from the shaft and will be steadily continued.

Baltic is finding that its West vein has a mineralization much more extensive than at first supposed, and it appears that it will be like the famous foot-wall disclosures at the Wolverine and South Kearsage. It has been cut into at all of the shafts and has been found to extend to the 20th level at No. 2, and is practically furnishing all the production at No. 5; and though like the foot wall at the South Kearsage, it is very bunched, it seems now that with the rather slight amount of opening that has been made that it may be eventually regularly mined as the Baltic lode. It is only about 14 ft. wide on the average as compared with the Baltic which runs about 23 to 25 ft., and its rock is by no means as rich, but at the present time it is quite profitable at a very low cost. The deepening of the shafts is proceeding steadily, the method used being to sink No. 3 and to run drifts from it to Nos. 2 and 4, and then to raise, which effects quite a saving in cost; No. 2 has about finished hoing up from the 28th level; No. 3 is below the 31st, and No. 4 is at the 29th. The new levels at No. 2 are good, and No. 3 is looking better.

Ahmeek will have its new shaft-rockhouse ready in about 3 months, but there will be very little loss of time in transferring from the old house to the new as the latter is built over the former.

Winona is shipping about 600 tons daily, and could ship much more but additional men are very hard to get. President Paine has returned to Boston and it is likely that the new leaching plant will be adopted for 100 tons a day capacity unless there should be a reduction of the market price of copper.

Michigan has about 180 ft. from the shaft on the exploratory crosscut entered for the distance of 7 ft. in an ex-

cellent grade of stamp rock of amygdaloid on the strike of the Ogimah, which it is thought to be. The crosscut that found this lode has met with a succession of cracks and fissures which have in almost every case carried copper, about a ton having been taken out in about a week. The lode will be entirely crossed and probably some drifting will be done. On the Butler in the eastern drift the copper still continues, and though there is what the miners call a "horse," a strip of barren trap, in the middle of the face of the drift there is 4 ft. of good stamp rock on one side of it and considerable on the other. The western drift which was turned to the footwall did not find any copper, so that now the copper above the present face will be followed.

Lake's purpose of immediately opening the old shaft on the Knowlton lode is most highly commended by those mining men here familiar with the old workings, many of whom thought this work should have been started when the continuation of the war for quite a long period seemed quite certain to take advantage of the high prices for the metal. Just after the formation of the present company in 1905 copper was taken out of the mine with but little work, that was sold for \$3800.

South Lake is getting good copper in the drift it is driving north for the purpose of making connection with Lake in order to secure necessary ventilation for the working of its South lodes, which are over 1400 ft. from the shaft. A good deal of mass is coming from the Butler lode. The drop-hammer for cleaning off the waste rock from the mass copper has arrived and is being set up, will soon be in operation, and the mass can soon go to the Quincy smelter.

Keweenaw is building a new rockhouse of wood, 25 ft. long by 24 ft. wide, which will be sufficiently large, as the mill is only a short distance from the mine and consequently no large storage bin will be required. It is thought now that the trestle for the connection with the Keweenaw Central, owned by this company, the rockhouse and the mill will be ready for forwarding the rock about Sept. 15. The mill, which belonged to the old Phoenix Co., has one Ball stamp, Hodge and Woodbury jigs, and Wilfley and Overstrom tables, and though not of the latest types this equipment should give a good recovery.

Houghton Copper is still getting good copper values at the bottom of the winze, the 12th level on the north drift. The drill will be shifted over to the south side of the shaft towards the Superior and better ground may be entered.

Cherokee is in at the depth of 65 ft., the same heavy copper that has been encountered all the way from the outcrop and with its two drills will make a greater rate of progress. The bottom is completely in the good ground.

Hancock is getting very good rock in all of its openings at the Quincy No. 7 shaft, where stoping is being carried on in the 66th, 68th, 69th, 70th and 71st levels and drifting in the 53d which is the 63d of the Quincy.

Michigan is getting, besides a fair quantity of amygdaloid, over 400 lbs. of mass copper daily, one piece weighing over 1000 lbs. The main crosscut has the length of 260 ft., and is disclosing a little copper occasionally when a crack is entered. The western drift is now in very good rock. The Ogimah lode is being cut into by drifts and the stamp rock is showing up on the average well.

Carp Lake continues to display the same high-grade copper in the upper mineralized belt, which is 6 ft. in width, and on which all the work now being carried on is being done. Drifting has been started in the first shaft opened at the bottom of the winze which is 35 ft. down from the outcrop and at the No. 9 shaft.

Osceola's production for August will be about 109,000 tons as compared with 105,000 for July and 114,000 for June.

Quincy is putting in a new 600-hp. boiler at the mills at Mason 6 miles south of the mine on Torch Lake in order to provide for the two conical tube mills.

IRON.

Ishpeming.

Contracts for a new shop at the Cliffs shafts, and also for repairs and alterations to the dry at the same property,

and the Lake mine have been awarded by the Cleveland-Cliffs Iron Co. to Louis Erickson & Son. The increased forces working at the mines have overtaxed the dry capacity for some time. The buildings will be of brick. Other building operations of the company include the construction of a new office at the Cliffs shafts and a new dry at the Holmes.

A new Sullivan first-motion hoist is being installed at Section 16 mines by the Oliver Iron Co. It has two 26-in. cylinders, and a 10-ft. drum, built to hold about 1500 ft. of hoisting cable. A steam head of 125 lbs. will be used. The machinery is nearly assembled, and the concrete foundation is being poured. The new hoist will be located much closer to the boiler house than the present one, and the engine house, the erection of which will soon be commenced will be of concrete construction. The company will build the structure itself, instead of letting a contract to outside parties. James Bryden is in charge of the installation. It is expected that the new hoist and engine house will be ready for operation about Nov. 1.

July iron ore shipments totaled 9,750,157 tons, which exceed June by 242,581. Ore shipments to Aug. 1 have broken all former records by more than 5,000,000 tons. The total carried was 29,365,724 tons. The former high record was made in 1913. Carriers now freely predict a season approximating 50,000,000 tons. The United States head of the lakes has shipped 20,376,405 tons up to Aug. 1, against 13,678,166 tons a year ago, or an increase of 6,698,239 tons.

The Oliver Co. is intending to educate its foreign employes. So far a definite program has not been adopted by the officials, but suggestions offered by M. H. Godfrey, general superintendent of the company for the Virginia district, who was made chairman of the committee to draw up plans, met with hearty approval and are recommended for adoption by the corporation. Godfrey suggests a card index plan for all of the employes of the corporation. The cards are to be in yellow, white and red. The yellow cards are to contain the names of those who have no papers, the red those who have taken out only their first papers and the white those who have taken out their final papers. The cards give the name and mine number of the employe, nationality, age and information as to whether he reads English and attends night school and if he has taken out naturalization papers. It will be the aim of the company to have every employe become a citizen and preference will be given those who take out their papers.

MISSOURI-KANSAS.

Joplin, Mo.

Due to the continued drouth of the past 3 months and to the high cost of supplies and labor, the close of this month sees one of the weakest markets this district has had for a number of years, with unsettled conditions generally. The biggest reduction in output of the year occurred in August, but despite this fact, there is a large tonnage of ore lying in the bins, due to the weakness of the ore market. At a meeting of the mine operators of the Joplin, Webb City and Miami districts, it was decided, however, that there would be no concerted shut-down of the mines of these districts, but many operators expressed their intention of shutting down—but there will be no united action.

The C. M. & H. Co. is installing a new 2-stage 6-in. pump at the old Glendale shaft on the Continental Zinc Co.'s tract in West Joplin. The water is being drained to permit the working of a new shaft a short distance to the east, which was put down by this company last winter. Good dirt is being taken out and the company desires to work it about 30 ft. deeper than is now permitted.

The A. W. C. Co. is taking advantage of the present enforced idleness and is installing a new compressor at No. 1 plant. It is a 900-ft. Laidlow machine and will be electrically driven.

The Franklin mine has been sold to Lown & Hastings, former owners of the O. F. & L. mine at Duenweg. The consideration is said to be around \$50,000. This mine has been

in the hands of J. A. McConnel of Joplin, as trustee in bankruptcy, since Aug. 3, and the sale was made through him. The new owners are experienced mine operators and will start operations immediately.

Work on the new shaft of Jonas Smith on the Continental Zinc Co.'s land, west of Joplin, is rapidly progressing. This shaft will be put down at least 160 ft.

Ten new shafts are being put down by small companies on the Lone Elm Mining Co.'s tract, which produces a very high-grade concentrate, making this land attractive to smaller operators.

The Log Cabin 40-acre tract just southwest of Galena has recently been leased by T. A. Hogg and several associates. Work of drilling the tract already has begun, and shafts will be sunk as soon as the land shows up sufficient ore-bearing dirt. Adjoining the Log Cabin tract is the Diplomat, West Virginia and Sapp mines, which are considered the best producers of the Galena district.

Miami, Okla.

The Defender Mining Co. is planning the erection of a concentrating plant on the Quapaw 80-acre tract, where a rich ore body has been proved by drilling. J. H. Wright of Joplin is president and general manager, A. J. Williford of St. Louis is vice-president, and J. L. Diffenderffer of Lebanon, Mo., is secretary and treasurer.

The Blue Mound Mining Co. has given the United Iron Works Co. of Joplin, a contract to erect a 300-ton concentrating plant on the former's land near Picher. The Blue Mound Co. has been operating eight drill rigs on its lease and rich clippings of usual high-grade Oklahoma ore have been brought out.

One of the largest mills in the district has recently started operations on the Netta tract owned by the Picher Lead Co., its capacity being 600 tons per 10-hour shift. At its other properties the Picher Co. is pushing developments. At the No. 7 shaft a big Gainesville pump is being installed, which is the largest in the Oklahoma section of the camp, with the exception of the Lennan pump at Commerce. At the No. 1 shaft new pumps are also being installed and draining will be done so dirt from this shaft can be utilized for the Crawfish mill, which since its starting is said to have averaged 2 tons of zinc ore per hour recovery.

The Amia Kenneth Co. is planning to sink a new shaft on the Saft-Hoffman lease north and east of Century, as a result of a good drill strike made recently. Pay dirt was encountered in the first hole at a depth of 105 ft., continuing to 160 ft., and in the second hole this same run was encountered and a heavier run beginning at 198 ft. and extending for 16 ft. Competent mining men declare this to be one of the richest strikes in this district.

MONTANA.

Butte.

East Butte began in January with a production of 1,060,000 lbs. and reported an output of 1,893,000 for July, showing an increase about 80%. Whether that rate of output will be continued or not remains to be seen but, with the splendid ore now coming from the lower levels, it is believed it will be and perhaps increased. Some of the smelter output is coming from custom ores, but the East Butte itself is doing exceptionally well. Many think the company will resume dividends this year.

Work is being rushed in the Great Butte property, and the management expects to have the plant in readiness to begin unwatering the Butte-Bacorn claims within 2 weeks. Much of the machinery for the surface plant is on the ground and completion of the plant only awaits the finishing of the concrete and brick work. The boilers are in place, the grading has been completed, concrete forms for the engine and compressor are finished and the compressor, pumps, pipes and auxiliary apparatus are on the ground. The construction of the 70-ft. head frame has also been completed and the collar of the shaft is cribbed and ready for the work of unwatering to start. It is stated that the Bacorn shaft, which

has a depth of 1000 ft., will be unwatered within 2 weeks, it is expected, after the pumps are started.

Virginia City.

More than 22,000 cu. yds. of gold-bearing gravel are washed daily by the four dredges of the Conrey Placer Mining Co. in Alder gulch and the Ruby valley, according to Charles Kammerer, general manager. The year ending this month has been the greatest for output in the history of dredging. The ground of Alder gulch is being worked for the third time in sections. The gulch was drifted by the first gold seekers of the early '60s. Then the same territory was ground-sluced in the '70s, and now the dredges are washing the soil and gravel for the third time. The diggings made famous in Montana history are still rich in gold. The company operates the largest dredge in the world. The machine handles 11,000 cu. yds. a day, or as much as the combined yardage of the other three dredges at work. The machine is called dredge No. 4, and is manned by 10 men, three on each shift and an extra man during the day shift. The dredges are kept running every hour of the year save when shut down for repairs. There are 85 men now on the payroll.

Bannock.

Bannock Gold Mining Co. will be ready to start in operation its 200-ton cyanide plant by Sept. 15. The equipment consists of a crusher, an Allis-Chalmers ball tube mill and facilities essential to an all-slime, continuous counter-current decantation system of cyanidation. The ore consists of white quartz, carrying gold and silver, and occurs in a contact vein, between limestone and syenite. The vein was opened by a main 760-ft. crosscut, starting 90 ft. above the creek level and running to the contact. Three other openings were made in a similar manner at higher points. A winze was sunk 165 ft. on the vein, from the main level, at which depth water level was reached. Tests showed the grade of ore to average \$11.65, and mill tests indicated that a recovery of 94.7% of the gold could be made and 68% of the silver. The same tests showed a cyanide consumption of 0.6 lb., and a mechanical loss of 0.5 lb. It is estimated that 200,000 tons of ore are exposed in the mine. The company has its own plant for hydro-electric power. The property is 26 miles from Dillon, and 14 miles from Grant, the latter on the Pittsburgh & Gilmore railroad. The officers of the company are: President, John F. Cowan, Salt Lake; vice-president, B. Binnard; secretary and treasurer, Dr. W. C. Ebaugh, Salt Lake; managing director, G. T. Hansen, Salt Lake, manager for Allis-Chalmers Co.; W. S. McCornick, Salt Lake, director.

Coloma.

P. M. McCree, consulting engineer of the Montana Gold Mines, who is now at the mine on a visit of inspection, states that 1000 ft. of the main tunnel had been completed. Two shifts are now employed, making progress at the rate of about 35 ft. per week. The rock passed through is of good character for the tunnel, as timbering was found necessary for only short distances in one or two places. No evidences have yet been seen of No. 1 vein. This is altogether favorable, and it is hoped that it will not be struck for a further considerable distance, for the reason that the further the tunnel goes before cutting this vein, the more chance there is to find that veins Nos. 1, 2, 3 and 4 will either "bunch up" or strike the Contact vein above the tunnel level, in which case valuable deposits are expected to be found at that point.

McCree states that the work is running smoothly and the new Jackhammers are working splendidly. Additional ones are being secured with which it is hoped to make even more rapid progress.

Troy.

Regardless of the fact that a scarcity of laborers has retarded construction of the improvements being installed at the properties of the Snowstorm Mines Con., the work is progressing fairly satisfactorily, according to Leo Greenough, president and general manager. "Despite delays we have been able to maintain a force that is carrying the betterments to completion within the time that we estimated would be required to complete construction," said Mr. Greenough. "Our standard gage railway line from Troy to the millsite is completed and operating, and material and machinery for the different plants are being delivered in advance of the con-

tract date. The hydro-electric station is well under way, and the transmission line is being built. The poles now are being set, and we will have everything in readiness to turn on the current when it is required." The company practically is a reorganization of the old Snowstorm Mining Co., which operated the Snowstorm mine, near Mullan, Ida., for a number of years and paid \$1,169,610 in dividends. The officers and principal stockholders are the same as in the defunct corporation, and it recently took over the assets of the Snowstorm, together with the Banner & Bangle group of lead-silver-zinc claims and adjoining properties near Troy. The new holdings are extensively developed with a series of tunnels, opening the mine to a vertical depth of 1200 ft., and recent reports state that there is sufficient ore in reserve to keep the mill now being built supplied for several years. About \$500,000 are being expended in constructing the mill, compressor plant, hydro-electric station and the railway. The millsite is about 2 miles from Troy and the mines about 6. The railway will be extended from the mill to the mine workings, and the entire system probably will be ready to operate soon after the first of the year.

NEVADA.

Tonopah.

Sinking of the Victor shaft of the Tonopah Extension to a depth of 1840 ft. is about to start. From the bottom level a crosscut will be driven to intersect the Murray vein. Preparations for stoping on the Murray vein from the 1540 level have been made and a heavy tonnage of excellent ore will soon be drawn from this point. The Afterall crosscut is being extended to develop the ore body, which is the most northerly vein yet opened in the district. It is reported the capacity of the mill is to be increased at least 10%. The plant at present is crushing 2200 tons per week.

Goldfield.

The ore body recently encountered at a depth of 875 ft. in the Silver Pick is about 3 ft. wide and assays \$30 to \$80. A heavy flow of water drove the miners out before much work could be done. The company is installing powerful pumps. The vein was struck east of the Columbia Mountain fault and is considered one of the most important developments in the district since early discoveries. It has been definitely decided to send the shaft to a depth of 1200 ft. and prospect both the shale-latite and shale-alaskite contacts.

The big flotation mill of the Goldfield Con. is now treating 1000 tons of ore daily and handling some ore of excellent grade from the newly-opened lower workings. It is reported the company is arranging to send 600 tons of tailings from the old dumps through the cyanide plant daily, and this product is figured to return a net profit of \$1 to \$2 per ton. Mine developments are stated to be pleasing. Rich ore has been uncovered in new ground in the Mohawk mine and conditions in the Red Top-Laguna territory are decidedly good. At the company's Aurora Con. mine 500 to 600 tons are going through the mill daily, and profits are said to be higher than at any time since work started. About 250 men are on the payroll.

Ore indications in the Lone Star continue to improve and the management is expectant of opening the main vein in the early future. Work is centered on the 225 level, where a huge dike is being explored. Above this point some bonanza quartz was extracted in early days.

Manhattan.

The discovery of rich ore at a depth of 310 ft. in the White Caps mine has stirred great interest and is considered the most important ore disclosure since the discovery of the camp. In the east drift from this level the vein is 12 ft. wide and averages \$30. In the west drift the ore shoot has a width of 40 ins. and assays up to \$125. The veins are apparently trending toward a junction and sinking will be resumed to open the ore further down. It is stated the ore can be readily worked by the new process the White

Caps Co. has developed. Part of the treatment will consist of roasting and subsequent treatment with cyanide.

Virginia City.

It is persistently rumored that the leading operating companies of the camp are seriously contemplating joining their resources to form a strong pumping association preliminary to unwatering of the deeper levels of the Comstock lode. It is said unwatering will be conducted to a depth of 3300 ft. and valuable ore bodies at this point opened for extraction. The output of the Union Con. has increased to \$10,000 per week, and on the 2400 level a strong shoot averaging \$19 has been opened.

Jarbridge.

Fully 200 men are now on the payrolls of Jarbridge companies and a large amount of new work is proceeding at all the main properties. New discoveries have been made north of Gorge gulch and about 1000 ft. east of the river and prospecting in this section is very active. Several million are in commission and the bullion output is steadily increasing.

NEW MEXICO.

Mogollon.

Socorro Mining & Milling Co. shipped twenty-one 100-lb. bars gold and silver bullion from operations covering first half of August and several tons of concentrate. New headframe for wire-rope tramway from Pacific mine is nearing completion. It is 60 ft. in height to carry cable directly over mill. The company paid a 1% dividend on Aug. 1, the fourth of like amount in 1916.

New working shaft of Mogollon Mines Co. has reached a depth of 860 ft. No stations will be cut until 900 level is reached.

The limited amount of exploration on the Clifton mine since May, when it was taken over by the Oaks Co. under bond and lease, disclosed a grade of ore almost from the beginning that is being packed regularly to custom works by burro. This mine adjoins the Eberle, both on the Queen vein, the two occupying the geographical center of the district, and their position will have an important bearing on a general consolidation of interests in the camp towards which the controlling factors are gradually working.

S. J. Kidder, manager Mogollon Mines Co., has tried out crushed vein rock on roads around property the past few months and this stood up well during rainy season, forming a smooth, hard surface. This plan for road covering will undoubtedly be used on new roads coming into camp both from Clifton, and Magdalena, and henceforth in repairing grade over mountain into Mogollon.

OREGON.

Prairie City

The Farnish Co. of San Francisco is operating a chrome-iron property near here, and there is an estimated 60,000 tons ready for shipment. It will be worked as an open pit, and a road is now being built from the property to this city. This body of ore lies at the head of Quartz gulch. It is on the south side of the mountain and on the south side of the contact which carries gold value. The property is owned by Joe Beggs and C. McCorkle and is being leased on a royalty basis to the Farnish Co.

SOUTH DAKOTA.

Hill City.

The old Harney Peak Co.'s tin mill is being remodeled by St. Louis capital, for concentration of tungsten ores. The motive power will be electricity, generated at the company's plant by steam boilers, using oil fuel. The mill will be

equipped with individual motors. It is the intention to handle custom ores also. It was expected that the plant would be in operation by Aug. 1, but delays occurred, which has postponed the date.

Deadwood.

The Deadwood-Standard mine in the Ragged Top district, which has been shut down for several years, is again active. For 3 months past there has been considerable work done on the property in the way of development. A shoot of silicious ore has been uncovered, carrying better than commercial values for its entire width. The shoot is from 15 to 18 ft. high and of unknown width. The work which is now being done was undertaken by Prof. Dove of Lead. The mill, a dry-crushing cyaniding plant, has been started up and at the present time is treating about 100 tons per day. While the work in the mine has been going on for some time, the mill has been in operation but a few days, and a cleanup will soon be made. In a few days the mill will be running to capacity, which will be from 400 to 600 tons.

Custer City.

The Custer Peak Mining Co.'s property has been dewatered to the 250 level. Sinking below the 250 level will commence immediately and will continue to the 500. A No. 9 Cameron has been installed. Also a 5-drill Norwalk compressor and a new 100-hp. boiler, making the total boiler capacity 200 hp. The increase in the value of the copper bearing ore, which was noted between the 150 and the 250 levels, is expected to continue, which should produce an ore of good milling value at the 500 level.

Lead.

The Two Bit Gold & Tungsten Mining Co. has been formed to operate in the Two Bit district on four claims. The main development has been done in a tunnel, running from the east side of the creek, in an easterly direction. At 100 ft. from the mouth, a vertical tungsten-bearing vein was struck and it is on this that the present development is being conducted. The vein has varied in width from a few inches to 2 ft. and has shown an average value of 48% tungstic acid. One and one-half tons of this quality of ore have been taken out and the present appearance of the ledge indicates that it is a permanent formation. The tunnel is in 110 ft. It was originally driven to develop the gold-bearing rock, known to exist at that point, which assays as high as \$36 gold and 18 ozs. silver. The tungsten indications have been found to extend from the tunnel, driven on the Two Bit No. 2 claim through the "4884" and the Yellow Jacket.

TEXAS.

Toyah.

The West Texas Sulphur Co., composed of New Orleans men, is preparing to exploit on an extensive scale the large sulphur deposit in the Toyah district acquired some time ago, embracing 600 acres. Test holes show that the sulphur deposit extends from the surface outcroppings to a depth of about 75 ft. The product is high grade and can be easily mined, it is claimed. The Michigan Sulphur & Oil which owns a large sulphur deposit in Culberson county, in the same section, recently installed the first unit of a large sulphur reduction plant and it is now turning out and shipping considerable quantities of the product. A party of Mobile men, headed by F. H. Edington, recently visited this section and made an inspection of the different sulphur deposits with the view of becoming financially interested in the industry.

Cliffside.

Much significance is attached to the announcement that has been received here from Washington that the work of exploring this section for potash by the survey is soon to be resumed. The government began boring for potash near Cliffside more than a year ago. While no information was divulged as to the success or indications that were met with, it is said that the valuable mineral product was met with in more or less quantities. The appropriation for the purpose was exhausted and the hole was temporarily abandoned. It

is now authoritatively stated that boring will be immediately resumed. Explorations will also be made in other localities where signs of the existence of underground beds of potash are found. It is the expressed belief of experts that this part of the Panhandle of Texas contains potash in paying quantities. There are many brackishwater lakes in the South Plains country, lying immediately to the south of the Panhandle, and the territory adjacent to these mineralized reservoirs will be explored in the search for potash.

UTAH.

Eureka.

After being idle 3 years the Utah Con. has resumed operations under Supt. A. D. Moore. An air compressor has been installed to facilitate work on the raise from the tunnel and the force can now accomplish as much work in 1 week as formerly required a month. There is a good showing in the vein matter on which the development is being pushed and important developments are expected within a brief time.

At the Lehi Tintic a compressor and an electric engine of 2-drill capacity has just been installed. The Utah Light & Power Co. will furnish the current, extending its present connections about 4000 ft. A body of lead-silver ore that carries average values of between \$18 and \$20 has been opened in the lower tunnel and shipments will be made regularly.

It is believed that depth will bring in new and better ore reserves at the Eureka Lily and a campaign is being started with this idea in view. Supt. Holdaway says that for a long period the leading mine geologists have asserted that East Tintic contained a great base fissure zone and that this fissure would be found in or near the old Lily ground. He believes that the Eureka Lily fissure, upon which the development work is now being prosecuted, is the one that will reveal the real richness of the camp. That there might be no delay in the plan of the company to get down to the values, a hoist has been installed on the 500 level, a large station cut, ore bins built and a skip constructed. From this station the development will proceed down a timbered incline shaft that will follow the Eureka Lily as deep as may be necessary.

The Eagle & Blue Bell shaft General Manager Pett has decided to send down another 200 ft. until the water level is reached. In the other properties surrounding, where the water level has been reached, it was at a point which would be approximately 200 ft. in the Eagle, or 185 ft. below where the station is being cut on the 1875 level. The shaft has gone through ore for 53 ft. and it is still showing strong in the sump 10 ft. below the 1875 level. Where the station is being cut the ore is scattered a little so that it was about the only place that was found where the station could be cut. It is the intention to start drifting and develop the ground as soon as the station is completed. The time is very opportune for this work as shipments from the property have been curtailed by the smelters.

American Fork.

The Miller Mining & Smelting Co. is planning to resume development, which has of late been operated only by leasers. Returns on the recent shipment of zinc gave values of 32.7%. The property has been worked at intervals since 1863. The mine has produced more than \$2,000,000 in this period. As yet no considerable depth has been attained, the ore being taken from workings none of which exceed 250 ft. The leasers who have been gophering around the old workings have, in addition to taking out the rich zinc ore, found small bodies of ore carrying as high as 3 ozs. gold and the fissures in the quartzite are carrying gold values that make development on a more comprehensive scale advisable.

It is expected that the Pacific mill will be ready for operation Nov. 1. The machinery, excepting one earload, is on the ground ready for installation, and this car is on the way. The plant will have a capacity of 65 tons daily. It is being so constructed that additional units may be added. On the Pacific dump there is sufficient ore to keep the mill going for a year

and the vein is said to have sufficient mill ore exposed to keep the plant going for 10 years longer. The ore from the Pacific is a sulphide and ideal for concentrating. Little power will be necessary for crushing. Tests made on the ore show that it will reduce down to four to one and produce concentrate values of between \$50 and \$60. This will mean a production of about 16 tons of concentrates daily. It will also make the extractions of the high-grade ore more convenient and less expensive. Supt. Ferlin expects to add materially to his mining force when the mill is completed. Ten teams are kept busy at present hauling the high-grade to the railroad. This ore is bringing the company from \$2500 to \$4500 per car. The ores are producing copper, silver and lead.

Park City.

In the last 2 months the Park City Mines Co. has been doing some work on its own account and the management expects to be shipping from the Easter vein on two levels within 4 or 5 weeks. From the American Flag mine since April 1, lessees on the old workings have mined ore to the value of \$9738.84. Supt. Forsman says he has 6 ins. of high-grade ore in a raise recently started from the 1000 level north. On the 700 level he is drifting north and south on the Easter vein from an east crosscut. Beddings will be intersected in both directions. These beddings will probably be productive of high-grade as they have been on other levels. A large part of the land embracing the north extension of the Easter fissure has not been prospected and several other known veins have been examined only enough to prove their mineral character. An extensive development campaign was started from the 1100 level, but the unusual flow of water caused the management to postpone deeper work until freezing.

WASHINGTON.

Spokane.

The sale of the Republic Con. Mines Co.'s holdings at Republic, to the Day interests, has been officially announced. The reported purchase price of the properties, including the Lone Pine, Pearl and Surprise mines, is \$143,000, of which \$93,000 were paid when the deal was closed. The holdings are gold producers, and were extensively developed by the former owners, the original company, the Republic Mines Corporation, having shipped a considerable tonnage of ore during the period the group was under control of J. L. Harper, who promoted the company, and his associates. The concern became heavily involved financially, and about 3 years ago George S. Bailey of Republic was appointed federal receiver. Later a sale of the assets was made to A. B. Willard, of Tekoa, Wash., and A. J. Laughon, Republic, stockholders and the principal creditors, for \$150,000. They then organized the Republic Con. Mines Co. to take over and operate the group under bond, and the first payment from the Days was devoted to liquidating the bond. The entrance into the Republic field of the Day interests is believed to presage resumption of activity in the camp, and more attention is being attracted to the district than at any time since the early days of its history. The ore is particularly desirable for fluxing purposes, and the proximity of the region to the Northport smelter undoubtedly means that production on an extensive scale will be inaugurated. This no doubt will result in stimulating development of other Republic properties and placing the camp in the position that its latent resources really justifies. Republic camp is one of the greatest low-grade gold regions in the west, and there also are deposits of high-grade ore. Lack of treatment and power facilities have been responsible for retarding development of the several promising properties, but it is believed that these obstacles to advancement eventually will be overcome, as the Days have the necessary capital to establish mills and provide power. Current can be obtained from the Bonington Falls plant of the West Kootenay Power & Light Co., now owned by the Consolidated Mining & Smelting Co. of Canada, by building a transmission line about 30 miles long, and it is anticipated that this is a part of the Day plans.

At least two new Stevens county properties will be added to the shipping list of northern Washington mines in the

next 60 days, and several others now in the development stage probably will be producing before the first of the year. The Admiral Mining Co., operating the Admiral mine, near Valley, will ship a car in a few days, and about Oct. 1 will begin forwarding not less than 100 tons monthly, which it is estimated will net about \$25 a ton. A force of men now is employed at the property, chiefly on development work, but the crew will be doubled as soon as regular shipments begin.

The Hecla Mining Co., which owns and has been doing extensive development on the Hecla group of copper-silver claims, 3 miles from Chewelah, now has about 400 tons of ore on the dump and will begin shipping as soon as a 1½-mile wagon road from the main tunnel to the principal highway leading to Chewelah is completed. Commissioner John C. Argall of Spokane is president of the Hecla Co., and other local men are heavily interested in the corporation.

The Spokane Mining Men's club is organizing a 4-day excursion into the Nelson and Slocan districts of British Columbia, and the expedition probably will leave Spokane in a special Pullman train over the Spokane International railway Sept. 29, according to plans that have been outlined by Secretary Frank C. Bailey, and the return trip will be made the night of Oct. 2. The program provides for a joint meeting at Nelson of the Spokane and Nelson Mining Men's clubs, and it is hoped that a session of the Canadian Institute of Mining Engineers and the Columbia Section, American Institute of Mining Engineers, can be arranged at the same time, as many of the Spokane and British Columbia mining men are members of all four organizations. The special Spokane train will transport the excursionists to Kootenay landing, on Kootenay lake, where a special Canadian Pacific boat will be waiting to take them on to Nelson, and from the later point special boats and trains will convey the party to the different mines that are to be visited, including those in the Sheep Creek, Ainsworth, Kaslo and Slocan districts.

With the entrance into the shipping lists of the Deer Trail mine, in the Deer Trail district of Stevens county, which is forwarding consignments to the smelter at Trail, transporting the output in wagons to the Northern Pacific railway at Davenport, 22 miles distant, there now are 22 mines in Washington and Idaho that are contributing to the treatment tonnage of the Canadian Con. Co.'s plant. The shipments to date this year from these properties amount to 19,971 tons. Of these producers 11 are in Stevens county.

A small deposit of ore, running as high as 19.9% tungsten, according to assays by the Stowell Assay Co., was encountered recently in the Spokane Belle mine, near Valley, and the owner, E. H. Belden, now has a small force at work stripping the veins in an effort to discover more of the metal.

Recognizing the increasing importance of the Valley mining district, in Stevens county, where more properties now are under development than ever before, the Consolidated Mining & Smelting Co. of Canada has authorized a reduced treatment charge on ores of the region that go to its smelter at Trail, and the Great Northern Railway Co. also has announced a reduction in the freight rate to that point, both new schedules to become effective about Oct. 1. The reduction rate will be \$1.50 a ton on ore that runs between \$25 and \$50, and the freight will be \$2.45, making the combined freight and treatment charge \$3.95. If the ore values exceed \$50 a proportionate additional charge will be made for both freight and treatment.

WISCONSIN-ILLINOIS.

Montfort.

The O. P. David mine shipped last week to M. & H. Zinc Co., LaSalle, 3 cars high-grade. The building of a new separating plant at Linden is to benefit the O. P. David mine.

Highland.

The Hard Fibre Co., a new smelting project, is represented in the Wisconsin field for the first time, and has been active in this camp bidding on carbonate zinc ore. Several shipments by local producers have been made within the past 2 weeks. Three new power and concentrating plants are in operation in this district with good results. Shipments of

carbonate zinc ore from the mines of the New Jersey Zinc Co. continue in volume.

Linden.

Frank Saxe, of the Milwaukee-Saxe Development Co., is authority for the statement that the eastern capitalists now exercising option on the company's holdings will provide a new \$25,000 magnetic ore separating plant without delay. Shipments of zinc ore for week Sept. 2 showed improvement. There remains in bin however at latest reports nearly 2000 tons of zinc concentrates.

Miffin.

Shipments of zinc ore have been restricted for the past 30 days from the mines of this district and reserves carefully collated show 1800 tons of zinc concentrate being carried in bin.

The Peacock Mining Co. in prospecting, struck rich deposits under old workings. Two hundred tons of mill rock are handled daily on one shift. The Buck, Meyer & Brown Mining Co. is sinking a new shaft in ground recently explored with drills; 28 men are employed in the mine and the recovery is high-grade going above 57% zinc. The Grunow Mining Co. making an average recovery of 12 tons of concentrates daily assaying 30% zinc. The O. K. Mining Co., a new project, is moving mill feed to the concentrator, a part of the B. M. & B. equipment. The Biddick mine, owned by the B. M. & B., is making an average of 20 tons of 32% concentrates on single shift, and shipping to the Benton Roaster Co. at Benton, from 3 to 5 cars weekly. The Lucky Six Mining Co., operating with 35 men, is making 10 tons of 46% zinc ore daily on single shift. A crosscut has been completed to new deposits discovered with drills south of the oldest established works.

The M. & A. Mining Co., operating the Big Tom mine, is now equipped with a 200-ton concentrator. The mine has been dewatered and the ground is being opened up for a heavy as well as steady production.

Vinegar Hill Zinc Co. is rebuilding its mill on the Yewdall lease. A considerable stretch of ground has been thoroughly proven with drill. Two shafts are in operation and a new hoist house with hoisting machinery installed is ready for service on shaft No. 2. An aerial tram will connect both plants. The Peni mine, controlled by the Royal Mining Co., is operating on the Grunow lease. Drills are going for the Grunow Mining Co. on the Gundry farm. B. M. & B. is drilling on the original Squirrel lease. Peacock Mining Co. continues with drills on new land. The two Coker mines, the property of the New Jersey Zinc Co., are yielding heavily, shipments running as high as 10 cars weekly, the ore all going to the refineries of the company at Mineral Point. Coker No. 2 is operating the old Sunrise mine with success, making 25 tons of concentrates daily. The Vinegar Hill Co. has taken over the Senator mine.

Platteville.

Some gains in price were shown during the week on standard and premium grades from zinc ore refineries, the price holding at \$60, while seconds ranged down to \$53 on values as low as 50%. Better offerings on medium grades were effected as buying improved and more ore moved from the bins of independent operating companies. No shipments of lead ore were made. Pyrites moved more freely, but the reserve in the field at latest reports is in excess of 15,000 tons. Local shippers were represented with a light turn-in, much ore being carried along.

Cuba.

Receipts of raw ore at the National Separating Works continue at the rate of 1000 tons or better. Deliveries are made to Illinois Zinc Co. and Granby Con. The entire surface plant of the Utt-Thorne Mining Co. on the Lawrence mine, was destroyed by fire last week. The loss is placed at \$18,000. Plans for a new outfit are now solicited. Gritty-Six is ready with a new plant. Big Eight Mining Co. is figuring on the early construction of a complete surface outfit.

Benton.

The installation of a new table plant at the Champion mine at New Diggins by the Wisconsin Zinc Co. is a new innovation as far as this district is concerned, in that the new plant houses eight Wilfley tables and operates as a separate unit. Heretofore attempts have been made to operate

with one or two tables with indifferent results. In this instance the plant is under supervision of an expert and is succeeding in making a profitable return. Further improvements will be by the installation of Whaley electric shovel. The Champion mine is now being supplied with one of these machines and others are contemplated by the Wis. Zinc Co.

Increased cost of wages with high costs of material mine managers hold is making present prices for ore less profitable than \$40 per ton for 60% ore some years ago. These same authorities declare it is a very difficult problem to reduce wages at this time. Machine men are paid \$3.25 to \$4; miners on the breast \$3; mill men \$25 weekly; muckers 16 cts. per ton; trimmers \$2.75; engineers \$20 to \$25 weekly; ground bosses \$25 weekly. Cartage is placed at 25 cts. per ton-mile. Even at these figures men of all classes are in universal demand.

Galena.

L. V. Rice, of the Fields Mining & Milling Co. of Chicago, operating the Thompson and Crawhall mines at Shullsburg and the Galena Refining Co. at Galena, is authority for the statement that the company is earnestly engaged in working out a new smelter process involving great reductions in the cost of spelter production, and that a small experimental plant is under consideration. C. C. Whittier, manager of the separating works at Galena, has been in conference with experts in St. Louis, returning recently after an extended trip, the main purpose of which is working out of plans looking to an early start in the carrying out of the project. That the company intends to entertain the proposition seriously is seen in the recent purchase of the Empire Separating Works at Platteville, which will be dismantled and removed to the company's mine sites, enabling it to make a larger output of high-grade ore necessary to provide a reasonable supply of spelter ore for the new plant. The location is yet in doubt.

WYOMING.

Holmes.

At the meeting, Aug. 23, arrangements were made to relieve Julius Thielman of his work at the Rambler mine and he has returned to his home in Wisconsin, where his private affairs now require his undivided attention. The actual technical work is now in charge of a competent and experienced mining engineer, who is giving his entire time to that work. The company has again opened up the high-grade ore and it looks very promising. The roads are now in good condition, the first car of concentrates has been shipped and regular shipments of both concentrates and high-grade ore will be made from now on. Dorchester Mapes will hereafter be in full charge of operations, as business manager and will spend most of his time at the mine.

CANADA.

BRITISH COLUMBIA.

Hudson Bay.

The Hudson Bay Zinc Co. is shipping 33% zinc ore to Mineral Point. The company is controlled by Butte & Superior and is managed by James L. Bruce of Butte, Mont.

Adamant.

The Utica Mines Co., which owns and is operating the Utica group, 6 miles from here, is shipping at the rate of 5 cars monthly, and this rate of production probably will be maintained indefinitely, according to Charles F. Caldwell, original promoter of the company and its general manager for several years. "Because of the lower price of silver prevailing earlier in the year, shipments made at that time netted us only about \$3000 a car, but returns from the first car shipped in August, the only one from which reports have been received, show that it ran \$5256. Mining is being confined chiefly to the stope on the west ledge of the property. The company, which has issued 1,600,000 shares of its capital stock, is in excellent financial condition. All outstanding indebtedness has been liquidated, and there is a substantial

balance to our credit in the banks." The operating profit of the company was \$14,796 in 1915, according to a recent report to stockholders by Manager Clyde B. White.

ONTARIO.

Cobalt.

The Jordan Veteran claim has been taken over by the Kennebec Silver Mines, Ltd., the last payments having been made. The values contrary to custom are here found in the Keewatin formation. Exploration and development work has been very successful. Two veins have been opened up showing native silver and a considerable quantity of high grade has been bagged. The company expects to ship 2 cars of ore before winter. The plant consists of a 5-drill compressor, steam driven, and a hoist. Power is furnished by two locomotive type boilers.

The crosscut on the 325 level at the Adanac is now under the shaft and raising will start to connect with the shaft at the 275 level. The raise from the 275 level to the 200 was completed only a short time ago. An additional 100 ft. of sinking will be done, giving a depth of 425 ft., and from that level all future exploratory work will be carried on. Some high-grade is being bagged from the west winze at present.

Diamond drilling has now been under way at the West Dome for about 6 months. A thorough system has been inaugurated starting near the shaft at the Big Dome line and working west. No. 1 hole was put down 834 ft. on an angle, to a vertical depth of 684 ft. At 513 ft. a 5-ft. ore body was encountered which assayed \$44. At 400 ft. 6 ft. was cut which assayed \$11.75. No. 2 hole which was put down under Edwards Lake showed nothing of value. It was bored to an angle depth of 1514 ft. No. 3 hole, one of the deepest in the camp, was put down 1814 ft. to a vertical depth of 1462 ft. This showed only low grade, of which 28 ft. was encountered in the entire depth. It ran from \$1.80 to \$4.40. No. 4, which was started at a distance of 2100 ft. west of the present working shaft, proves that values continue right across the southerly portion of the property. Sixteen hundred ft. were drilled to a vertical depth of 1150 ft. At 150 ft. a 5-ft. ore body was cut which assayed \$13.80, and at 1100 ft. there are 3 ft., giving \$14.80. At 1485 ft. there is 5 ft. of \$8 ore. This hole shows 52 ft. of ore with an average value of \$6.71. No. 5 is located 1200 ft. west of No. 1 shaft and shows the best results. At a depth of between 300 and 400 ft. a 10-ft. body was cut which averaged about \$20. The hole was put down 1570 ft., with a vertical depth of 1100 ft., and the entire core showed 64 ft. of ore averaging \$5.90 per ton. The location of the new 4-compartment working shaft will be about 1400 ft. west of the present shaft, or about the center of the property, to facilitate economic production on a large scale when plans for the mill are fully decided on. This shaft will be 12 by 12 ft. and a start will be made on it shortly. Since diamond drilling was commenced 20 veins have been encountered.

Porcupine.

On surface the vein at the Davidson has been proven for 1000 ft. and is 40 to 50 ft. wide. Channel assays taken at regular intervals for 500 ft. over a width of 10 ft. averaged \$21. The main shaft is down 246 ft. with working stations at the 100 and 200 levels. Drifting operations to the west on the 100 level are now in the vein for 70 ft. and for the last 50 ft. over its entire width values averaged \$21.00, while for 16 ft. in width the values run \$12 per ton. The west face of the drift shows the highest values. On the 200 level a crosscut is driven in ore for 35 ft. across a body. Sampling of this body is now being made and average values will run \$12 to \$15. The main shaft is being sunk to the 300 level, at which point extensive lateral work will be started. With the tapping of the main vein on this level it is expected it will provide a 2-year supply for a 100-ton mill. The present management states there must be at least 2 years proven ore blocked before the building of a mill is begun. The most important lateral development in progress is on the 200 level where a crosscut is being sent southeast to tap a shear zone which is regarded promising. A number of high-grade stringers are now showing in the breast of the workings, some of which while narrow, contain specimen ore and would run \$2000.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Ball, Lionel C.—*Mount Cannindah Copper Mine, Australia*. [The history by years, geology, concentrating and smelting methods are taken up in detail with production figures].—Queen. Gov't Mg. Jnl. July 15 1916; p 318; pp 6*; 35c.

Burrows, A. G.; Hopkins, P. E.—*Boston Creek Gold Area*. [Brief descriptions of some of the properties and the general geology of the area].—Canadian Mg. Jnl. Aug. 15 1916; p 399; pp 3½*; 35c.

Dunstan, B.—*Queensland Mineral Deposits, Australia*. [Occurrence, production, values, prospects and properties by the chief Government Geologist].—Queen. Gov't Mg. Jnl. July 15 1916; p 314; pp 1¼; 35c.

Rose, Hugh.—*Mining Practice at Santa Gertrudis, Mexico*. [Abst. from the A. I. M. E. Bulletin. Contains drawings, details and general description].—E. & M. J. Aug. 26 1916; p 371; pp 6*; 25c.

Ore Genesis

Alderson, Matt. W.—*Mining Possibilities in Colombia, S. A.* [The author's experience in placer and vein operations for gold in that country].—Mg. World Aug. 26 1916; p 367; pp 2¼*; 10c.

—*Formation of Nitrate Deposits, Chile*.—M. & S. P. Aug. 25 1916; p 314; pp 1*; 20c.

—*Origin of the Sudbury Nickel-Copper Ores*.—Canadian Mg. Jnl. Aug. 15 1916; p 390; pp 1*; 35c.

—*The Mount Morgan Mine and Works, Australia*. [Complete description of the geology, mining and concentrating plant of this mine once a gold mine but now copper].—Mg. & Engg. Rev. July 5 1916; p 244; pp 9*; 35c.

Mineralogy and Petrography

Coleman, A. P.—*Chief Minerals of the Sudbury Nickel Ores*. [The location and nature of the particular minerals found in the field].—Canadian Mg. Jnl. Aug. 15 1916; p 388; pp 1¼*; 35c.

II. ORES AND METALS

(1) METALS AND ORES

Alloys

Dunstan, B.—*Queensland Mineral Deposits, Australia*. [Occurrence, production, values, prospects and properties by the chief Government Geologist].—Queen. Gov't Mg. Jnl. July 15 1916; p 314; pp 1¼; 35c.

Tschischewsky, N.; Herdt, A.—*Iron-Boron and Iron-Carbon Alloys*. [A paper from the Journal of the Russian Met. Soc. Gives the properties, method of preparation and equilibrium curve for the alloys].—Iron Age Aug. 24 1916; p 396; pp 2*; 30c.

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Ball, Lionel C.—*Mount Cannindah Copper Mine, Australia*. [The history by years, geology, concentrating and smelting methods are taken up in detail with production figures].—Queen. Gov't Mg. Jnl. July 15 1916; p 318; pp 6*; 35c.

Coleman, A. P.—*Chief Minerals of the Sudbury Nickel Ores*. [The location and nature of the particular minerals found in the field].—Canadian Mg. Jnl. Aug. 15 1916; p 388; pp 1¼*; 35c.

Parsons, L. A.—*Diamond Drilling at Sudbury, Ontario*. [Details of operation and costs].—E. & M. J. Aug. 26 1916; p 381; pp 1¼; 25c.

Saint-Smith, Cecil E.—*The Tinto Copper Syndicate's Mine, Montalban Irvinebank District, Australia*. [A complete description of the mine workings].—Queen. Gov't Mg. Jnl. July 15 1916; p 316; pp 2¾*; 35c.

Wilson, Philip D.—*Comparison of Stopping Methods at Calumet & Arizona Mine*. [Abst. from the bulletin of the A. I. M. E. Description of methods used and comparison of costs and advantages].—M. & S. P. Aug. 26 1916; p 315; pp 3½*; 20c.

—*Origin of the Sudbury Nickel-Copper Ores*.—Canadian Mg. Jnl. Aug. 15 1916; p 390; pp 1*; 35c.

—*The Mount Morgan Mine and Works, Australia*. [Complete description of the geology, mining and concentrating

plant of this mine once a gold mine but now copper].—Mg. & Engg. Rev. July 5 1916; p 244; pp 9*; 35c.

Gold Fields and Mining

Alderson, Matt. W.—*Mining Possibilities in Colombia, S. A.* [The author's experience in placer and vein operations for gold in that country].—Mg. World Aug. 26 1916; p 367; pp 2¼*; 10c.

Bain, H. Foster.—*The Far Rand and the Government*. [Comments on the ideas of the South African government regarding the district].—Mg. Mag. Aug. 1916; p 84; pp 8½; 50c.

Burrows, A. G.; Hopkins, P. E.—*Boston Creek Gold Area*. [Brief descriptions of some of the properties and the general geology of the area].—Canadian Mg. Jnl. Aug. 15 1916; p 399; pp 3½*; 35c.

Kotze, R. N.—*Far East Rand and Suggested Changes in the Gold Law*. [Abst. from a South African government report taking up operations and production with respect to suggested law].—Mg. Mag. Aug. 1916; p 75; pp 9*; 50c.

Platts, John B.—*Pocket-Hunting Applied to Prospecting*. [Refers to the locating of rich gold pockets].—M. & S. P. Aug. 26 1916; p 306; pp 1; 20c.

Rose, Hugh.—*Mining Practice at Santa Gertrudis, Mexico*. [Abst. from the A. I. M. E. Bulletin. Contains drawings, details and general description].—E. & M. J. Aug. 26 1916; p 371; pp 6*; 25c.

—*Consolidation of the Treadwell Mines, Alaska*. [Operating costs, production, description of the companies' holdings, etc., and items of financial interest are given].—M. & S. P. Aug. 26 1916; p 307; pp 7*; 20c.

—*The Mount Morgan Mine and Works, Australia*. [Complete description of the geology, mining and concentrating plant of this mine once a gold mine but now copper].—Mg. & Engg. Rev. July 5 1916; p 244; pp 9*; 35c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron and Steel

Copeland, Clem A.—*Properties of Iron and Steel Wires and Cables*. [Gives curves and tabulated data showing both

physical and electrical properties].—*Jnl. Elect., Power & Gas* Aug. 26 1916; p 157; pp 2¼*; 35c.

Edwards, J. W.—*Industrial Diseases of Iron and Steel Workers in Middlesbrough, England*. [A paper read before the British Medical Assn.].—*I. & C. Tr. Rev.* Aug. 11 1916; p 153; pp 1; 35c.

Phelps, Charles C.—*Shanking Drill Steels*. [Explanatory drawings are shown].—*E. & M. J.* Aug. 26 1916; p 387; pp 3¼*; 25c.

Stone, G. S.—*Spelter: Its Grades and Uses*. [Tells of impurities, the amounts allowable in different grades and their effect on spelter's properties].—*Mg. World* Aug. 12 1916; p 287; pp 1½; 10c.

Tschishewsky, N.; Herdt, A.—*Iron-Boron and Iron-Carbon Alloys*. [A paper from the Journal of the Russian Met. Soc. Gives the properties, method of preparation and equilibrium curve for the alloys].—*Iron Age* Aug. 24 1916; p 396; pp 2*; 30c.

Young, Ralph A.—*Testing of Dredge Bucket Pins*. [On the use of carbon-steel instead of more expensive alloyed steels].—*E. & M. J.* Aug. 26 1916; p 377; pp 2¼*; 25c.

Iron and Steel: Foundry and Furnace Practice

Baker, David F.—*Oxygen in Blast Furnace Operations*. [Its use in opening frozen and hard tap-holes, frozen cylinder notches or tuyeres that are plugged with iron].—*Iron Age* Aug. 24 1916; p 398; pp 2; 30c.

—*Basic Phosphate Fertilizer as a By-Product in Iron Smelting*. [A method used in connection with open-hearth smelting].—*Chem. Eng. & Mfg.* Aug. 1916; p 68; pp 1*; 30c.

Lead

Higgins, W. C.—*Operations at the South Hecla Mine at Alta, Utah*.—*S. L. Mg. Rev.* Aug. 15 1916; p 15; pp 2¼*; 25c.

Scott, W. A.—*Concentrating Mill Tailings Near Park City, Utah*. [Concentration and haulage are dealt with. To get rid of zinc considerable of the lead and silver was lost formerly].—*Mg. World* Aug. 26 1916; p 359; pp 2¼*; 10c.

Tournay-Hinde, A. W.—*The Flow of Air in Lead Blast Furnaces*. [Abst. of a paper read before the Engg. Assn. of New South Wales].—*E. & M. J.* Aug. 26 1916; p 392; pp 1; 25c.

Nickel

Coleman, A. P.—*Chief Minerals of the Sudbury Nickel Ores*. [The location and nature of the particular minerals found in the field].—*Canadian Mg. Jnl.* Aug. 15 1916; p 388; pp 1¼; 35c.

Parsons, L. A.—*Diamond Drilling at Sudbury, Ontario*. [Details of operation and costs].—*E. & M. J.* Aug. 26 1916; p 381; pp 1¼; 25c.

—*Origin of the Sudbury Nickel-Copper Ores*.—*Canadian Mg. Jnl.* Aug. 15 1916; p 390; pp 1*; 35c.

—*Recent Developments in the Sudbury District, Ontario*.—*Canadian Mg. Jnl.* Aug. 15 1916; p 391; pp 1¼*; 35c.

Silver

Higgins, W. C.—*Operations at the South Hecla Mine at Alta, Utah*.—*S. L. Mg. Rev.* Aug. 15 1916; p 15; pp 2¼*; 25c.

Saint-Smith, Cecil E.—*The Tinto Copper Syndicate's Mine, Montalban Irvinebank District, Australia*. [A complete de-

scription of the mine workings].—*Queen. Gov't Mg. Jnl.* July 15 1916; p 316; pp 2¼*; 35c.

Scott, W. A.—*Concentrating Mill Tailings near Park City, Utah*. [Concentration and haulage are dealt with. To get rid of zinc considerable of the lead and silver was lost formerly].—*Mg. World* Aug. 26 1916; p 359; pp 2¼*; 10c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Zinc

Higgins, W. C.—*Operations at the South Hecla Mine at Alta, Utah*.—*S. L. Mg. Rev.* Aug. 15 1916; p 15; pp 2¼*; 25c.

Scott, W. A.—*Concentrating Mill Tailings near Park City, Utah*. [Concentration and haulage are dealt with. To get rid of zinc considerable of the lead and silver was lost formerly].—*Mg. World* Aug. 26 1916; p 359; pp 2¼*; 10c.

Sieenthal, C. E.—*Production of Primary Spelter First Half of 1916*. [Abst. from U. S. G. S. semi-annual report].—*Mg. World* Aug. 26 1916; p 370; pp 1¼; 10c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Blakeley, A. G.—*Chemistry in Coal Mining*. [Some details and speaks of lines along which the coal mine chemist could work].—*Coal Age* Aug. 19 1916; p 296; pp 6½; 20c.

Cooper, S. G.—*The Production and Use of Power and Its Relation to Fuel Economy*.—*I. & C. Tr. Rev.* Aug. 4 1916; p 125; pp 1; 35c.

Hopwood, William.—*Mining and Dealing with Mine Water in the Mold Coal-field, England*. [A paper read before the National Assn. of Eng., England].—*I. & C. Tr. Rev.* Aug. 4 1916; p 127; pp 1¼*; 35c.

Lloyd, John.—*Safety and Efficiency in Coal Mining*. [A general discussion of measures taken along this line].—*Coal Age* Aug. 26 1916; p 332; pp 3*; 20c.

Pope, George S.—*Methods of Sampling Delivered Coal*. [Methods of sampling used in the government purchase of coal].—*U. S. Bur. of Mines Bull.* 116; pp 64*; 25c.

Ting, V. K.—*The Coal Resources of China*. [A general review of the country as regards coal deposits].—*Far East. Rev.* June 1916; p 1; pp 4*; 35c.

Coal Dust, Fire Damp, Etc.

Hood, W. W.; Knox, G.; Evans, E. C.—*South Wales Coal Dust Experiments*. [A paper read before the South Wales Colliery Officials' Assn.].—*Coll'y Guard.* Aug. 11 1916; p 256; pp 1¼*; 35c.

Pellegrino, John.—*Quenching a Mine Fire in a Kansas Mine with Chemicals*.—*Coal Age* Aug. 26 1916; p 303; pp 1¼*; 20c.

Coal and Coke By-Products

Childs, W. H.—*The Disposition of By-Product Oven Derivatives*. [A paper read before the American Iron and Steel Inst. A complete flow sheet is shown].—*Coal Age* Aug. 26 1916; p 344; pp 2*; 20c.

Clarke, Thomas C.—*The By-Product Oven an Adjunct to Preparedness*. [A paper read before the Soc. of Chem. Ind.].—*Coal Age* Aug. 26 1916; p 342; pp 1¼; 20c.

Lishman, G. P.—*Recent Improvements in By-Product Coke Oven Practice*.—*Jnl. Soc. of Chem. Ind.* July 31 1916; p 767; pp 3*; 50c.

Petroleum

Lee, Wallace.—*Geology of the Kentucky Part of the Shawneetown Quadrangle*. [The economic deposits are composed of coal, oil, lead, zinc and clay].—*Kentucky Geol. Surv.*; pp 73.

—*New Under-Reamer Efficient*. [A device for use in oil-well drilling].—*Oil Age* Aug. 1916; p 9; pp 1¼*; 35c.

Fuels Miscellaneous

Peabody, Ernest H.—*Oil Fuel*. [On the use of forced draft and blowers in using oil fuel for generating steam].—*Pract. Eng.* Sept. 1 1916; p 737; pp 2¼*; 20c.

Pope, George S.—*Methods of Sampling Delivered Coal*. [Methods of sampling used in the government purchase of coal].—*U. S. Bur. of Mines Bull.* 116; pp 64*; 25c.

(B) STRUCTURALS AND CERAMICS

Cement

Pierce, Edwin G.—*The Determination of Sulphuric Anhydride in Portland Cement Analysis*. [Complete description of a method].—*Chem. Eng. & Mfg.* Aug. 1916; p 62; pp 1¼*; 30c.

—*Utilization of Shells in Manufacture of Portland Cement—Plant of Texas Portland Cement Co.*—*Chem. Eng. & Mfg.* Aug. 1916; p 60; pp 1¼*; 30c.

Concrete

Gould, Harry J.—*A Simple and Efficient Cost Keeping System for Concrete Construction*. [Both forms and descriptive information are given].—*Engg. & Cont.* Aug. 30 1916; p 199; pp 3; 20c.

Sherwin, R. A.—*Forms for Concrete Work*. [Abst. of a paper read before the American Concrete Inst. Details for construction and design of the same].—*Canadian Eng.* Aug. 17 1916; p 34; 35c.

—*Snake Creek Tunnel, Utah*. [A concrete tunnel. The construction and methods used in driving it are described].—*M. & S. P.* Aug. 5 1916; p 205; pp 2*; 20c.

Lime

Crow, W.—*Chemically Correct Hydrate of Lime on a Commercial Basis*. [Discusses the subject and has a supplement drawing of a section of the Schaffner continuous hydrator].—*National Lime Mfg. Assn. Bull.* 14; pp 8*.

Loughlin, G. F.—*Lime in 1915*. [On the uses, units of measurement and production].—*Min. Res. of U. S.* 11:19; pp 20.

III. TECHNOLOGY

MINES AND MINING

Surveying and Drafting

Bocricke, W. F.—*Some Practical Notes on Mine Surveying*. [An alternative for shaft plumbing is given].—*E. & M. J.* Aug. 19 1916; p 333; pp 2¼*; 25c.

Jackson, A. M.—*Azimuth*. [A paper read before the Assn. of Ontario Land Surveyors].—*Canadian Eng.* Aug. 24 1916; p 145; pp 2; 35c.

Marshall, R. B.—*Primary Traverse in Illinois, Wisconsin, Minnesota, North Dakota and South Dakota*. [Survey data on survey stations established].—*U. S. G. S. Bull.* 644-E; pp 72.

Sanner, F. C.—*Set-Over Tables for the Mine Transitman*.—Coal Age Aug. 26 1916; p 335; pp 1*; 20c.

Ore Reserves

Campbell, M. R.—*Half Century Life of Coal Supply*. [Abst. from a U. S. G. S. report].—Coal Tr. Bull. Aug. 15 1916; p 40; pp 2½; 25c.

Ting, V. K.—*The Coal Resources of China*. [A general review of the country as regards coal deposits].—Far East Rev. June 1916; p 1; pp 4*; 35c.

Drilling and Boring

Parsons, L. A.—*Diamond Drilling at Sudbury, Ontario*. [Details of operation and costs].—E. & M. J. Aug. 26 1916; p 381; pp 1¼; 25c.

Phelps, Charles C.—*Shanking Drill Steels*. [Explanatory drawings are shown].—E. & M. J. Aug. 26 1916; p 387; pp 3½*; 25c.

Weston, E. M.—*Governing the Use of Explosives in Mines*. [From "Practical Mining on the Rand." Treats on the use of explosives and correct method of placing holes].—Mg. World Aug. 26 1916; p 363; pp 2½*; 10c.

—*Canadian Mining Corporation*. [Cost and other details of operation].—E. & M. J. Aug. 19 1916; p 348; pp 1¼; 25c.

—*New Under-Reamer Efficient*. [A device for use in oil-well drilling].—Oil Age Aug. 1916; p 9; pp 1½*; 35c.

Explosives and Blasting

Taylor, Guy B.; Cope, W. C.—*Sensitivity to Detonation of Trinitrotoluene and Tetranitromethylanilin*. [Describes method and apparatus for making test with some results obtained].—U. S. Bur. of Mines Tech. Paper 145; pp 13; 15c.

Weston, E. M.—*Governing the Use of Explosives in Mines*. [From "Practical Mining on the Rand." Treats on the use of explosives and correct method of placing holes].—Mg. World Aug. 26 1916; p 363; pp 2½*; 10c.

Shafts and Shaft Sinking

Rose, Hugh.—*Mining Practice at Santa Gertrudis, Mexico*. [Abst. from the A. I. M. E. Bulletin. Contains drawings, details and general description].—E. & M. J. Aug. 26 1916; p 371; pp 6*; 25c.

—*The Mount Morgan Mine and Works, Australia*. [Complete description of the geology, mining and concentrating plant of this mine, once a gold mine but now copper].—Mg. & Engg. Rev. July 5 1916; p 244; pp 9*; 35c.

Ventilation

Crankshaw, H. M.—*Mining and Ventilation Methods in Thick Pitching Beds*. [A paper to be read at the A. I. M. E. Arizona meeting].—Coal Tr. Bull. Aug. 15 1916; p 23; pp 5*; 25c.

—*Queensland Mines Inspection*. [Labor, wages, accidents, ventilation, etc.].—Queen. Gov't Mg. Jnl. July 15 1916; p 329; pp 3; 35c.

Dredging

Alderson, Matt. W.—*Mininn Possibilities in Colombia, S. A.* [The author's experience in placer and vein operations for gold in that country].—Mg. World Aug. 26 1916; p 367; pp 2¼*; 10c.

Eddy, Lewis H.—*Yuba No. 15 All-Steel Gold Dredge*. [A general detailed description of the dredge and its operation].—E. & M. J. Aug. 19 1916; p 329; pp 2*; 25c.

Young, Ralph A.—*Testing of Dredge*

Bucket Pins. [On the use of carbon-steel instead of more expensive alloyed steels].—E. & M. J. Aug. 26 1916; p 377; pp 2¼*; 25c.

Haulage and Conveying

Green, R.—*Horse Haulage vs. Compressed Air Haulage at Collieries*. [In discussing the subject a comparison of actual costs is made].—Canadian Mg. Inst. Bull. Aug. 1916; p 711; pp 6; 35c.

Hellmund, R. E.—*Rating of Mine Locomotives*.—Coal Age Aug. 26 1916; p 337; pp 2; 20c.

Scott, W. A.—*Concentrating Mill Tailings Near Park City, Utah*. [Concentration and haulage are dealt with. To get rid of zinc considerable of the lead and silver was lost formerly].—Mg. World Aug. 26 1916; p 359; pp 2½*; 10c.

—*The Mount Morgan Mine and Works, Australia*. [Complete description of the geology, mining and concentrating plant of this mine, once a gold mine but now copper].—Mg. & Engg. Rev. July 5 1916; p 244; pp 9*; 35c.

Accidents

Fay, Albert H.—*Coal Mine Fatalities in the United States, May, 1916*. [The nature, number and location of the accidents are given in tabulated form].—U. S. Bur. of Mines Monthly Statement; pp 28.

Pellegrino, John.—*Quenching a Mine Fire in a Kansas Mine with Chemicals*.—Coal Age Aug. 26 1916; p 303; pp 1¼*; 20c.

—*Queensland Mines Inspection*. [Labor, wages, accidents, ventilation, etc.].—Queen. Gov't Mg. Jnl. July 15 1916; p 329; pp 3; 35c.

Safety

Lloyd, John.—*Safety and Efficiency in Coal Mining*. [A general discussion of measures taken along this line].—Coal Age Aug. 26 1916; p 332; pp 3*; 20c.

Rose, Hugh.—*Mining Practice at Santa Gertrudis, Mexico*. [Abst. from the A. I. M. E. Bulletin. Contains drawings, details and general description].—E. & M. J. Aug. 26 1916; p 371; pp 6*; 25c.

Sanitation

Edwards, J. W.—*Industrial Diseases of Iron and Steel Workers in Meddelsborough, England*. [A paper read before the British Medical Assn.].—I. & C. Tr. Rev. Aug. 11 1916; p 153; pp 1; 35c.

Labor and Management

—*Queensland Mines Inspection*. [Labor, wages, accidents, ventilation, etc.].—Queen. Gov't Mg. Jnl. July 15 1916; p 329; pp 3; 35c.

Accounts and Bookkeeping

Huac, A. J.—*Cost Accounting for the Clay Plant*. [A series of articles, including forms, tables and description for a complete cost accounting system].—B. & C. Rec. Aug. 15 1916; p 307; pp 3; 35c.

Production

Ball, Lionel C.—*Mount Cannindah Copper Mine, Australia*. [The history by years, geology, concentrating and smelting methods are taken up in detail with production figures].—Queen. Gov't Mg. Jnl. 1916; p 318; pp 6*; 35c.

Dunstan, B.—*Queensland Mineral Deposits, Australia*. [Occurrence, production, values, prospects and properties by the chief Government Geologist].—Queen. Gov't Mg. Jnl. July 15 1916; p 314; pp 1¼; 35c.

Kotze, R. N.—*Far East Rand and Suggested Changes in the Gold Law*. [Abst.

from a South African government report taking up operations and production with respect to suggested law].—Mg. Mag. Aug. 1916; p 75; pp 9*; 50c.

Loughlin, G. F.—*Lime in 1915*. [On the uses, units of measurement and production].—Min. Res. of U. S. II:19; pp 20.

Phalen, W. C.—*Bauxite and Aluminum in 1915*. [On the production, uses and methods of refining].—Min. Res. of U. S. I:7; pp 16*.

Sieenthal, C. E.—*Production of Primary Spelter First Half of 1916*. [Abst. from U. S. G. S. semi-annual report].—Mg. World Aug. 26 1916; p 370; pp 1¼; 10c.

Mining Costs

Parsons, L. A.—*Diamond Drilling at Sudbury, Ontario*. [Details of operation and costs].—E. & M. J. Aug. 26 1916; p 381; pp 1¼; 25c.

Rose, Hugh.—*Mining Practice at Santa Gertrudis, Mexico*. [Abst. from the A. I. M. E. Bulletin. Contains drawings, details and general description].—E. & M. J. Aug. 26 1916; p 371; pp 6*; 25c.

Wilson, Philip D.—*Comparison of Stopping Methods at Calumet & Arizona Mine*. [Abst. from the bulletin of the A. I. M. E. Description of methods used and comparisons of costs and advantages].—M. & S. P. Aug. 26 1916; p 315; pp 3½*; 20c.

—*Consolidation of the Treadwell Mines, Alaska*. [Operating costs, production, description of the company's holdings, etc., and items of financial interest are given].—M. & S. P. Aug. 26 1916; p 307; pp 7*; 20c.

Mining Miscellany

Weimbren, M.—*Method of Removing Broken Ore from Flat Stopes*. [Abst. from the Jnl. of the Chem. Met. & Mg. Soc. of South Africa].—Mg. World Aug. 26 1916; p 362; pp ¼*; 10c.

Wilson, Philip D.—*Comparison of Stopping Methods at Calumet & Arizona Mine*. [Abst. from the bulletin of the A. I. M. E. Description of methods used and comparison of costs and advantages].—M. & S. P. Aug. 26 1916; p 315; pp 3½*; 20c.

MILL AND MILLING

Sampling

Pope, George S.—*Methods of Sampling Delivered Coal*. [Methods of sampling used in the government purchase of coal].—U. S. Bur. of Mines Bull. 116; pp 64*; 25c.

Crushing, Grinding, Etc.

Labbe, Charles.—*Replacing Mortar Blocks in Stamp Mills*.—E. & M. J. Aug. 26 1916; p 391; pp 1¼*; 25c.

—*The Mount Morgan Mine and Works, Australia*. [Complete description of the geology, mining and concentrating plant of this mine, once a gold mine but now copper].—Mg. & Engg. Rev. July 5 1916; p 244; pp 9*; 35c.

Flotation

—*A New Flotation Machine*. [An account of the recent patent to Eberenz and Brown].—Mg. World Aug. 26 1916; p 365; pp ¼*; 10c.

Concentration: Sorting, Sizing, Washing

Ball, Lionel C.—*Mount Cannindah Copper Mine, Australia*. [The history by years, geology, concentrating and smelt-

ing methods are taken up in detail with production figures].—Queen. Gov't Mg. Jnl. July 15 1916; p 318; pp 6*; 35c.

Bradley, W. W.—*Concentration Methods for the Reduction of Quicksilver Ores*. [Work now being carried on by the California Mining Bureau].—Mg. World Aug. 26 1916; p 366; pp ¾; 10c.

Scott, W. A.—*Concentrating Mill Tailings Near Park City, Utah*. [Concentration and haulage are dealt with. To get rid of zinc considerable of the lead and silver was lost formerly].—Mg. World Aug. 26 1916; p 359; pp 2½*; 10c.

—*The Mount Morgan Mine and Works, Australia*. [Complete description of the geology, mining and concentrating plant of this mine, once a gold mine but now copper].—Mg. & Eng. Rev. July 5 1916; p 244; pp 9*; 35c.

Mill and Smelter Costs

—*Consolidation of the Treadwell Mines, Alaska*. [Operating costs, production, description of the company's holdings, etc., and items of financial interest are given].—M. & S. P. Aug. 26 1916; p 307; pp 7*; 20c.

CHEMISTRY AND ASSAYING

Chemistry

Blakeley, A. G.—*Chemistry in Coal Mining*. [Some details and speaks of lines along which the coal mine chemist could work].—Coal Age Aug. 19 1916; p 296; pp 6½; 20c.

Pierce, Edwin G.—*The Determination of Sulphuric Anhydride in Portland Cement Analysis*. [Complete description of a method].—Chem. Eng. & Mfg. Aug. 1916; p 62; pp 1¼*; 30c.

Analysis

Pierce, Edwin G.—*The Determination of Sulphuric Anhydride in Portland Cement Analysis*. [Complete description of a method].—Chem. Eng. & Mfg. Aug. 1916; p 62; pp 1¼*; 30c.

Electrochemistry

Buck, H. W.—*Comparisons Between Steam and Water Power*. [Discussion of the two forms of power and their application].—Mg. World Aug. 26 1916; p 373; pp 1½; 10c.

METALLURGY

Electrometallurgy

Phalen, W. C.—*Bauxite and Aluminum in 1915*. [On the production, uses and methods of refining].—Min. Res. of U. S. 1:7; pp 16*.

Thermic Metallurgy

Ball, Lionel C.—*Mount Cannindah Copper Mine, Australia*. [The history by years, geology, concentrating and smelting methods are taken up in detail with production figures].—Queen. Gov't Mg. Jnl. July 15 1916; p 318; pp 6*; 35c.

Bradley, W. W.—*Concentration Methods for the Reduction of Quicksilver Ores*. [Work now being carried on by the California Mining Bureau].—Mg. World Aug. 26 1916; p 366; pp ¾; 10c.

Dunstan, B.—*Queensland Mineral Deposits, Australia*. [Occurrence, production, values, prospects and properties by the chief Government Geologist].—Queen. Gov't Mg. Jnl. July 15 1916; p 314; pp 1¼; 35c.

Tournay-Minde, A. W.—*The Flow of Air in Lead Blast Furnaces*. [Abst. of a paper read before the Engg. Assn. of New South Wales].—E. & M. J. Aug. 26 1916; p 392; pp 1; 25c.

Hydro-Metallurgy

Phalen, W. C.—*Bauxite and Aluminum in 1915*. [On the production, uses and methods of refining].—Min. Res. of U. S. 1:7; pp 16*.

POWER AND MACHINERY

Electricity

Copeland, Clem A.—*Properties of Iron and Steel Wires and Cables*. [Gives curves and tabulated data showing both physical and electrical properties].—Jnl. Elect., Power & Gas. Aug. 26 1916; p 157; pp 2¼*; 35c.

Hellmund, R. E.—*Rating of Mine Locomotives*.—Coal Age Aug. 26 1916; p 337; pp 2; 20c.

Rose, Hugh.—*Mining Practice at Santa Gertrudis, Mexico*. [Abst. from the A. I. M. E. Bulletin. Contains drawings, details and general description].—E. & M. J. Aug. 26 1916; p 371; pp 6*; 25c.

—*Construction of a Big Plant*. [General arrangement and some special construction features at the Public Service Electric Co.'s Plant, Essex, New Jersey].—Pract. Eng. Sept. 1 1916; p 727; pp 15*; 20c.

Compressed Air

—*Fullerton, Hodgart and Barclay Vertical Air Compressor*. [Sectional and plain views are shown].—I. & C. Tr. Rev. Aug. 4 1916; p 132; pp 2*; 35c.

Gas Producers, Producer Gas

—*Lynn-Rambush Gas-Producer*. [Drawings and illustrations showing its operation and construction].—Engg. Aug. 11 1916; p 127; pp 1*; 35c.

Combustion Engines

Clarke, Thomas C.—*The By-Product Oven an Adjunct to Preparedness*. [A paper read before the Soc. of Chem. Ind.].—Coal Age Aug. 26 1916; p 312; pp 1¼; 20c.

Steam and Steam Engines

Buck, H. W.—*Comparisons Between Steam and Water Power*. [Discussion of the two forms of power and their application].—Mg. World Aug. 26 1916; p 373; pp 1½; 10c.

Crawford, C. W.—*The Steam Engine's Extravagance*. [A general discussion on the use of different designs of steam engines].—Coal Age Aug. 26 1916; p 351; pp 1¼; 20c.

Peabody, Ernest H.—*Oil Fuel*. [On the use of forced draft and blowers in using oil fuel for generating steam].—Pract. Eng. Sept. 1 1916; p 737; pp 2¼*; 20c.

Schiefer, H. V.—*Handling Coal in Large Boiler Houses*.—Coal Age Aug. 26 1916; p 349; pp 2*; 20c.

—*Construction of a Big Plant*. [General arrangement and some special construction features at the Public Service Electric Co.'s Plant, Essex, N. J.].—Pract. Eng. Sept. 1 1916; p 727; pp 15*; 20c.

—*Steven's Under-Feed Stoker*.—Pract. Eng. Sept. 1 1916; p 764; pp 1½*; 20c.

Miscellaneous Power and Machinery

Buck, H. W.—*Comparisons Between Steam and Water Power*. [Discussion of the two forms of power and their application].—Mg. World Aug. 26 1916; p 373; pp 1½; 10c.

Kent, Robert T.—*Power Transmission by Leather Belting*.—Wiley & Sons; book; pp 114*; \$1.25.

IV. MISCELLANEOUS

Miscellaneous Costs

Gould, Harry J.—*A Simple and Efficient Cost Keeping System for Concrete Construction*. [Both forms and descriptive information are given].—Engg. & Cont. Aug. 30 1916; p 199; pp 3; 20c.

—*Canadian Mining Corporation*. [Cost and other details of operation].—E. & M. J. Aug. 19 1916; p 348; pp 1¼; 25c.

Testing

Hood, W. W.; Knox, G.; Evans, E. C.—*South Wales Coal Dust Experiments*. [A paper read before the South Wales Colliery Officials' Assn.].—Coll'y Guard. Aug. 11 1916; p 256; pp 1¼*; 35c.

Young, Ralph A.—*Testing of Dredge Bucket Pins*. [On the use of carbon-steel instead of more expensive alloyed steels].—E. & M. J. Aug. 26 1916; p 377; pp 2¼*; 25c.

Metallography

Tschishewsky, N.; Herdt, A.—*Iron-Baron and Iron-Carbon Alloys*. [A paper from the Journal of the Russian Met. Soc. Gives the properties, method of preparation and equilibrium curve for the alloys].—Iron Age Aug. 24 1916; p 396; pp 2*; 30c.

Waste: Slag, Tailings, Fumes, Etc.

—*Basic Phosphate Fertilizer as a By-Product in Iron Smelting*. [A method used in connection with open-hearth smelting].—Chem. Eng. & Mfg. Aug. 1916; p 68; pp 1*; 30c.

Law, Legislation, Taxation

Kotze, R. N.—*Far East Rand and Suggested Changes in the Gold Law*. [Abst. from a South African government report, taking up operations and production with respect to suggested law].—Mg. Mag. Aug. 1916; p 75; pp 9*; 50c.

Conservation

Cooper, S. G.—*The Production and Use of Power and Its Relation to Fuel Economy*.—I. & C. Tr. Rev. Aug. 4 1916; p 125; pp 1; 35c.

History

Ball, Lionel C.—*Mount Cannindah Copper Mine, Australia*. [The history by years, geology, concentrating and smelting methods are taken up in detail, with production figures].—Queen. Gov't Mg. Jnl. July 15 1916; p 318; pp 6*; 35c.

—*The Mount Morgan Mine and Works, Australia*. [Complete description of the geology, mining and concentrating plant of this mine, once a gold mine but now copper].—Mg. & Engg. Rev. July 5 1916; p 244; pp 9*; 35c.

Societies

—*North of England Institute of Mining and Mechanical Engineers*.—Coll'y Guard. Aug. 11 1916; p 254; pp 2*; 35c.

Financial

—*Consolidation of the Treadwell Mines, Alaska*. [Operating costs, production, description of the companies' holdings, etc., and items of financial interest are given].—M. & S. P. Aug. 26 1916; p 307; pp 7*; 20c.

—*Recent Developments in the Sudbury District, Ontario*.—Canadian Mg. Jnl. Aug. 15 1916; p 391; pp 1¼*; 35c.

Ore and Metal Markets; Prices-Current

New York, Sept. 7, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Sept. 6 were as follows:

	New York, cents.	London, pence.
Aug. 31.....	67 1/4	32
Sept. 1.....	68 1/8	32 3/8
2.....	68 1/8	32 3/8
3.....	68 1/8	32 3/8
4.....	68	32 3/8
5.....	68	32 3/8
6.....	68 1/4	32 1/2

MONTHLY AVERAGE PRICES OF SILVER.

	New York				London	
	—1916—			1915.	Standard Oz.	
Month.	High.	Low.	Avg.	Avg.	Avg.	Avg.
January	57½	55½	56.775	48.890	26.875	22.744
February	57	56½	56.755	48.477	27.000	22.769
March	60¾	56½	57.935	49.926	27.080	23.650
April	73½	60¾	64.415	60.034	31.375	23.259
May	77¼	68¾	74.27	49.915	34.182	23.560
June	68¾	62¾	65.02	49.072	31.038	21.577
July	65	60	62.94	47.519	29.870	22.950
August	67	25	64	47.178	31.25	22.750
September .....	.....	.....	.....	48.68	.....	23.600
October .....	.....	.....	.....	49.285	.....	23.923
November .....	.....	.....	.....	51.713	.....	24.640
December .....	.....	.....	.....	55.038	.....	26.232
Year .....	.....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—General demand since our last report has been active. Domestic and foreign users have been buying steadily. Orders for delivery in November and December and in the first quarter of next year have been frequent and large. Paucity of nearby metal—spot and October—is becoming more acute. Electrolytic for November is not in plentiful supply either, while some producers are sold out for December. Spot electrolytic in second hands has been sold at 28 1/2 cts. in 50-ton lots, while for October delivery sales have been made at 28 1/4 cts. Some dealers quote 27 1/2 cts. for spot, but consumers who endeavored to buy at this price found that only 5 to 10 lots were available or the copper was off-grade. Prices for first hands for November delivery hold at 28 cts., with December quoted at 27 3/4@28 cts. Some prime lake copper on the spot sold at 27 3/4 cts., but lake copper for the fourth quarter is held at 28 cts. Spot casting copper changed hands at 25 1/2 cts., with some producers quoting 25 cts. for the fourth quarter.

Europe is taking copper at the rate of 70,000,000 lbs. a month. Taking our output at the outside estimate of 165,000,000 lbs. a month, it will be seen that with domestic absorption 80,000,000 lbs. a month, refiners have little metal to put aside to maintain safeguards against interruptions. Indications are that exports will increase in the closing months of the year. Shipments of 80,000,000 lbs. are anticipated, while some factors report that 90,000,000 lbs. may go out each in November and December. On this reckoning it is likely that additional refining capacity will come into play before long. Augmentation of refining capacity to 200,000,000 lbs. a month was contemplated.

One of the largest copper producers declares that each month of war will add a like period to the extensive reconstruction absorption of copper. He asserts that for fully 2 years after the turmoil in Europe has ceased demand for copper will continue at a rate that will compel production at the present record-breaking volume. This view is being noted in a continually enlarging circle. The fear of a reaction after peace is declared is not being expressed so openly as hitherto. The situation, therefore, is not one where possibility of over-production acts as a restraining barrier on the market.

The London market last week again showed standard copper to be erratic, while electrolytic advanced £1 to £130. Standard opened the week with an advance, but closed £1 lower in spot and £1 10s in futures from the high price. The copper statistics just received show that the total visible

supply on Aug. 31 increased 492 tons to 11,514 tons. Stocks of furnace material in England increased 1660 tons to 4839 tons, while stocks of fine copper in France increased 32 tons to 2675 tons. The afloat from Chile was 850 tons and from Australia 3150 tons.

Quotations for copper per pound at New York for the week ended Sept. 6 were as follows:

(For Fourth Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
Aug. 31.....	28@28 1/4	28@28 1/4	25@25 1/2
Sept. 1.....	28@28 1/4	28@28 1/4	25@25 1/2
2.....	28@28 1/4	28@28 1/4	25@25 1/2
3.....		Holiday	
4.....			
5.....	28@28 1/4	28@28 1/4	25@25 1/2
6.....	28@28 1/4	28@28 1/4	25@25 1/2

Quotations for copper per ton at London for the week ended Sept. 6 were as follows:

	Standard		Electrolytic.	
	Spot.	Futures.		
Aug. 31.....	£109 0 0	£106 0 0	£120 0 0	
Sept. 1.....	110 0 0	107 10 0	130 0 0	
2.....	110 0 0	107 10 0	130 0 0	
3.....	109 10 0	107 0 0	130 0 0	
4.....	109 0 0	106 10 0	130 0 0	
5.....	109 0 0	106 0 0	130 0 0	
6.....	109 0 0	106 0 0	130 0 0	

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.60	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September				17.758
October				17.925
November				18.856
December				20.375
Year				17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.60	23.00	24.101	13.707
February	28.50	25.25	27.462	14.672
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September				17.705
October				17.859
November				18.826
December				20.348
Year				17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12 1/2	26.031	102.760	62.392
March	27.75	25.50	26.210	106.185	62.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.35	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September					68.660
October					72.577
November					77.400
December					80.400
Year					

Tin.—Indications of the independence of tin consumers insofar as current supplies are concerned were in view last week when sharp advances at London and Singapore failed to cause concern among users. Sellers on this side marked up prices, but on the absence of buying support the market subsided. The trade has had another week of inactivity and to a certain extent the market has been a speculative affair, as evidenced by the fluctuations.

Straits tin at London opened the week with a £2 5s ad-

vance, but subsequently declined to £170 10s, a drop of £2 10s. The Singapore market acted similarly, advancing to £175 and receding to £171 10s at the close. This market closely followed the movement abroad, with spot Straits closing at 38½ cts., at which price some sellers offered freely. The August deliveries were disappointing, amounting to only 4335 tons on both coasts, while the stocks and landing on Aug. 31 aggregated 4756 tons, a record-breaking figure.

The poor statistics influenced London and Singapore adversely this week, as expectations were that deliveries would run in excess of 5000 tons. The heavy stocks were not considered a depressant, as much of the tin at the seaboard is already owned by the large consumers and cannot under the guarantees be resold, despite the falling market. At this writing spot Straits is held at 38½ cts., with October quoted at 38¼ cts. and November and December at 38½ cts.

Quotations for tin per pound at New York and per ton at London and Singapore during the week ended Sept. 6 were as follows:

	New York		London.	Singapore,
	Spot.	Sept.	Straits, spot.	shipments.
Aug. 31.....	38½c	38½c	£170 15 0	£172 10 0
Sept. 1.....	38½c	38½c	170 10 0	171 10 0
2.....	38½c	38½c	170 10 0	171 10 0
4.....	Hotday	Hotday	170 10 0	171 15 0
5.....	38½c	38½c	170 17 6	172 10 0
6.....	39c	38½c	171 0 0	173 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.386
September .....	.....	.....	.....	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—The market has lapsed into dullness and dealers who were holding nearby metal for further advances offered freely, their offers being further pressed by fears of a railroad strike. Spot metal as a result eased off to 6.50 cts. St. Louis, but the market for lead delivered New York held steady at 6.65@6.70 cts., although now that the railroad matter has been settled the eastern market may also ease off.

The position of lead is very strong. Independent producers are well sold up for September and have taken a considerable line of business for October delivery, price to be fixed at the A. S. & R. Co. quotation for that month. The situation as respects price changes this month is clouded. No hint as to what the principal producer will do can be obtained, but in view of the prevailing dullness there are some who believe that the quotations of 6.50 cts. New York and 6.42½ cts. St. Louis will be continued.

Canadian consumers who furnished the main support to the market on the recent rise are now well covered, while domestic users are also adequately supplied. Therefore, producers are not looking for another excited period this month unless Russia suddenly comes into the market, in which event prices will spring forward, in view of the scarcity of metal.

The London market has been very steady, with prices advancing, spot going up 12s 6d to £31 5s and futures 7s 6d to £29 17s 6d last week.

Quotations for lead per pound at New York and per ton at London for the week ended Sept. 6 were as follows:

	New York		London	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
Aug. 31.....	6.70c	6.50c	£31 5 0	£30 2 6
Sept. 1.....	6.70c	6.50c	31 5 0	29 17 6
2.....	6.70c	6.50c	31 5 0	29 17 6
4.....	Hotday	Hotday	31 0 0	30 0 0
5.....	6.70c	6.50c	31 0 0	30 0 0
6.....	6.70c	6.50c	29 10 0	32 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London		
	High.	Low.	Avg.	1915.	1916.	1915.
January	6.20	6.50	5.926	5.730	31.92	18.637
February ...	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	22.010

April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	6.75	6.88	5.875	29.760	25.750
July	6.85	6.25	6.37	5.738	28.035	25.611
August	6.70	5.95	6.32	4.750	30.260	22.150
September .....	.....	.....	.....	4.627	.....	22.953
October .....	.....	.....	.....	4.612	.....	23.932
November .....	.....	.....	.....	5.152	.....	26.240
December ...	.....	.....	.....	5.346	.....	28.884
Year .....	.....	.....	.....	4.675	.....	23.099

Lead Ore.—In the Missouri-Kansas-Oklahoma district during the week ended Sept. 2 practically the same conditions prevailed in the district. The water supply is still short and with low prices there is little incentive to try for a heavier production. Prices were from \$65 to \$67 and the production for the week totaled 2,360,980 lbs. bringing the production for the year to date at 70,842,473 lbs. of concentrates. These respective productions were valued at \$76,570 and \$3,002,054.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	60.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September .....	.....	.....	.....	48.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—The stacking up of ore supplies due to the threatened railroad strike made considerable buying during the latter part of the week when fears of the threat were done away with and the prices due to the larger supply on hand were down \$5, the better grades bringing \$65 and this price ranging down to \$45. The week's production was 11,325,050 lbs. and the year's to date was 445,629,374 lbs. Values of these amounts were placed at \$329,876 and \$19,906,509.

Calamine.—With a dull market for its allied ores calamine was off \$5 the past week and brought from \$35 to \$45. Production was up again to its prevailing figure and 422,300 lbs. of concentrates were produced during the week, making the total for the year 20,632,610 lbs. The week's production was valued at \$8654 and the year's at \$737,536.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	120.00	85.00	106.25	63.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.60	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	58.75	60.25
September .....	.....	.....	.....	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—The situation in spelter has undergone no change since our last report. The market has been very dull, with prices receding, although the factors that are causing the lower prices are the subject of conflicting views, some attributing the weakness to producers and others to speculation by dealers. In any event the market has been abnormally quiet and interests who formerly took an optimistic viewpoint on the future of the metal are now beginning to feel that overproduction has furnished a corrective towards the high prices. Foreign demand was the dominant support to the market, and with England now pressing its policy to free itself of American spelter the problem of maintaining the market is a difficult one to solve, especially in view of the fact that some copper companies producing spelter as a by-product at a low cost are in a position to sell much lower than prevailing prices and still obtain profits.

Spot spelter has been offered down to 8.87½ cts. New York and it was not difficult to shade to 8¼ cts., while for the fourth quarter sellers freely offered at 8¼ cts., although

no business could be traced as having been closed at this price, or any other price, for that matter.

The London market has declined rather sharply, with cables reporting that English producers were seeking to liquidate spot holdings, while Americans were offering futures freely, indicating a renewal of shipment of consignment lots to the English market. Spot spelter at London declined £7 last week, while future dropped £3.

Quotations for spelter per pound at New York and per ton at London for the week ended Sept. 6 were as follows:

		New York.	London—	
		Spot.	Spot.	Futures.
Aug. 31.....	8.87½c	£52 0 0	£42 0 0	
Sept. 1.....	8.87½c	49 0 0	42 0 0	
2.....	8.87½c	49 0 0	42 0 0	
4.....	Holiday	49 0 0	42 0 0	
5.....	8.62½c	49 0 0	42 0 0	
6.....	8.62½c	48 10 0	41 10 0	

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	High.	Low.	Avg.	High.	Low.	Avg.
January	19.42½	17.30	18.801	6.519	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	15.62½	11.25	12.72	22.625	67.410	100.320
July	10.75	8.75	9.80	20.803	53.00	98.150
August	9.75	8.37½	9.11½	16.110	56.00	68.250
September				14.493		64.400
October				14.196		64.196
November				16.875		88.240
December				16.675		89.153
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Tungsten.—The market has continued its activity and again over 200 tons have changed hands; and prices ranging around \$20. For a special quality ore, as much as \$22.50 was paid for immediate delivery. During the past week one feature of the market has been the fact that since a very long time, a contract has been made for forward delivery. Business has been done for October and November shipment for some quantities and it appears as if buyers have come to the opinion that the market has touched about bottom. Besides the 200 tons mentioned above for spot, 250 tons changed hands for home consumption.

Quicksilver.—Improved demand from powder makers and smaller receipts have acted to strengthen this metal. Prices have been advanced to \$80 per flask for spot virgin, with sellers reporting users freely seeking metal, but little to be had. Some large export business has been closed in the past week and indications are that England has been a steady buyer since the first of August.

Antimony.—The boom is over. Business in antimony is poor and sellers have resumed price concessions in an effort to stimulate sales. The recent buying spurt served to clear the market of spot metal, but arrivals have again created stocks and sellers are finding it difficult to attract buyers. Spot metal has been offered down to 12½ cts. and in some cases 12¼ cts. has been quietly quoted. Some Chinese interests recently sent out advices that conditions in China arising from the revolt were causing small producers to suspend operations and that a scarcity of antimony was likely, but these advices were considered as being representative of the customary Asiatic method of seeking a support for the market.

Finished Copper, Brass and Other Products.—There has been no change in prices on finished goods, but the market is very strong except in zinc sheets. Makers report an active demand, with many of them booked full over the rest of the year.

Platinum.—A sudden and sharp spurt developed in platinum last week, the price advancing \$15 an ounce to \$80 an ounce. Refiners declared that increased demand and smaller supplies had caused the advance.

Ferromanganese.—Although the English government

has continued its policy of limiting licenses for shipments of ferromanganese, the market is quiet and somewhat easy. Spot English 80% was offered at \$160 seaboard by one seller, but others continued to ask \$170 seaboard for unrestricted.

Pig Iron.—Further improvement in pig iron as respects both demand and prices has been noted. Some large tonnages have been purchased and furnaces are intimating that prices will soon go up sharply. The Worthington Pump & Machinery Co. took 16,000 tons foundry irons for the first half, while in the west some round lots as basic iron figured in the week's business.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.07½	to	.08½
Nitric, 40 deg.....	.09	to	.09½
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured 183 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.71
Alum.—Powdered, lb.....	.05	to	.07
Lump, lb.....	.04	to	.06
Ground, lbs.....	.041	to	.06½
Ammonia—			
Muriate, white grain, lb.....	.08½	to	.08½
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06	to	.06½
Red, lb.....	.60	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.14	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	2.75	to	2.80
Foundry.....	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese—Spot.....	175.00	to	.....
Last half.....	175.00	to	.....
Ferrosilicon, 50%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.65
White crystals.....	.15½	to	.15½
Broken, cakes.....	.14½	to	.15
Powdered.....	.17	to	.17½
Lead—Granulated, lb.....	.17	to	.17½
Brown sugar.....	.14½	to	.15½
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.23	to	.25
Benzine, 59 to 62°, gal.....	.23	to	.28½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.13
Refined, bbl.....			.12
Platinum—Oz. ref.....	50.00	to	55.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.39	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.45	to	.50
Prussiate, yellow.....	.65	to	.70
Prussiate, red.....	1.85	to	2.00
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.25½	to	.26
Soda—Ash, 48% (43% basis), bbl.....	2.75	to	3.00
Strontia Nitrate, casks, lb.....	.30	to	.31
Sulphur—			
Crude, ton.....	28.00	to	29.00
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50%, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.29½	to	.30
Oxide, lb.....	.43	to	.45
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

Dividends on Issued Capitalization							Dividends on Issued Capitalization						
NAME OF COMPANY		Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest	NAME OF COMPANY		Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest
						Date Amt.							Date Amt.
Acacia, g.	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12 \$0.01	Golden Eagle, g.	Colo.	480,916	\$1	\$.....	\$98,916	Sept. '01 \$0.01
Adams, s. l.	Colo.	80,000	10	.....	778,000	Dec. 18, '09	Golden Star, g.	Ariz.	400,000	5	.....	120,000	Mar. 16, '10
Adventure, c.	Mich.	100,000	25	50,000	50,000	July 20, '16	Gold' Con. Fra., g.	Nev.	922,000	1	.....	92,111	Oct. 16, '09
Ahmeek, c.	Mich.	200,000	25	1,200,000	5,250,000	July 16, '16 3.00	Goldfield Con.	Nev.	3,559,148	100	.....	28,999,831	Oct. 31, '16
Alaska Goldfields.	Alaska	250,000	6	.....	403,250	Jan. 10, '16	Good Hope, g. & s.	Colo.	500	100	.....	941,250	Jan. '08
Alaska Mexican, g.	Alaska	600,000	6	.....	3,507,381	Nov. 28, '15	Good Sp. Anchor, s.	Nev.	550,000	1	33,000	119,765	June 18, '16
Alaska Mines Sec.	U. S.	200,000	25	250,000	15,780,000	May 29, '16	Grand Central, g.	Utah	500,000	1	.....	1,545,200	Dec. 23, '16
Alaska Treadwell, g.	Alaska	180,200	5	54,000	2,045,270	Feb. 28, '16	Grand Gulch, c. s.	Nev.	233,845	2.50	9,584	11,992	June 1, '16
Alaska United, g.	Mich.	100,000	25	450,000	650,000	July 15, '16 2.00	Granite, g.	Alaska	430,000	17,700	.....	5,748,192	May 10, '16
Alouez, s.	Mont.	1,533,829	100	.....	103,444,983	Aug. 30, '15 3.77	Owlin, g.	Cal.	100,000	10	.....	481,500	Feb. '06
Am. Sm. & R. com.	U. S.	500,000	100	1,500,000	30,533,333	June 1, '16 1.50	Hazel, g.	Cal.	900,000	1	.....	1,114,000	Jan. '15
Am. Sm. & R. pt.	U. S.	500,000	100	1,750,000	56,646,886	June 1, '16 1.75	Hecla, s. l.	Idaho	1,000,000	0.25	950,000	4,705,000	Aug. 20, '16
Am. Sm. Sec. A. pt.	U. S.	170,000	100	765,000	11,445,000	July 1, '16 1.50	Hercules.	Idaho	1,000,000	1	1,850,000	12,630,000	Aug. 16, '16
Am. Sm. Sec. B. pt.	U. S.	300,000	100	1,125,000	16,615,000	July 3, '16 1.25	Hidden Treasure, g.	Cal.	30,000	10	.....	457,452	Sept. '00
Am. Zinc, L. & Sm.	Mo.	193,120	25	2,756,190	3,905,000	Aug. 1, '16 1.50	Holy Terror, g.	S. D.	500,000	1	.....	172,000	Jan. '00
Anaconda, c.	Mont.	2,331,250	50	11,656,350	175,914,271	Aug. 28, '16 2.00	Homestake, g.	S. D.	251,180	100	1,306,032	37,011,740	Aug. 25, '16
Annie Laurie, g.	Utah	25,000	100	.....	439,561	Apr. 22, '05	Hope Dev.	Cal.	500,000	1	.....	6,000	Dec. 31, '16
Argonaut, g.	Cal.	200,000	6	40,000	1,080,000	June 27, '16	Horn Silver, L. & z.	Utah	400,000	1	40,000	5,182,000	June 30, '16
Arizona, c.	Ariz.	100,000	25	611,164	29,212,164	Apr. 1, '16	Imperial, c.	Ariz.	500,000	10	.....	3,000,000	June 24, '07
Atlantic, c.	Mich.	100,000	25	.....	990,000	Feb. 15, '15	Inspiration Con.	Ariz.	920,657	20	3,091,233	30,911,233	July 31, '16
Bagdad-Chase, g. p.	Mont.	250,000	1	.....	202,394	Jan. 1, '09	Inter' Nickel, com.	U. S.	1,673,384	25	5,433,498	30,941,338	Aug. 1, '16
Bald Butte, g. & s.	Mich.	100,000	25	.....	1,354,645	Nov. 1, '07	Inter' Nickel, pt.	U. S.	89,126	100	401,067	5,748,192	June 1, '16
Baldie, c.	Mont.	40,000	5	60,000	7,950,000	Dec. 31, '13 2.00	Intern'l Sm. & Ref.	U. S.	100,000	100	.....	4,100,000	Feb. 2, '14
Barnes-King, g.	Utah	1,000,000	0.10	.....	940,000	Nov. 15, '07	Interstate-Calahan	Idaho	464,990	10	1,394,970	3,952,415	June 30, '16
Beck Tunnel Con.	Utah	400,000	1	80,000	90,000	Aug. 15, '16	Iowa, g. & s.	Colo.	1,666,667	1	.....	270,167	Dec. 31, '15
Big Four Expl.	Wyo.	120,000	1	.....	79,000	Jan. 15, '11	Iowa Tiger, g. & s.	Colo.	3,000	1	.....	25,179	Jan. 15, '15
Board of Trade, s.	Colo.	300,000	1	.....	1,425,000	Oct. 28, '11	Iron Blossom, L. & s.	Utah	1,000,000	1	250,000	2,750,000	July 20, '16
Bonanza Dev.	Nev.	999,396	5	349,949	349,949	June 25, '16	Iron Cap. pt. d.	Ariz.	33,491	10	5,422	29,803	July 1, '16
Booth (Reorganized)	Nev.	408,596	10	.....	40,850	Dec. 16, '14	Iron Clad, g.	Colo.	1,000,000	1	.....	60,000	Nov. '05
Bom, g.	Nev.	100,000	25	.....	402,350	Oct. '02	Iron Silver, s.	Colo.	600,000	20	.....	5,060,000	Dec. 31, '15
Boston & Colo. Sm.	Mont.	100,000	25	.....	63,225,000	May 1, '11 4.00	Isabella, g.	Colo.	2,250,000	1	.....	742,500	Mar. '01
Bost. & Mont. Con.	Colo.	200,000	25	.....	220,000	Dec. 18, '13	Isle Royale, c.	Mich.	150,000	25	150,000	300,000	July 31, '16
Breece, L. & s.	Cal.	300,000	1	.....	203,315	Sept. 15, '15	Jameson, g.	Cal.	500,000	10	.....	378,800	Jan. '11
Brunswick Con. g.	Utah	100,000	10	.....	2,768,400	July 11, '08	Jerry Johnson, g.	Nev.	1,718,022	1	.....	187,500	Nov. 5, '14
Bullwhacker, c.	Mont.	450,000	1	.....	10,000	July 1, '07	Jim Butler, g.	Nev.	1,718,022	1	.....	616,406	Aug. 15, '16
Bunker Hill Con.	Cal.	200,000	1	40,000	851,000	Aug. 4, '16	John Ore & Spelter	Mo.	400,000	5	62,000	62,000	July 22, '16
Banker Hill & Bull.	Idaho	327,000	10	1,164,500	17,917,500	Aug. 4, '16	Jumbo Ext. g.	Nev.	1,560,000	1	194,000	648,949	June 30, '16
Butte Alex Scott.	Mont.	75,000	10	814,602	1,054,119	Apr. 20, '16 16.50	Kendall, g.	Mont.	500,000	6	60,000	1,555,000	Apr. 3, '16
Butte-Balsklava, c.	Mont.	250,000	10	.....	125,000	Aug. 1, '10	Kenebeck Zinc.	Mo.	200,000	.....	60,000	60,000	June 30, '16
Butte Coalition, c.	Mont.	1,000,000	16	.....	4,700,000	Dec. 1, '11	Kennecott, c.	Alas.	250,000	10	7,000,000	12,000,000	June 30, '16
Butte & Superior, s.	Mont.	272,607	10	5,862,993	11,383,017	June 30, '16 10.75	Kennedy, g.	Cal.	100,000	100	.....	1,801,001	June '00
Caledonia, L. & s.	Idaho	2,806,000	1	625,200	1,507,931	Aug. 5, '16	King of Arizona, g.	Ariz.	200,000	1	.....	396,000	Aug. 2, '09
Calumet & Ariz., c.	Ariz.	641,923	10	2,665,676	25,714,000	June 30, '16 2.00	Klar Piquet, s.	Wis.	20,000	1	.....	167,500	Dec. 16, '12
Calumet & Hedia, c.	Mich.	1,750,000	25	3,000,000	132,250,000	June 23, '16 16.00	Knob Hill, g.	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13
Camp Bird, g.	Utah	600,000	25	113,584	10,243,964	Jan. 1, '16 12.75	La Fortuna, g.	Ariz.	250,000	1	60,000	1,200,500	Oct. '02
Cardiff, L. & s.	Utah	600,000	1	125,000	250,000	June 1, '16	Lake View, g.	Utah	500,000	0.06	.....	114,500	June 12, '16
Carlota, g. & s.	Utah	600,000	1	.....	60,000	Dec. '06	La Dolar, g.	Colo.	1,600,000	1	.....	25,000	Feb. 23, '03
Central Eureka, c.	Utah	100,000	25	100,000	4,000,000	Apr. 25, '16 1.00	Liberty Bell, g.	Colo.	133,651	5	.....	1,752,795	Jan. 31, '16
Center Creek, L. & s.	Sfo.	100,000	10	55,000	650,000	Aug. 1, '16 1.50	Lightner, g.	Cal.	102,255	1	.....	331,179	June '08
Central Eureka, g.	Cal.	100,000	1	.....	799,159	Mar. 5, '06	Lindeo, s.	Wis.	1,020	1	.....	11,200	Dec. 31, '16 3.00
Century, g. & s.	Utah	1,000,000	1	44,000	392,087	Feb. 15, '16	Little Bell, s. l.	Utah	300,000	1	15,000	76,000	Apr. 22, '16
Champion, c.	Mich.	100,000	25	5,000,000	15,000,000	Aug. 8, '16 6.40	Little Florence.	Nev.	1,000,000	1	.....	430,000	Jan. '08
Chel Con.	Utah	882,960	1	132,323	483,360	Aug. 2, '16	Little Packer.	Idaho	1,000,000	1	.....	37,500	Oct. 23, '13
Chino Copper, c.	N. M.	889,980	6	3,044,930	9,742,925	June 30, '16 2.25	Lower Mammoth.	Utah	1,000,000	1	.....	67,000	Dec. 15, '11
C. K. & N. g.	Colo.	1,431,300	1	.....	171,829	Nov. '04	MacNamara, g. & s.	Nev.	734,676	1	.....	46,800	Apr. 23, '05 12.00
Cliff, g.	Alaska	100,000	1	.....	116,000	Feb. 5, '14	Magma, c.	Ariz.	240,000	6.00	240,000	480,000	June 30, '16
Cliff, s. l.	Utah	300,000	10	.....	60,000	Dec. '08	Mammoth, g. & s. c.	Utah	400,000	10	60,000	2,380,000	June 30, '16
Clinton, g. & s.	Colo.	1,000	100	.....	60,000	Dec. '08	Manhattan, Big, g.	Nev.	752,400	1	.....	30,248	Aug. 16, '11
Colo. G. & s.	Utah	1,000,000	0.20	.....	2,600,000	Mar. 16, '13	Mary McKinney, g.	Colo.	1,370,252	1	.....	1,169,306	July 28, '14
Colorado, s. l.	Utah	283,540	5	.....	212,623	Oct. 14, '07	Mary Murphy, g. & s.	Colo.	370,000	6	.....	1,000,000	Aug. 16, '16
Columbus Con. L. & s.	Utah	283,540	5	.....	212,623	Oct. 14, '07	Mass Con. c. s.	Mich.	100,000	45	100,000	25,000	Aug. 16, '16
Combination, c.	Nev.	320,000	1	.....	873,000	Dec. '06	May Day.	Utah	800,000	0.25	46,000	104,000	May 1, '16
Comstock-Phoenix.	Nev.	786,000	1	.....	50,000	Nov. 11, '11	Mexican, g. & s.	Nev.	201,600	3	.....	171,350	June 4, '14
Con. Mercu, g.	Utah	1,000,000	1	.....	1,265,000	June 25, '13	Miami, c.	Ariz.	747,114	6	3,275,234	8,676,113	Aug. 16, '16 1.50
Consolidated, g.	Colo.	2,500,000	1	.....	380,000	Mar. '02	Mine La Motte, l.	Mo.	300,000	10	.....	300,000	Jan. 23, '04
Con. St. Gothard, g.	Cal.	100,000	10	.....	11,430	Oct. 14, '08	Modoc, g. s.	Colo.	600,000	1	.....	275,000	Oct. 20, '11
Continental, z.	Mo.												

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1918	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah..	600,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04	Success.....	Ida..	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03	
Pharmacist, g.	Colo..	1,500,000	1	91,600	Feb. 1, '10	.00%	Superior & Pitts. c	Ariz.	1,499,792	10	10,318,568	Dec. 21, '16	.35		
Phelps, Dodge & Co	U. S..	450,000	100	6,400,000	53,771,527	June 30, '15	6.00	Tamarack, c.....	Mich.	60,000	25	9,420,000	July 23, '07	4.00	
Pioneer, g.	Alaska	5,000,000	1	2,041,526	Oct. 7, '11	.03	Tamarack-Custer..	Idaho.	2,000,000	1	106,675	Aug. 30, '16	.02		
Pittsburg, I. Z.	Mo..	1,000,000	1	20,000	July 15, '07	.02	Tennessee, c.....	Tenn.	200,000	25	300,000	6,206,250	Apr. 15, '16	.75	
Pittsburg-Idaho, I.	Ida..	1,000,000	1	249,104	July 15, '13	.04	Tightner, g. s.....	Cal..	100	100	160,000	Jan. 3, '14	.00		
Pitts Silver Peak...	Nev.	2,790,000	1	840,600	Dec. 1, '14	.02	Tomboy, g. s.....	Colo..	310,000	5	74,400	3,851,555	June 30, '16	.24	
Platteville, I. z.....	Wis.	600	60	179,600	June 15 '07	10.00	Tom Reed, g.....	Ariz.	909,555	1	2,555,934	Sept. 5, '15	.01		
Plumas Eureka, g.	Cal.	160,625	10	2,831,294	Apr. 5, '01	.06	Ton-Helmont, g. s.	Nev..	1,500,000	1	562,500	8,205,527	July 1, '16	.12%	
Plymouth Con.....	Cal..	240,000	6	116,500	239,300	Aug. 10, '16	.24	Ton-Extension, g. s.	Nev..	1,272,501	1	413,660	1,400,856	July 1, '16	.15
Portland, g.	Colo..	3,000,000	1	270,000	10,447,080	July 20, '16	.03	Tonopah, g. s.....	Nev..	1,000,000	1	450,000	13,450,000	July 21, '16	.15
Prince Con., s. l.....	Nev..	1,000,000	2	125,000	250,000	July 1, '16	.05	Tonopah Midway, g	Nev..	1,000,000	1	250,000	Jan. 1, '07	.05%	
Quartette, g. s.....	Nev..	100,000	10	375,000	July 31, '07	.20	Tremis.....	Cal..	200,000	2.60	234,000	Apr. 25, '15	.02		
Quicksilver, pf.....	Cal..	43,000	100	1,931,411	Apr. 8, '03	.50	Tri-Mountain, c.....	Mich.	100,000	25	1,100,000	Oct. 30, '12	3.00		
Quip, g.	Wash.	1,600,000	1	67,000	Feb. 1, '12	.01	Tuolumne, c.....	Mont.	800,000	1	495,525	Apr. 15, '13	.10		
Quincy, c.	Mich.	110,000	25	770,000	22,547,600	June 30, '16	4.00	Uncle Sam Con., a.	Utah..	600,000	1	470,000	Sept. 20, '11	.06	
Ray Con., c.	Ariz.	1,571,279	10	1,571,279	5,144,406	June 30, '16	.50	Union, g.	Colo..	1,250,000	1	444,244	Jan. 27, '03	.02	
Red Metal, c.	Mont.	100,000	10	1,200,000	Apr. 1, '07	4.00	Union Basin, z.....	Ariz.	835,350	1	167,070	Nov. 16, '15	.10		
Red Top, g.	Nev..	1,000,000	1	128,175	Nov. 25, '07	.10	United, c. pf.....	Mont.	60,000	100	1,600,000	Apr. 15, '07	3.00		
Republic, g.	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%	United, c. com.....	Mont.	450,000	100	6,125,000	Aug. 6, '07	1.75		
Richmond, g. s. l.....	Nev..	54,000	1	4,453,797	Dec. 23, '00	.01	United, z. l. pf.....	Mo..	19,556	25	211,527	Oct. 15, '07	.60		
Rocco-Home, I. s.....	Nev..	300,000	1	152,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01		
Rochester Ld. & L.	Mo..	4,900	100	190,846	July 1, '12	.50	United (Crip. Ck.)	Colo..	4,009,100	1	440,435	Jan. 1, '10	.04		
Round Mountain, g.	Nev..	889,018	1	363,964	Aug. 25, '13	.04	United Globe, c.....	Ariz.	23,000	100	759,000	June 30, '16	18.00		
Sacramento, g.	Cal..	1,000,000	6	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S..	60,000	100	11,000,000	Sept. 23, '10	5.00		
St. Joseph, I. Z.	Mo..	1,464,798	10	704,733	10,972,631	June 30, '16	.25	United Verde, c.....	Ariz.	300,000	10	38,220,000	Aug. 9, '16	.75	
St. Mary's M. L.....	Mich.	160,000	25	2,083,000	6,880,000	Aug. 28, '16	2.00	United Verde Ext.,	Ariz.	1,000,000	50	600,000	Aug. 1, '16	.60	
Schoenb'r-Wal'n.z.l	Mo..	10,000	10	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo..	59,188	100	414,078	Oct. 9, '03	1.00		
Scratch Gravel.....	Cal..	1,000,000	1	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo..	39,468	100	1,775,396	Oct. 1, '07	1.50		
Seven Tro. Cn., g. s.	Nev..	1,443,077	1	252,532	Apr. 1, '15	.02%	U. S. R. & M. com	USMx	351,115	60	7,590,745	July 15, '16	1.00		
Shannon, c.	Ariz.	300,000	10	750,000	Jan. 30, '13	.50	U. S. R. & M. pf	USMx	486,350	60	1,288,668	18,084,366	July 15, '16	.87%	
Shattuck-Ariz., c.	Ariz.	350,000	10	4,200,000	July 20, '16	1.25	Utah, c.	Utah..	1,624,490	10	8,934,695	41,656,692	June 30, '16	3.00	
Silver Hill, g. s.....	Nev..	108,000	1	88,200	June 24, '07	.05	Utah-Apex, a. l.....	Utah..	528,200	5	254,100	330,125	July 1, '16	.25	
*Silver King Coal'n	Utah..	1,250,000	5	562,500	14,147,485	July 1, '16	.15	Utah Con., c.	Utah..	300,000	5	9,600,000	June 26, '16	.75	
Silver King Con.....	Utah..	637,582	1	127,516	942,373	July 22, '16	.10	Utah M. & T. i.....	Utah..	760,000	1	325,000	1,285,495	Aug. 16, '16	.60
Silver Mines Expl.	N. Y..	10,000	100	250,000	June 16 '10	2.00	Utah-Missouri, z.....	Mo..	10,000	1	10,000	10,000	May 29, '16	1.00	
Sioux Cons., I. s. c.	Utah..	745,389	1	872,705	July 20, '11	.04	Victoria, g. s. l.....	Utah..	250,000	1	207,500	Apr. 23, '10	.04		
Skidoo, g.	Cal..	1,000,000	6	365,000	Oct. 2, '14	.01	Vindicator Con., g.	Cal..	1,500,000	1	3,397,500	July 25, '16	.08		
Smuggler, s. l. x.....	Colo..	1,000,000	1	2,225,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D..	560,000	1	619,456	May 15, '16	.02%		
Snowstorm, c.	Idaho.	1,600,000	1	1,169,610	Oct. 10, '13	.01%	Wellington, I. z.....	Colo..	10,000,000	1	1,050,000	July 1, '16	.60		
Socorro, c.	N. M..	377,342	5	56,599	196,070	Aug. 1, '16	.06	West End Con.....	Nev..	1,788,486	1	536,545	Jan. 15, '16	.05	
South Eureka, g.	Cal.	299,951	1	1,409,754	Aug. 16, '07	.07	West Hill.....	Wis..	20,000	1	8,000	40,000	June 29, '16	.20	
South Hecla.....	Ida..	500,000	1	39,450	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal..	200,000	10	190,000	Aug. 25, '16	.10	
So. Swansea, g. s. l.	Utah..	300,000	1	287,500	Apr. 3, '04	.01%	Wilbert.....	Ida..	1,000,000	1	30,000	40,000	Aug. 15, '16	.01	
Spearfish, g.	S. D..	1,500,000	1	165,600	Jan. 7, '05	.01	Wolverine, c.....	Mich.	60,000	25	360,600	8,760,000	Apr. 1, '16	6.00	
Standard Con., g. s.	Cal..	178,394	10	6,274,408	Nov. 17, '13	.25	Wolverine & Ariz., c	Ariz.	118,674	16	53,403	53,403	Jan. 1, '16	.25	
Standard, c.	Ariz.	425,000	1	69,600	Sept. 8, '05	.60%	Work, g.	Colo..	1,600,000	1	1,697,685	Apr. 31, '12	.02		
Stewart, I. Z.	Idaho.	1,238,362	1	2,043,297	Dec. 31, '15	.05	Yak.....	Colo..	1,000,000	1	120,000	2,127,685	June 30, '16	.07	
Stratton's Crip. Ck.	Colo..	2,000,000	1	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah..	1,000,000	1	167,500	Feb. 1, '13	.01		
Stratton's Ind.....	Colo..	1,000,000	5	5,023,658	Dec. 23, '06	0.12	Yellow Aster, g.....	Cal..	100,000	10	17,600	1,189,759	Aug. 1, '16	.02	
Sir'n's Ind. (new)g.	Colo..	1,000,000	30	691,250	Jan. 31, '16	.16	Yellow Pine.....	Cal..	1,000,000	1	760,000	1,643,008	Aug. 15, '16	.15	
Strom.....	Colo..	1,000,000	1	2,275,000	July 9, '05	.02	Yosemite Dredg.....	Cal..	24,000	10	102,583	July 15, '14	.10		

Corrected to September 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization			
					Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest	
							Date	Amt.								Date	Amt.
Ajuchitlan.....	Mex...	60,000	\$ 5	\$.....	\$237,600	July 1, '13	\$0.25	Las Cabrillas.....	Mex...	1,040	\$10	\$.....	\$591,406	June 3, '12	10.00		
Amistad y Concordia g s	Mex...	9,600	50		429,358	July 16, '08	1.28	La Roi No. 2, g.....	B. C...	120,000	25		1,527,320	Dec. 15, '15	\$0.24		
Amparo, s. g.....	Mex...	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.05	Lucky Tiger.....	Mex...	716,337	10	321,902	3,585,293	Aug. 20, '16	.08		
Bartolo de Medina Mill	Mex...	2,000	25		103,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont...	2,247,692	1	202,293	4,810,061	July 1, '16	.03		
Batopilas, s.	Mex...	446,268	20		55,870	Dec. 31, '07	.12%	Mexican, I. pf.....	Mex...	12,500	100	1,018,750	May 1, '16	3.60			
Beaver Con., s.	Ont...	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.....	Mex...	240,000	10		660,000	Mar. 10, '08	.25		
Boleo, g.	Mex...	120,000	20		721,871	May 8, '11	6.00	Mexico Mines of El Oro	Mex...	190,000	5		4,475,500	June 25, '14	.96		
British Columbia, c.....	B. C...	591,709	6		615,399	Jan. 5, '13	.15	Minas Pedrazzini.....	Mex...	1,000,000	1		497,500	Jan. 23, '11	.06%		
Buena Tierra.....	Mex...	330,000	6		160,330	Jan. 30, '15	.24	Mines Co. of Am.....	Mex...	900,000	10		4,958,600	July 25, '13	.12%		
Buffalo, Ont.....	Ont...	1,000,000	1		2,787,000	July 1, '14	.06	Mining Corp. of Canada	Can...	2,076,000	1	259,375	1,037,600	Mar. 30, '16	.12%		
Canadian Goldfields.....	Can...	600,000	0.10		237,099	July 15, '14	.01%	Montezuma, I. pf.....	Mex...	5,000	100		402,500	Nov. 15, '08	3.50		
Cananea Central, c.....	Mex...	600,000	10		360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex...	500,000	1		100,000	July 20, '09	.04		
Cariboo-Cobalt.....	Ont...	1,000,000	1		296,000	Sept. 1, '15	.09	Mother Lode.....	B. C...	1,250,000	1	137,500	137,500	Jan. 3, '16	.11		
Cariboo-McKinney, g.....	B. C...	1,250,000	1		56,250	Dec. 1, '09	.00%	Nalca, s. l.....	Mex...	100	300		3,190,000	Oct. 11, '09	\$283		
City of Cobalt.....	Ont...	600,000	1		138,375	May 15, '09	.01	N. Y. & Hond. Rosario.	C. A...	200,000	10	220,000	3,970,000	July 28, '16	.50		
Cobalt Central, s.....	Ont...	4,761,600	1		192,845	Aug. 29, '14	.02%	Nipissing, s.....	Ont...	1,300,000	6	900,000	14,340,000	July 20, '16	.25		
Cobalt Lake, s.....	Ont...	350,000	1		40,000	May 24, '11	.03%	North Star, s. l.....	B. C...	1,000,000	1	630,000	630,000	Feb. 1, '10	.02		
Cobalt Silver Queen.....	Ont...	1,600,000	1		316,000	Dec. 1, '08	.03	Palma, g.....	Mex...	3,000			99,600	Dec. 1, '12	.60		
Cobalt Townsite, s.....	Ont...	199,282	5		1,042,259	Aug. 20, '14	.24	Panuco, g.....	Mex...	10,000			7,465,000	Nov. 4, '09	6.00		
Conlagas, s.....	Ont...	800,000	5	400,000	8,240,000	Aug. 6, '16	.25	Pencoles, s. g.....	Mex...	120,000	20		6,451,687	Sept. 30, '13	1.25		
Con. Mg. & Sm., g. s. c.	B. C...	63,050	100	420,617	2,740,654	July 1, '16	2.60	Peregina, pf.....	Mex...	10,000	100		328,658	Sept. 1, '10	3.50		
Crown Reserve, s.....	Ont...	1,999,597	1		6,102,408	July 15, '16	.03	Peterson Lake.....	Ont...	2,401,820	1	84,064	340,287	July 1, '16	.01%		
Dolores.....	Mex...	400,000	5		1,374,865	July 24, '11	.22%	Pinguic, pf.....	Mex...	20,000	100		720,000	Apr. 15, '13	3.00		
Dome Mines, s.....	Ont...	400,000	10	400,000	890,000	June 1, '16	.50	Porcupine Crown.....	Ont...	2,000,000	1	180,000	600,000	July 2, '16	.03		
Dos Estrellas, (El Oro)	Mex...	300,000	0.60		15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.).....	MeX...	6,000	15		963,360	Apr. 1, '08	1.00		
El Favor.....	Mex...	3,600,000	1		210,000	Apr. 30, '14	.01	Rambler-Cariboo.....	B. C...	17,500	100	70,000	490,000	Aug. 15, '16	.01		
El Oro, g. s.....	Mex...	1,147,500	6		9,136,842	July 11, '13	.24	Rea Mines, Leasing.....	Ont...	200,000	1		12,750	Feb. 20, '15	.06%		
El Rayo, g. s.....	Mex...	268,070	2		140,410	Apr. 24, '11	.35	Right of Way.....	Ont...	1,685,600	1	16,855	660,514	June 15, '16	.00%		
El Triunfo, c.....	Ont...	2,000,000	1		20,000	Aug. 28, '11	.01	Rio Plata.....	Mex...	374,618	5		345,764	Feb. 1, '16	.05		
Esperanza, s. g.....	Mex...	600,000	6		12,520,250	Dec. 31, '11	.02%	San Francisco Mill.....	Mex...	2,000	25		445,098	Oct. 15, '08	1.00		
Granby Con., s.	B. C...	149,985	100		6,850,111	Aug. 1, '16	2.00	San Rafael.....	Mex...	2,000	25		6,798,260	Jan. 11, '12	.20		
Greene-Cananea, c.....	Mex...	474,411	100	2,431,405	6,666,850	Aug. 28, '16	2.00	San Toy, s.....	Mex...	6,000,000	1.00		540,000	July 24, '13	.01		
Greene Con., c.....	Mex...	1,000,000	10	2,500,000	12,544,000	July 25, '16	1.00	Santa Gertrudis, Hdgo.....	Mex...	1,500,000	5	364,500	2,519,772	June 16, '16	.24		
Greene Gold-Silver, pf.	Mex...	300,000	10		194,871	Mar. 28, '07	.40	Sta. Gert'y Guadalupe, g. s.	Mex...	60,000			3,960,000	Mar. 27, '09	2.00		
Guanaajuato Con.....	Mex...	540,000	5		600,000	Oct. 8, '06	.07%	Sta. Maria del Paz.....	Mex...	9,900	12%		6,006,000	Jan. 2, '13	1.50		
Guanaajuato Dev., pf.....	Mex...	10,000	100		274,356	Jan. 1, '11	3.00	Seneca-Superior.....	Ont...	478,841	1	622,649	1,543,761	Aug. 15, '16	.30		
Quangnholm Explorat.....	Mex...	833,732	25	10,713,456	34,082,760	Apr. 3, '16	11.85	Soleidad, s. l.....	Mex...	960	20		4,439,840	Oct. 17, '11	.80		
Haleybury, s.....	Ont...	60,000	1		60,000	Apr. 6, '11	.60	Sorpresa, g. s.....	Mex...	19,200	20		3,979,240	Jan. 5, '11	34.00		
Hedley.....	B. C...	120,000	10	120,000	1,943,520	June 30, '16	.60	Standard, s. l.....	B. C...	2,000,000	1	400,000	2,200,000	Aug. 10, '16	.02%		
Hinds Con., g. s. l.....	Ont...	5,000,000	1		85,000	Feb. 27, '08	.05	Temiscamg' & Hud. Bay	Ont...	7,761	1		1,940,250	Nov. 10, '14	.03		
Illiger.....	Ont...	240,000	100	1,160,000	5,370,000	Aug. 14, '16	.05	Temiskaming, s.....	Ont...	2,500,000	1	75,000	1,834,156	July 22, '16	.03		
Jimulco, c.....	Mex...	10,000	100		375,000	Dec. 31, '13	1.00	Terzulan, c.....	Mex...	100	100		1,965,000	Jan. 1, '09	1.50		
Kerr Lake, s.....	Ont...	600,000	5	300,000	5,420,000	Jun. 18, '16	.25	Tough-Oak.....	Ont...	631,600	6	199,311	265,750	July 3, '16	.12%		
La Blanca.....	Mex...	140,000	20		2,775,700	Mar. 27, '11	.03	Tretheway, s.....	Ont...	1,000,000	1		1,061,988	July 15, '16	.06		
La Republica, s.....	Mex...	400,000	6		110,000	Aug. 15, '11	.06	Wettlaufer-Lorrain, s.....	Ont...	1,476,590	1		656,386	Oct. 20, '13	.05		
La Rose Con., s.....	Ont...	1,498,627	5	224,793	5,611,913	July 20, '16	.06	Yukon, c.....	Y. T...	3,600,000	5	625,000	8,108,110	June 30, '16	.07%		

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Surface Tension of Oil-Water Emulsions—A Flotation Theory

GEORGE BELCHIC* and ROY O. NEAL.**

Many theories to explain the process of oil flotation have been advanced by various investigators with a view of bringing flotation from an empirical to a more scientific process. The fact that the flotation process is adaptable to most sulphide ores has made this process of paramount importance in ore dressing. Although successful flotation has been accomplished without the use of oil, as in the Delprat process, today, with but few exceptions oil is used.

The part played by the oil in producing successful flotation has held the attention of many investigators for a long time, because, if it were possible to definitely point to a specific value of the oil in the flotation process, much labor and time could be saved in the successful treatment of a particular ore by flotation.

Confining ourselves directly to oil flotation, we find in the literature on this subject that various investi-

gators believe that the following explains the value of oil in flotation:

T. A. Rickard: "The addition of oil lowers the surface tension and imparts a decided viscosity to the surface of water."

C. T. Durell: "That oil not only toughens the air bubbles, but exerts a cohesive force on the oil-coated metallic particles."

O. C. Ralston: "That the addition of oil to water decreases the surface tension of water."

T. M. Bains, Jr.: "From an electric standpoint, oil will insulate the air bubbles and prevent the dissipation of its charge."

George Huston: "Oil is needed to form a surface film, so necessary for the preservation of the air bubbles."

The above shows that in general, investigators have not reached similar conclusions with regard to the part played by oil in flotation.

In order to bear out the assumptions made by various investigators that oil reduces the surface tension of water, and thus allows the air bubbles to exist when they reach the surface of the water in the flota-

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Table I—Surface Tension Measurements—Capillary Method 22° C.

PRODUCT	Surface Tension of Product Alone	Surface tension of 2000 grams of neutral water plus oil.				Surface tension of 2000 grams of water made acid with 2 grams of sulphuric acid plus oil.				Surface tension of 2000 grams of water made alkaline with 2 grams of sodium hydroxide plus oil.			
		Grams of Oil:				Grams of Oil:				Grams of Oil:			
		1	2	3	5	1	2	3	5	1	2	3	5
Neutral Water.....	89.0												
Acid Water..... (2000 grams H ₂ O + 2 grams H ₂ SO ₄)	60.0												
Alkaline Water..... (2000 grams H ₂ O + 2 grams NaOH)	88.0												
Pine Oil No. 5.....	23.3	52.8	45.7	59.4	52.8	55.8	52.8	52.3	47.0	62.7	55.0	49.2	3.91
Cresol.....	44.5	74.5	68.2	66.0	61.6	65.8	63.8	63.8	63.8	88.0	85.8	76.6	68.2
Linseed Oil.....	34.5	60.7	54.1	57.2	50.6	62.0	59.4	54.5	49.2	49.2	44.8	42.2	39.6
Olive Oil.....	35.2	56.3	54.1	50.6	52.8	58.0	59.9	63.8	64.6	48.4	58.5	60.7	62.4
Wood Creosote Oil No. 17.....	37.6	58.5	57.2	55.4	53.6	53.2	52.8	52.8	52.8	51.9	66.0	63.8	59.4
Paraffin Oil.....	30.1	73.9	73.4	71.7	69.5	66.0	68.2	68.2	61.6	74.8	79.2	81.4	81.8
Sunflower Oil.....	29.5	63.8	59.4	50.6	48.4	59.4	57.2	57.2	57.2	61.6	57.2	52.8	50.6
Castor Oil.....	53.5	66.0	62.4	58.2	59.4	55.0	55.8	55.4	55.4	53.9	54.0	48.4	47.3
Hemlock Oil.....	30.0	61.6	63.8	66.0	61.6	66.0	63.8	61.6	61.6	74.8	70.4	66.0	66.4
Wood Distillate.....	30.1	61.6	59.4	52.8	50.6	61.6	55.0	52.8	48.4	83.6	66.0	63.8	61.6
Cottonseed Oil.....	29.5	70.4	68.2	66.0	63.8	63.2	61.6	59.4	57.2	61.6	60.7	59.4	52.8
Oleic Acid.....	23.7	74.8	61.6	55.0	48.4	48.2	46.6	46.2	44.8	41.8	42.6	42.2	35.2

tion machine, the authors undertook to measure a series of surface tensions of mixtures of oil in water.

In this investigation the flotation machine used was of the Minerals Separation type, consisting of an agitating and floating cell, with a propeller and blades to mix the pulp and beat air into it.

The capacity of the agitating cell of this machine was 2000 grams of water and 400 grams of ore, making a dilution of 5:1. In making the surface tension measurements, 2000 grams of water and 1, 2, 3, and 5 grams of oil were used. Of course, no ore was added in these tests. The oil and water were agitated for 7

4. Neutral water with 1, 2, 3, and 5 grams of a series of oils.

5. Alkaline water with 1, 2, 3, and 5 grams of the same series of oils.

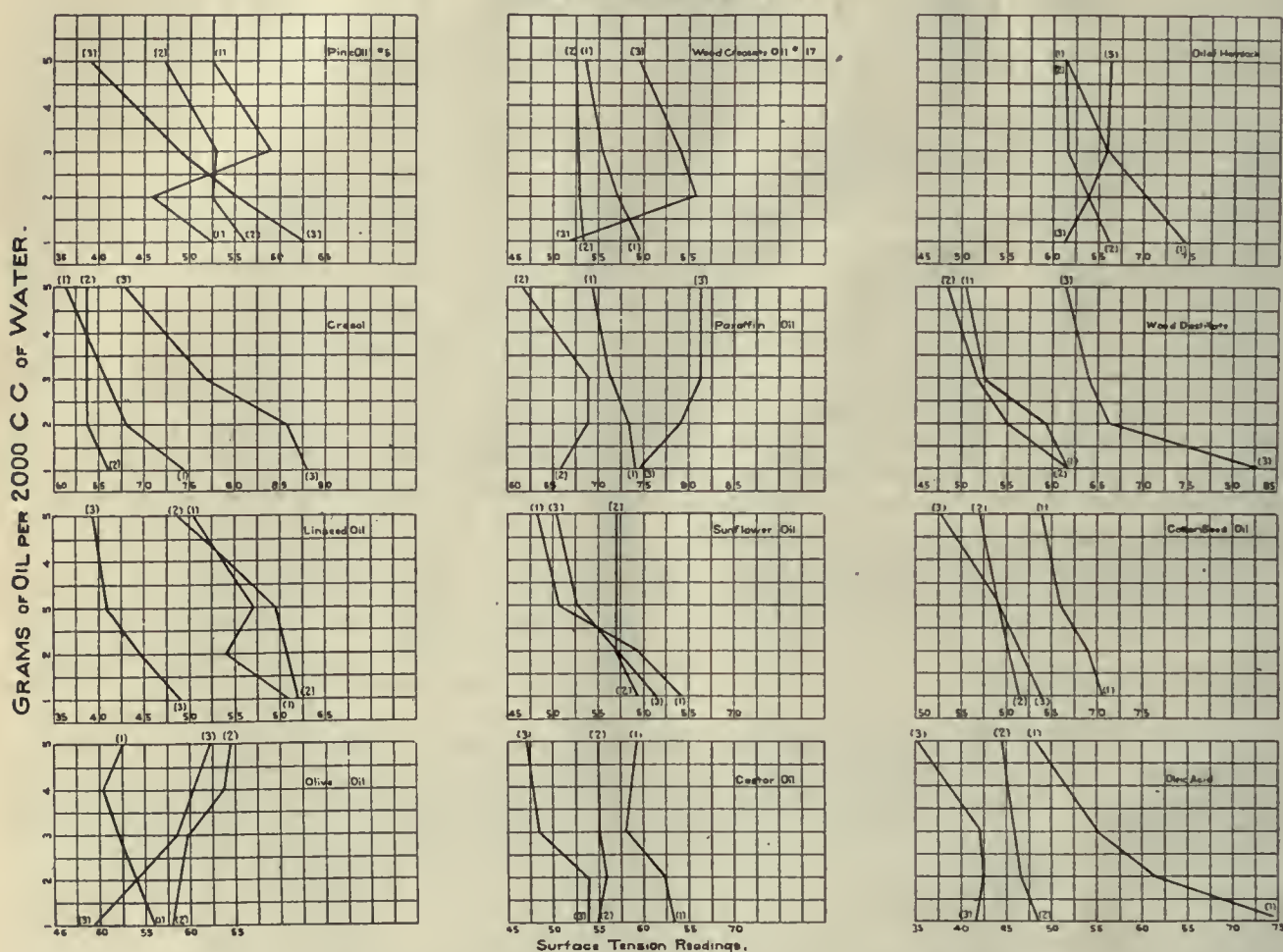
6. Acid water with similar quantities of the same series of oils.

The surface tension measurements are shown in table I and table of curves.

Discussion of the Results.

The discussion of the results is taken up under the following headings:

Curves of Surface Tension Measurements.



NOTES.—(1) Water neutral. (2) Water acid: 2 grams H_2SO_4 per 2000 c.c. H_2O . (3) Water alkaline: 2 grams $NaOH$ per 2000 c.c. H_2O .

Surface tension by the Capillary Method at 22° C. (71.6° F.). Surface tension at 22° C. water—89; water + H_2SO_4 —60; water + $NaOH$ —88.

minutes, a sample of the mixture, or oil-water emulsion, was removed and immediately its surface tension ascertained by the capillary method. Since acid and alkali are now commonly used with oil in flotation, a series of surface tension measurements were made with the addition of acid and alkali.

The following surface tension measurements were therefore ascertained:

1. Neutral water alone.
2. Alkali water alone.
3. Acid water alone.

1. Surface tension measurements when neutral water is used.

2. Surface tension measurements when acid water is used.

3. Surface tension measurements when alkaline water is used.

It is important to note first that the addition of sodium hydroxide to water hardly makes any perceptible difference in the surface tension. The surface tension of neutral water, as shown in the table, is 89, while that of water and sodium hydroxide is 88.

This would then indicate that a small addition of sodium hydroxide (2 lbs. of sodium hydroxide to a ton of water), has no effect upon the surface tension of water.

The addition of sulphuric acid (2 lbs. to a ton of water), decreases the surface tension of water from 89 to 60.

Surface Tension Measurements When Neutral Water is Used.

In looking over the surface tension measurements when neutral water is used, it is seen that all of the oils reduce the surface tension of the water. However, there is no relation between the amount of reduction in the surface tension of water and the surface tension of the oil. For example, pine oil No. 5 and oleic acid have surface tensions of 23.3 and 23.7 respectively, yet 1 gram of pine oil reduces the surface tension of water from 89 to 52, while 1 gram of oleic acid reduces the surface tension of water from 89 to 74.

Cresol has a surface tension of 44.5 and castor oil 43.5; equal quantities of the two oils produce different reduction in the surface tension of water. If successful flotation depended upon a particular surface tension reading of an oil-water emulsion, it is seen from the table that it would require 3 grams of cresol to the 1 gram of castor oil to produce a surface tension reading of 66. Furthermore, if the above assumption would hold, then many oils would be precluded from the list of successful flotation oils. In other words, if only 4 lbs. of castor oil to the ton of ore is necessary to produce successful flotation, by reason of establishing the necessary surface tension measurement, of the oil-water emulsion, then it would require about 12 lbs. of cresol oil to produce equal results.

Another interesting comparison is that of paraffin, hemlock and wood-distillate oils, having surface tensions of 30.1, 30 and 30.1 respectively. The addition of 1 gram of these oils to water reduces the surface tension of water from 89 to 73.92, 89 to 61.6, and 89 to 61.6 respectively.

Surface Tension Measurements When Acid Water is Used.

The surface tension of acid water, as shown in the table, is 60. The effect of adding oils to acid water is either to increase or decrease the surface tension. With the addition of larger amounts of the same oil, the surface tension is decreased, with but one exception, olive oil.

Surface Tension Measurements When Alkaline Water is Used.

While the oils in this series of measurements do not show a surface tension increase above that of alkaline water alone, it is, however, significant to note that a number of them increase the surface tension with the increase in the added amounts of the oil. For example, olive, wood creosote No. 17, and paraffin oils

show higher surface tension readings when 5 grams of the respective oils are added to the alkaline water than the readings shown by the addition of only 1 gram of the respective oils.

Summary.

The conclusion drawn from the table of results indicates that large quantities of oil added to water (acid, alkaline and neutral) do not necessarily produce a marked reduction in the surface tension of water. In some cases, as with acid water, the surface tension is even increased above that of acid water alone; and with alkaline water, large quantities of some oils increase rather than decrease the surface tension.

What is then the value of oil in flotation? In closely observing the action of the various oils when agitated with water, it was found that each oil formed a somewhat different foam. That is to say, that the foaming power of one oil differs from another. While nearly all oils produce a foam with alkaline water, many of them do not with acid or neutral waters. The amount of air included in the foam varied likewise, so that the ability to produce a persistent bubble foam appeared to be independent of the surface tension. For example, while pine oil No. 5 foamed more copiously with alkaline than with neutral and acid waters, yet the surface tension reading is higher in the former case, when 1 and 2 grams of oil are added.

The writers are of the opinion, therefore, that the foaming power of an oil should be closely studied, rather than the effect of the oil upon the surface tension of water. The mere fact that an oil has the property of causing a reduction of the surface tension of water when added to it in either large or small quantities, does not qualify it as a good flotation oil.

Finally, surface tension alone cannot any more be regarded as a theory to explain the process of oil flotation than can the electrical theory, or any other theory; but by combining all the possible phases relating to oil flotation a good working theory may be eventually brought forth.

The experiments were made in the laboratories of the Division of State Chemical Research, University of Kansas, Lawrence.

British Imports of Manganese Ore.—British imports of manganese ore in July were 33,817 gross tons, against 50,826 tons in June. The total imports to August 1 were 259,309 tons, against 154,158 tons to August 1, 1915. The monthly import rate to August 1, this year, has been 37,044 tons, against 22,022 tons per month in the same period in 1915. The 1913 and 1914 rates were 39,953 tons and 50,098 tons respectively per month.

In the exploitation of new ground, the elevation of ore bodies in contiguous territory is a basis upon which to determine the depth to carry on prospect work.

A New Flotation Oil from Sage Brush.

MAXWELL ADAMS.*

Considerable interest has recently been developed in sage-brush oil because of its possible utilization as a flotation agent in the mining industry. A list of some of its physical properties, together with the method used in its extraction, may prove of interest at this time.

Something over a year ago, a study of the essential oils in desert plants was begun in the chemical laboratory of the University of Nevada. None of the oils so far studied possess properties of special interest to engineers, except the oil of sage, *Artemesia tridentate*, which has exceptional power as a flotation agent. This plant, known as common sage brush, also called black sage, is widely distributed over the semi-arid west, being found quite generally on most of the dry plains and mountains west of Missouri.

The method of extracting the oil followed in these experiments is very simple. The leaves, twigs and small branches are placed in an airtight drum, having a capacity of about 27 cu. ft. Steam is admitted through a number of small openings at the bottom of the retort, and the pressure maintained at 20 to 25 lbs. per sq. in. for 3 hours. The escape of the steam from the retort is regulated by allowing it to pass through a stop-cock into a condenser. The water in the receiver is drawn off from time to time and the oil, which is insoluble and floats upon the water, is thus collected. At the end of 2 hours most of the oil has been driven out, though traces continue to come over for a much longer time. By raising the pressure, the time required could probably be shortened and the yield increased, but the lack of laboratory equipment has prevented the carrying out of this experiment.

The stock wood, bark and branches contain no oil, the distribution of the oil being limited to the leaves and young shoots. There is a seasonal variation in the amount of oil contained. Samples collected on different dates gave the following amount of oil: May 1, 0.42%; May 27, 0.6%; June 30, 0.72%; Aug. 1, 0.9%; Sept. 10, 1%. The increase appears fairly constant from early spring, when the leaves first appear, until light frosts occur in the autumn. When the plant is air-dried there is some loss of oil, as the following data will show: Two 100-lb. samples were collected at the same time. One was distilled when green; the other was air dried for 10 days before distillation. The green sample yielded 275 grams, and the dried sample 248 grams of oil, showing a loss of about 10%.

A laboratory experiment can furnish little data useful in forming an estimate of the commercial cost of production. A man working for 6 hours, and using a pair of common pruning shears, collected twigs which yielded 1 lb. of oil. Since only a small percentage of the oil is lost if the brush is dried, the most

economical method of production would perhaps be to collect it in large quantities, by using a tractor engine and a drag, in some such way as land is cleared for farming. When the brush is dry, the leaves and young shoots are easily shaken from the limbs. Thus the amount of material to be distilled would be greatly diminished and the oil perhaps obtained at a cost and in quantity sufficient to make it available as a flotation oil, if not alone, possibly as an ingredient, to increase the flotative power of other oils.

The crude oil is dark in color. When redistilled with steam it is water-white at first, changing gradually to a straw-yellow color upon standing. It has the following physical properties: Density at 15° C., 0.9206. Refractive index at 20° C., 1.4732. Rotation at 20° C., -4.69. At 98° C., a light oil, with a very sharp and pungent odor, begins to distill, but only after the temperature is above 165° C. does rapid distillation take place. At 180° C., the oil turns dark and decomposition begins. At a pressure of 12 mms., and below 125° C., almost all the oil can be distilled.

The chemical properties of the oil are as yet undetermined. There are small quantities of alpha and beta pinene. The main part of the oil has a camphor-like odor and taste, but has failed to give the ordinary tests for ketones. The fraction boiling at 175 to 180° C. has some of the properties of ordinary cineol, but is acted upon by metallic sodium, which indicates that the chief ingredient is not cineol. The chemical composition, which has little interest in this connection, will be worked out later. The important question for the engineer is: Can the oil be produced in quantity and at a cost that will make it available for ore flotation?

Pig Iron Production for First Half of 1916.

The bulletin just issued by the American Iron and Steel Institute shows that the production of coke pig iron in the United States for the first half of 1916 amounted to 19,347,935 tons, compared with 17,473,500 tons in the second half of 1915. Including the production of charcoal pig iron, which amounted to 191,996 tons, and anthracite and mixed anthracite and coke pig iron, which amounted to 79,591, the total production of all kinds of pig iron for the first half of 1916 amounted to 19,610,522 tons. This pig iron as to grades consisted of 8,830,085 tons of basic, 6,839,177 tons of bessemer and low phosphorus, 3,086,410 tons of foundry grades, 460,839 tons of malleable, 169,306 tons of forge, 189,046 tons spiegeleisen and ferro-manganese and 44,659 tons of other grades.

By a special process of annealing, toughness and malleability may be developed to a remarkable degree in white cast iron. In this way castings are made to answer for forgings in many cases.

*Arizona Meeting, A. I. M. E.

Mining Operations in Bingham Camp, Utah

W. A. SCOTT.

The group of mining properties operated in Bingham canyon, Utah, by the United States Smelting Co. comprises the Galena, Telegraph, Niagara, Last Chance and others. Operations are carried on without hoisting ore and without pumping water. A main haulage and drainage level was driven 6,000 ft. from the canyon to the Galena workings, connecting with Galena shaft at a depth of 730 feet. Branches were driven from this main level to connect with other centers of operation. One branch, 2000 ft. long, was extended into Telegraph ground; another branch of 1000 ft. taps the Niagara; a 2500-ft. drift northwesterly runs on the contact of limestone and quartzite, and another 700-ft. drift is being extended along the line of Last Chance vein.

This main level, and more than 4000 ft. of branches, are equipped with tracks of 30-lb. rails, laid upon heavy ties. Ore cars of 8 tons' capacity, 2-ton cars for waste, and timber trucks, are drawn by pneumatic locomotives, which are supplied with air by high-power compressors. The compressed air is conducted into the tunnels through a special pipe line, which connects with charging stations, where air at 1100-lbs. pressure may be transferred to the locomotives.

There is one station near the tunnel entrance; the next station is 1000 ft. in, and the third being 4500 ft. from the portal. The air is let into the locomotive engines through reducing valves, whereby the pressure is reduced to 250 lbs.

In ordinary use in this system of haulage, the locomotive, on being charged at the entrance, runs in 4000 ft., where it is again charged for a run to the farthest ore chutes and return.

The compressor plant for supplying air to locomotives is situated near the tunnel entrance. A small locomotive of this type is operated on the 400-ft. level from Galena shaft, for moving ore to a chute that connects with the main haulage level.

All ore being mined is taken from stopes above the main tunnel, and is hauled out through that channel. Some waste is being hoisted to the surface through the Galena shaft; but future plans contemplate the disposal of all waste in the old stopes.

Ore being shipped from this group to the smelters and concentrator at present amounts to 450 to 500 tons per day. In some of the stopes is mostly a copper sulphide, while that found in other stopes is practically all lead sulphide. All ore contains some gold and silver and a small percentage of zinc. About two-thirds of the lead ore is of milling grade. Treatment at the company's mill at Midvale results in three products—lead, iron and zinc concentrates. In the wet concentrating mill a zinc middling is obtained which is further concentrated by an electrostatic process. The lead ore of smelting grade is sent to the company's

own smelters at Midvale; the copper ore to the American Smelting & Refining Co.'s smelter at Garfield.

Utah-Apex Property.

The Utah-Apex mine and mill, on Carr fork, are operated under directions of Wm. L. Creden, managing director, and V. S. Rood, general superintendent. The main transportation level, starting close to the bed of the canyon, runs 3000 ft. to the shaft, and has been extended 2000 ft. beyond that point. This interior shaft has been sunk 500 ft. below the tunnel level, and is being raised from that level to the surface, 1000 ft. This raise is now 300 ft., operations being conducted by means of an air hoist at that point, which is the 700 level, measured from the surface. A new double-drum electric hoist, to be operated by a 500-hp. motor, is being set in position at the surface, to be put in service as soon as the rising shaft is completed. This will open a continuous shaft to a depth of 1500 ft., or to a point 500 ft. below the haulage level.

A section of the mine above the 700-ft. level was formerly operated through an old inclined shaft, which will be abandoned as soon as the new shaft and equipment are completed. The water that accumulates below the haulage tunnel is raised to that level by a pump stationed at the bottom of the shaft. The raising of this shaft and the installation of hoist and accessory equipment involves the expenditure of close to \$100,000. Within the last three years two air-compressors have been installed at the tunnel entrance. These are Ingersoll-Rand, electric driven, belt connected.

The company is mining 400 tons of smelting ore and 200 tons of milling ore per day. The smelting ore carries 13 to 16% lead, 12% zinc, and 4 to 5 ozs. silver. This is a sulphide and is shipped to the plant of U. S. Smelting Co. The mill ore, which is quite silicious, runs 9 to 10% lead, 3 ozs. silver and about 1% zinc. The concentration of 3½ tons into 1 results in the elimination of most of the silica by jigs and tables. The jig product and coarse table concentrate amounts to 60% of the recovery. The jig tailings are reground and passed to classifiers, the spigot material going to the tables and the overflow to Janney flotation machines, these being preceded by two emulsifiers. There are 12 Janney cells, the first nine being roughers, the last three being cleaners. The capacity of the mill is to be increased from 200 to 300 tons per day by Jan. 1.

Highland Boy Property.

The Highland Boy mine, situated farther up Carr fork, is producing 1250 tons of ore per day, all of which is transported to the plant of International

Smelting Co., over the Highland Boy's 4-mile aerial tramway, which has a carrying capacity of 100 tons per hour. The ore is of two classes, which are mined and transported separately, consisting of 1050 tons of copper and 200 tons of lead ore per day. The copper ore runs about 2%, the lead ore running about 16%, with 4 ozs. silver. The entire mine output is hauled out through the main tunnel level to the tramway terminal.

At a point on the tunnel, 900 ft. from the entrance, is an incline shaft, at 45°, which goes to a vertical depth of 600 ft. This is a 3-compartment incline; 4-ton skips are being operated in two of them, by which the ore is raised to the tunnel level and dumped into shipping pockets. The waste is disposed of by filling in the worked-out stopes. The water in lower levels is pumped to the tunnel level by two Prescott station pumps, set at the base of the incline. These are electric driven, and handle 250 gals. per minute. The Highland Boy belongs to Utah Con. Mining Co., Fred Cowans, Salt Lake, being general manager; A. S. Winther is superintendent.

The Utah Metal.

The Utah Metal & Tunnel Co., C. H. Doolittle, general manager, controls Bingham & Newhaven mine and mill, the Utah metal mine and other contiguous properties. Included, is the Utah metal tunnel, 12,000 ft. long, extending from a point on Carr fork, below Bingham & Newhaven, through the mountain range to Middle canyon, on the Tooele side. Good bodies of ore were opened on the course of this tunnel, near the Carr fork end, shipments of which are being made direct to the smelter by railway. Bingham & Newhaven ore and concentrates are shipped to International smelter over the Highland Boy's aerial tramway, same being let down through chutes to loading bins on the Highland Boy haulage level.

A source of revenue to Utah Metal & Tunnel Co. is from a supply of water piped from Middle canyon through the long tunnel and sold to Utah Copper Co. for steam shovel, boiler and domestic use along Bingham canyon.

About 225 tons per day of Bingham & New Haven ore is concentrated in its mill, making 90 tons of concentrates that run about 12% lead, 3.87 ozs. silver, 27% iron, 0.8 to 1% copper and 0.23 oz. gold. Besides this, about 100 tons of ore per day are shipped direct to the smelter.

The mill is equipped with crusher, rolls, trommels, jigs, classifiers, tube mill, tables and slimers, making several grades of jig, table and vanner products. As an auxiliary to this mill, a flotation plant is being constructed in a separate building, to retreat the slimes from the gravity concentrating mill. The plan is to pass the slimes through Dorr classifiers and thickeners, after which it will pass to Pachuca mixers, where the oils will be introduced before being treated by flotation machines, which consist of Callow cells—four

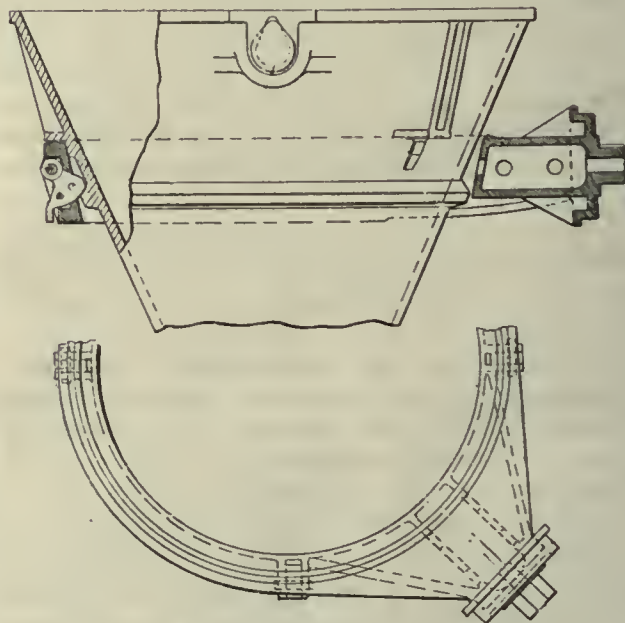
roughers and one cleaner. The new plant is expected to be ready for operation late in September. G. E. Adams, mill superintendent, has the work well in hand, and expects to make the flotation plant a profitable adjunct.

Bingham Coalation.

Bingham Coalation Mines Co., controlling the Redwing, Butler-Liberal and Massasoit properties in Markham gulch, is under the management of A. T. Hastings, Bingham, who has a number of short-term leases in force, some shipments from which are being made. The company is developing on the several fissures of the group, and expects to sink a new shaft on the Butler-Liberal.

Dump Car Ladle Easily Loaded.

The ladle or tank of a dump car, when loaded with molten metal or slag, weighs about 20 tons. Also, it is terrifically hot. To swing this ladle by a crane, from the furnace, and set it in the dump car yoke is difficult, if the yoke is so arranged that any delicate adjustment is necessary to get the ladle in place. The yoke arrangement shown in the illustration permits the trick to be turned easily and quickly. The ladle is



DUMP CAR LADLE EASILY LOADED.

conical and sets into the ring-shaped yoke, lowering easily into place without any see-sawing. Ribs in the ladle are then engaged by the simple locking device shown at the left. At the dump, the ring itself is tipped on the trunnions. Carl P. Astrum of East Orange, N. J., is the inventor, his patent being assigned to the M. H. Treadwell Co., of New York.

The strength of current employed in American electrolytic copper refineries is from 12 to 15 amperes per square foot of cathode surface.

Mining and Prospecting in National Forests

CHARLES S. BROTHERS.*

Broadly speaking, the rules relating to prospecting for mineral and the location, entry and patenting of mining claims within the National Forests are the same as those relating to the public domain. The law (Act of June 4, 1897), which defines the purposes of the National Forests and provides for their administration, states that "it is not the purpose or intent of these provisions or of the Act providing for such reservations, to authorize the inclusion therein of lands more valuable for the mineral therein, or for agricultural purposes, than for forest purposes." And, "any mineral lands in any forest reservation which have been or which may be shown to be such, and subject to entry under the existing mining laws of the United States and the rules and regulations applying thereto, shall continue to be subject to such location and entry notwithstanding any provisions herein contained."

The Government's Intention.

Also the following provisions of law are in the interest of the miner and settler:

"The Secretary of the Interior (now the Secretary of Agriculture according to a later law) may permit, under regulations prescribed by him, the use of timber and stone found upon such reservations, free of charge, by bona fide settlers, miners, residents, and prospectors for mineral, for firewood, fencing, buildings, mining, prospecting, and other domestic purposes, as may be needed by such persons for such purposes; such timber to be used within the state or territory, respectively, where such reservations may be located."

"All water on such reservations may be used for domestic, mining, milling, or irrigation purposes, under the laws of the state wherein such forest reservations are situated, or under the laws of the United States and the rules and regulations established hereunder."

"Nothing herein shall be construed as prohibiting the egress or ingress of actual settlers residing within the boundaries of such reservations, or from crossing the same to and from their property or homes; and such wagon roads and other improvements may be constructed thereon as may be necessary to reach their homes and to utilize their property under such rules and regulations for all proper and lawful purposes, including that of prospecting, locating and developing for mineral resources thereof; *Provided*, That such persons comply with the rules and regulations covering such forest reservations."

No comment on the law seems necessary; its purpose and intent are perfectly clear. Now, let us turn to the "rules and regulations" laid down by the Secretary of Agriculture and the Forester governing the field men actually in charge of the National Forests. The following are quotations from "The Use Book":

There is no restriction whatever on going on the National Forests for prospecting and locating mining claims. No permit is necessary.

The locator, or subsequent owner, of a mining claim has a right to the use of sufficient timber from his claim for development purposes. This includes the construction of such buildings as may be necessary as an adjunct to such development and the timber for shafts and tunnels, as well as for fuel in connection with such development. Timber, however, may not be cut from one claim to be used on another claim, even if it be of the same group, unless its use tends to develop the claim from which it is cut, as well as the one on which it is used, except under free-use permit.

Free use of timber may be granted to bona fide settlers, miners, residents, and prospectors for minerals, for firewood,

fencing, building, mining, prospecting, and other domestic purposes.

Supervisors may, with the approval of the district forester, designate as free-use areas, portions or all of any National Forest, and settlers, miners, residents and prospectors for minerals may cut and remove from such areas, free of charge and without permit, under such rules as may be prescribed by forest officers, any dead timber needed for their own use for firewood, fencing, buildings, mining, prospecting, and other domestic purposes. No timber may be taken under this regulation for sale to other persons or for commercial use.

Material may be cut outside of a free-use area without permit in cases of emergency or of immediate need. The person taking such material shall promptly notify the forest officer in charge of the district.

The administration of the National Forests is a duty imposed upon the Secretary of Agriculture by law. In order properly to discharge that duty, it is necessary that he ascertain the status of all lands within the National Forest. The examination of claims within National Forests by forest officers is therefore made primarily in furtherance of this object. The information thus obtained by the employees of this department is, as a matter of governmental economy, placed at the disposal of the Secretary of the Interior, upon whom rests the responsibility for determining the title to all lands within the National Forests.

A valid claim is one initiated in good faith under some act of Congress for the acquisition of title to public lands and continued by use consistent with the character of the claim and necessary for its actual development.

No claims can be initiated upon lands withdrawn for National Forest purposes, except under the mining laws, the coal-land laws, certain right-of-way laws, and under the act of June 11, 1915 (34 Stat., 233). Claims, however, within a National Forest, initiated prior to the withdrawal of the lands, or their inclusion therein, may be perfected and patents obtained by compliance with the law under which such claims were initiated.

Prospecting will not be interfered with and mineral locations will not be examined prior to application for mineral patent, except where a report is requested by the Department of the Interior or where locations interfere with the administration of the National Forest. No adverse report will be submitted to the Department of the Interior which has not been made by a mineral examiner. Prospecting may be carried on without obtaining a permit from forest officers.

Some Interesting Facts.

So much for the law and the rules and regulations. Congress, the Secretary of Agriculture and the Forester having done their part—let us see what can be shown in the way of performance on the part of the field men. In the very nature of things the showing cannot be complete since the great majority of prospectors and miners never come in contact with the forest officers except to pass the time of day or swap tobacco, but pursue the even tenor of their way undisturbed. However, the records of the Forest Service show some interesting facts in this connection. During the fiscal year ending June 30, 1915, 518 mining claims within National Forests passed to patent. Of these, 24 claims were in California. During the same time 17 claims in California were canceled by the Department of the Interior after hearings had been held and evidence presented on both sides.

The timber upon the 17 canceled claims amounted to 36,776,000 ft. board measure, whereas that upon the 24 patented claims was only 2,333,000 ft. Some of these canceled claims were not initiated by bona

*National Forest Inspector, Dist. 5, U. S. Forest Service.

fide miners or prospectors for mineral but by those who desired to secure title to the land for its timber. It is gratifying, however, that each year the number of attempts to use the mining laws to secure lands for purposes other than mining grows smaller. During the fiscal year 1915 favorable reports were made upon 17 mining claims in California and eight unfavorable reports were made. A large number of selections of land under the railroad and state school land grants have been protested. There were 59 of these protests pending at the end of the fiscal year, June 30, 1915, affecting lands in California. When these are finally disposed of such lands as are shown to be mineral in character will become available for prospecting and development under the mining laws.

During the fiscal year 1915, 40,015 free-use permits were issued to prospectors, miners, settlers and residents for 123,168,000 ft. board measure of timber, valued at \$206,464.13, according to sales prices for National Forest timber. Data is not readily available to show what part of this went to the prospector and miner, but it is safe to assume that he got a liberal share of it.

This much for law established by Congress, rules and regulations established by the Secretary and the Forester, and practice and performance on the part of the forest officers in the field. At the present time I know of no important difficulties existing between the Forest Service and bona fide miners or prospectors. I believe it is safe to say that everything of that kind has disappeared in California due to a better understanding on both sides.

Limits to the Miner's Rights.

While it is true that the United States is very liberal to the prospector and miner, it should not be overlooked that there are certain limits to existing laws and that the men in charge of the administration of the National Forests must observe these limits with the same good faith that they observe in carrying out the laws' most liberal provisions.

For instance, the right to cut timber for mining purposes extends only to the timber on the land embraced in the claim, or in claims of the same group when the workings in which the timber is used develop the claim from which taken. And a mining claimant can not lawfully cut or remove timber from his claim for sale or for purposes other than the development of the claim, except where a removal of the timber reasonably in advance of the mining work is necessary to the development of the claim.

The Department of the Interior and the courts have held that development work, for which timber may be cut on a claim, is restricted under the law to that work which directly facilitates the extraction of mineral from the ground. Therefore, timber for use in smelters, ore reduction works, etc., should ordinarily be purchased.

It is essential to the validity of a mining claim that

it shall be initiated upon the discovery of mineral for the purpose of developing a mine and not merely to secure title to the land for some purpose foreign to mining.

These limitations are not peculiar to National Forests but apply to all claims regardless of whether or not they are within a National Forest. Obviously, it is within the power of the claimants to aid greatly in the efficient performance of the public business by recognizing and observing these limits and by according to forest officers the same frankness and consideration which forest officers must show them.

Few Real Causes for Disputes.

Forest officers are not only custodians charged with the duty of protecting and conserving the forest resources but they are also agents of the people and must assist the public in making use of these resources. If there is just cause for complaint regarding the conduct of any forest officer, the matter should be taken up in writing either with the immediate superior of the officer complained against or with the Forester at Washington. In the interest of keeping "practice and performance" on the part of field officers up to the standard set by law and the rules and regulations, the service will welcome investigation of any unsatisfied complaint by officers or committees of any association or other organization of miners.

The purposes of the Forest Service and of the bona fide miner and prospector are not at variance in any particular and all differences will vanish in the light of mutual understanding and confidence. Let us always approach the subject in that spirit and with patience and frankness when apparent causes for differences arise.

Atmospheres Deficient in Oxygen.

Some recent tests or experiments by members of the Bureau of Mines may be summarized as follows:

Atmospheres that are deficient in oxygen begin to affect men when the percentage of oxygen is about as low as that affecting canaries and mice. Canaries are slightly more susceptible to "oxygen want" than are mice. In mixtures of air and nitrogen containing about 7.6 to 7.8% nitrogen canaries show pronounced distress. When the oxygen content is about 7% mice show considerable distress, and a man is in grave danger of dying; hence canaries and mice should not be used by exploring parties in mines to show when men unequipped with breathing helmets should retreat because the atmosphere is low in oxygen. Mice and canaries, especially the latter, are chiefly of value for indicating to exploring parties the presence of dangerous proportions of carbon monoxide. In an atmosphere in which oil-fed lamps will not burn an exploring party should not depend upon canaries for further guidance, but should use breathing apparatus in advancing into the atmosphere.

Semi-Annual Report of the American Smelting & Refining Co.

In reviewing the half year's operations of the American Smelting & Refining Co., President Daniel Guggenheim states that the profits of the company, during the period in question, make an abnormal comparison with the earnings of the same period in 1915.

During the first 6 months of last year, the prices of all metals were depressed, and the production of ores was correspondingly decreased.

But, during the past 6 months, the company has realized the reverse effect of the European war. Prices have been stimulated beyond any previous record, and this has inevitably resulted in a large increase of production.

On the other hand, the costs of operations have been very much higher during the past 6 months. Wages have been advanced and an 8-hour day introduced at all points. The cost of materials has been advanced 50%, and, in more than one instance, more than 100%. On this account, the profits per ton of ore smelted, or bullion refined, have been seriously reduced, due to the fact that the toll received from the mines and smelters has been fixed in long-time contracts, made when present costs were not believed possible.

The present favorable showing as to profits is due, partly, to a very large and abnormal increase in business, but, to a greater extent to the production of company mines and to new lines of business in which the company has interested itself, and which, it is hoped, will be increasingly profitable. A few years since, the business of the company was almost entirely the smelting of lead and silver ores, and the refining of the resulting bullion. This portion of the company's business has been far less profitable per ton of materials handled than during the same period of last year.

The company again records with regret the entire lack of earnings from the very valuable properties of the company in the Republic of Mexico.

Consolidated General Balance Sheet.

The following is the consolidated general balance sheet as of June 30, 1916, of the American Smelting & Refining Co., and American Smelters Securities Co.

ASSETS—	
Property Account:	Amount.
Cost of plants, properties of subsidiary companies and additions and improvements less depreciation and additions and improvements written off to profit and loss	\$142,047,705.49
Investment in Securities and Other Companies	558,412.63
Metal Stocks:	
Ore, bullion and factory product on hand and in transit	\$75,583,421.02
Less:	
Approximate value of metals purchased and on hand, payment of which is to be made in refined metals and not in cash	\$45,026,796.84
Unearned treatment charges	7,713,030.11
Total	\$52,739,886.95

Remainder	22,849,534.07
Working Assets:	
Materials and supplies	\$ 3,735,159.47
Prepaid taxes and insurance and suspended debtor accounts	325,871.16
Total working assets	4,061,030.63
Current Assets:	
Cash on hand and in transit	\$19,358,096.88
Loans secured by Stock Exchange collateral and bankers' acceptances	4,425,704.29
Loans secured by copper in process of refining	379,090.78
Advances to affiliated companies ..	403,825.21
Accounts and notes receivable	11,404,450.93
Total current assets	35,971,168.09
Cash, Securities and Accrued Interest in Funds:	
Sinking fund, American Smelters Securities Co. 6% 15-year debenture bonds:	
Cash with trustee	\$ 1,461,164.43
Accrued interest	69,075.00
Pension fund	620,419.84
Total in funds	2,150,659.27
Unextinguished discount on bonds ..	479,166.66
Grand total	\$208,117,676.84
LIABILITIES:	
Preferred capital stock outstanding:	Amount.
American Smelting & Refining Co.	\$50,000,000.00
American Smelters Securities Co., Series "A"	\$17,000,000.00
Less amount deposited with trustee for redemption under stock retirement agreement	350,200.00
Series "B"	16,649,800.00
Total preferred capital stock outstanding	\$96,649,800.00
Common capital stock outstanding:	
American Smelting & Refining Co.	50,108,000.00
Debtenture bonds outstanding:	
American Smelters Securities Co., Issue maturing Feb. 1, 1926	\$15,000,000.00
Less:	
Par value held by trustee in sinking fund	2,763,000.00
Remainder	12,237,000.00
Current Liabilities:	
Accounts, drafts and wages payable	\$15,510,866.74
Deferred payments on mining properties	21,260.00
Interest on debenture bonds:	
Unclaimed	44,325.00
Accrued not due	375,000.00
Dividends:	
Unclaimed	61,615.67
Payable after close of period ..	2,117,146.25
Accrued taxes not due	466,870.45
Total current liabilities	18,597,074.11
Reserve and Suspended Creditor Accounts:	
Reserve for enlargement and extension	\$ 1,900,409.83
Employees' benefit pension reserve ..	615,109.67
Fire insurance reserve	384,089.72
Safety and welfare	244,618.24
Miscellaneous	1,177,277.01
Total reserve and suspended creditor accounts	4,322,404.47
Profit and loss surplus	26,203,398.26
Grand total	\$208,117,676.84

The net income for the 6 months' period, applicable to the payment of dividends, amounted to \$11,145,693.89, or an increase over the same period of last year of \$6,125,711.87.

The last two quarterly dividends on the common stock were declared at the regular rate of 4% per annum, and 2% per annum extra.

After the payment of regular dividends on the preferred stocks, and at the rate of 6 per cent on the common stock, there was carried to the credit of surplus \$6,642,959.89.

During the past 6 months, the company has purchased new properties, and largely extended the capac-

ity of old works, at a cost of \$3,623,786.02. It is expected that at least an equal amount will be expended during the balance of the year for similar purposes.

Of this amount, there was charged to depreciation and ore depletion \$1,019,489.33, and to the reserve created out of the earnings of 1915 for enlargement and extension \$1,999,590.17. The balance, amounting to \$604,706.52, was added to the property account. The very large increase in the production of all character of ores has required an equal increase in smelting and refining capacity. How well this has been accomplished is evidenced by the fact that, although the daily product of the company, both in amount and in value, is much greater than at the beginning of the year, the total value of ores and furnace products on hand has decreased more than three-quarters of a million dollars. The inventory was taken at the same conservative unit values as in the past.

With the decrease in the stock of raw material there has been an increase of cash and demand loans of over \$5,000,000.

Income and Profit and Loss.

The following is a summary of the consolidated income and profit and loss.

	6 Mos. ended June 30, 1916.	6 Mos. ended June 30, 1915.
Net earnings of smelting and refining plants and industries immediately dependent thereon	\$10,132,100.73	\$5,234,925.47
Net earnings from mining properties	1,635,283.65	767,469.09
Total net earnings of operating properties	\$11,767,384.38	\$6,002,394.56
Other income—Net:		
Interest, rent, dividends received, commissions, etc.	1,461,674.25	754,958.68
Gross income	\$13,229,058.63	\$6,757,353.24
Charges against gross income:		
Administrative expenses	\$ 452,379.83	\$ 449,105.75
Research and examination expenses	106,484.37	23,492.23
Corporate taxes (including accrued income tax)	111,023.71	71,480.03
Interest on debenture bonds outstanding with public	368,987.50	388,680.61
Amortization of discount on bonds	25,000.00	25,000.00
Depreciation	889,972.15	779,612.60
Depletion of ore reserves	129,517.18	
Total charges	\$ 2,083,364.74	\$1,737,371.22
Net income for six months	\$11,145,693.89	\$5,019,982.02
Profit and loss surplus at the beginning of year	19,560,438.37	19,510,057.77
Profit and loss gross surplus	\$30,706,132.26	\$24,530,039.79
Less Dividends:		
On preferred stocks:		
American Smelting & Refining	\$ 1,750,000.00	\$1,750,000.00
American Smelters Securities Preferred "A"	499,494.00	504,900.00
American Smelters Securities Preferred "B"	750,000.00	750,000.00
Total preferred stock	\$ 2,999,494.00	\$3,004,900.00
On American Smelting & Refining, common stock	1,503,240.00	1,000,000.00
Total dividends	\$ 4,502,734.00	\$4,004,900.00
Profit and loss surplus	\$26,203,398.26	\$20,525,139.79

New Concentrator for the Beeson Tungsten Property, Nevada.

H. M. Byllesby & Co., Chicago, who purchased the Beeson tungsten property, at Ragged Top, 22 miles southwest of Lovelock, Nev., have let a contract to Stearns-Rogers Manufacturing Co., Denver, for constructing a concentrating mill at Toulon siding, on S. P. Co. railroad, to treat the scheelite ore, now being

mined and hauled to Toulon. The plant is designed for 65 tons capacity, and will be operated by electric power. This is to be the first unit. Two caterpillar tractors and several teams are being used for hauling ore, the distance being 20 miles.

The ore occurs as a deposit in garnetized lime, at a contact of limestone and granite. Initiatory operations are carried on by open cuts and glory-hole methods. The accompanying illustration shows a cut and glory-hole, following a blast which broke 250 tons of ore. In addition to this, a vertical shaft is being sunk, and two tunnel levels are being driven in ore. The



GLORY HOLE ON RAGGED TOP TUNGSTEN MINE.

ore runs over 2% tungsten, and the plan is to concentrate to a shipping, marketable product. The mill is to be ready to operate in 90 days. The operations and instruction are under direction of Forbes Rickard, Denver, general manager and consulting engineer. Hubert C. Charles, local manager, is in charge of the Lovelock office.

The Ozokerite Field in Central Utah

HEATH M. ROBINSON.*

The largest district in the United States in which ozokerite has been mined and prospected is an area in central Utah a little more than 12 miles long and from 1 to 4 miles wide. The map shows the location of this field.

The main line of the Denver & Rio Grande railroad borders the field on the southwest, which is only from 1 to 4 miles wide, all the mines and prospects are within short distances of railroad facilities. Wagon roads have been built from many of the mines and prospects to shipping points on the railroad. As the mines have not been continuously worked, many of these roads have been little used and were found to be in poor condition at the time the field was examined.

Composition and Properties.

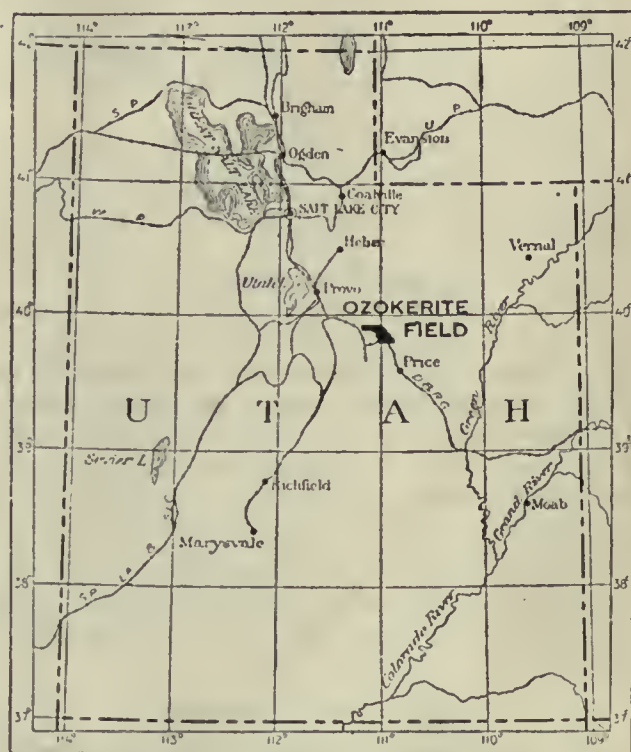
Ozokerite is a mixture of hydrocarbons in various proportions, the exact nature of which is a subject of dispute. Some authors consider that it is composed of members of the paraffin series; others place its chief constituents in the olefin series. In commenting on certain experiments, Redwood says: "The natural inference is that in addition to crystalline paraffin ozokerite contains certain colloidal substances (amorphous paraffin), the presence of which hinders the crystallization of the paraffin." In color ozokerite varies from black or dark brown to light yellow, but some specimens have a greenish color. It may be as soft as tallow or as hard as gypsum. The light-colored varieties yield the largest amounts of ceresin, the refined product. The melting point of ozokerite ranges, in general, from 58° to about 80° C., but a very few specimens have been reported to have a melting point at 100° C. Although paraffin with a melting point as high as that of ozokerite may be extracted from petroleum, it is not a commercial product, and the paraffin that is put on the market has a melting point considerably lower. The specific gravity ranges from about 0.85 to 0.97. Ozokerite is soluble in ether, petroleum, benzene, turpentine and carbon bisulphide.

Origin.

There appears to be a close relationship between ozokerite and certain kinds of petroleum. In a paper by Gosling an analysis of ozokerite is compared with one of American petroleum, and the comparison shows that the two substances contain the same compounds or fractions, though in different proportions. As would naturally be expected, the paraffin content of the ozokerite is higher than that of the petroleum. In the Galician mines all gradations between oil high in paraffin and ozokerite containing some petroleum have been observed. Some of the veins of ozokerite in the Utah field have a width about equal to that of thick

paper, a condition which implies a somewhat fluid state of the material at the time of impregnation and suggests that the substance which first filled the fissures was a petroleum rich in paraffin. Thus from laboratory and field observations all mixtures of petroleum and ozokerite are known to exist, and it may be concluded that the ozokerite of the Utah field is derived from a petroleum high in paraffin.

The passage from petroleum to ozokerite is thought by some geologists to have been accomplished by the oxidation and decomposition of the hydrocarbons of



SHOWING LOCATION OF OZOKERITE FIELD.

petroleum. However, the probability of the lack of oxidizing agents at considerable depths below the ground-water level would argue against this as a general process. On the other hand, it is now generally accepted that solid hydrocarbons, which of course embrace paraffin, exist in many crude oils at low temperatures. Kast and Seidner have found that the mud which separates out on the bottom of storage tanks containing crude petroleum is made up largely of paraffin, and they suggest that "this amorphous paraffin closely resembles and is evidently identical with ozokerite." Petroleum may be regarded as a solvent holding paraffin in solution, and on evaporation of the solvent the ozokerite is left as a residue. Slight changes in temperature, such as are found with increasing depth below the surface, would be a factor in solution and

*Abstract from Bull. 641A, U. S. Geol. Survey.

deposition, but this factor probably is not so important as evaporation of the lighter and more volatile oils of the petroleum.

The petroleum from which the ozokerite has been derived may have had two sources. It may have been derived from the overlying oil shale or it may have been forced up from lower beds. The bituminous material in the oil shale is largely made up of vegetal remains, and it is thought by Peckham that oil containing a large percentage of paraffin is indicative of a vegetable origin. On the other hand, Eldridge believes that the veins of solid hydrocarbons in the Uinta Basin, to the northeast, were formed by the forcing into the crevices and later rapid solidification of semifluid hydrocarbons. It would be interesting to know if the ozokerite contains more volatile oils in the lower levels of the mines than in the higher, or if the reverse is true, as such facts may have a bearing on the source of the petroleum from which the ozokerite has been derived. Analyses of the ozokerite compared with analyses of oil from the oil shale might possibly show some significant resemblances.

The Utah ozokerite field resembles in a number of places the Boryslaw field of Galicia, Austria, which is the most productive field of ozokerite. The Galician field is less than 1 sq. mile in area. The ozokerite is found in fissures, usually measuring from 2 to 12 ins. in width, which cut shale and sandstone of Miocene age that overlie beds of petroliferous shale. All gradations between solid ozokerite and petroleum rich in paraffin are found in the mines. The mine shafts in this field are very closely spaced and range in depth from 66 to 656 ft. Much of the semifluid material is under high pressure, and it is reported that certain of the mine openings have at times been filled by the squeezing of semifluid ozokerite. The Boryslaw deposits become narrower with increasing depth, and Redwood is inclined to believe that the ozokerite has been forced up from below.

Production and Concentration.

The first prospecting of this region was done in 1886. Since that time mining and prospecting have been carried on at irregular periods, for litigation has prevented continuous development. Exact figures for the production of the field are not available, and at the time of the writer's examination all the mines were inactive. According to statistics published by the Survey in the yearly reports on mineral resources, the Utah field produced over 640,000 lbs. of ozokerite previous to 1900, and it is reported by officials of the American Ozokerite Co. that the field has yielded about 120,000 lbs. since that date. The total output of the Utah field is only a small fraction of the quantity imported into the United States in a single year, but the production of the past is not a measure of the production that is possible under favorable market and mining conditions.

The following concise description of the methods of concentration used in the Utah field is given by Taff

and Smith: The manner of separating ozokerite from the associated rocks is a simple process. The plant * * * consists of a steam boiler and engine, a crusher, and steam-heated vats. The soft rock and ozokerite mixture is crushed and run into long vats with narrow bottoms containing water kept at a boiling temperature. The ozokerite melts at a temperature of 54 to 70° C. (129 to 158° F.) and floats off as a liquid into cooling vats, while the rock is driven out along the narrow bottom of the vats by revolving screws. On cooling the ozokerite is remelted into dry pans to remove the moisture.

Uses of Ozokerite.

Ozokerite is a nonconductor of electricity and is extensively used for insulating. Candles made from ozokerite have qualities superior to those found in other candles. Much of the ozokerite mined is converted into ceresin, a highly purified product which is used to replace or adulterate beeswax and has a variety of other uses. It is also used as a foundation for various waxes and polishes; as a covering to protect metal surfaces from the action of moisture, acids, or alkalies; and for wax figures and dolls.

Lagonda Boiler Tube Cleaners.

The one positive way to keep boiler tubes free from scale is to clean them frequently and thoroughly by mechanical means. In a new catalogue recently issued by the Lagonda Mfg. Co., there is a line of cleaning equipment described which is complete from cutter head to hose line. These cleaners are ball bearing, thrust bearing, steam, water or air-driven, designed



CLEANING A HEINE BOILER WITH CENTER DRIVE DIRECT MOTOR CLEANER.

for all sorts of conditions of service from moderate "cases" to the most stubborn found in the hard-water regions. For 20 years, these people have been making boiler tube cleaners, and the best of their experience is boiled down into this book, which is practical and worth having.

Mining in the Willow Creek District, Alaska

STEPHEN R. CAPPS.*

Mining in the Willow Creek district was continued in 1915 on about the same scale as in the preceding year. The output was derived mainly from the three mines that have been in active operation for several years, although a small single stamp mill was erected on one claim that has heretofore not been among the producers. As a result of the beginning of construction on the new Government railroad, which will pass along the edge of this district, prospecting was active, and plans are under way for active mining on several properties. In September, 1915, the writer spent about a week in the Willow Creek district, and visited all the working mines and many of the more promising prospects. The following notes on the various properties are not intended to be complete in themselves, but to supplement the more complete report by carrying the account of mining developments up to the fall of 1915.

Alaska Free Gold Mining Co.

The Alaska Free Gold Mining Co. operated throughout the open season and employed on an average about 50 men. The mill was run in three shifts of 8 hours each, as was also a part of the mine. In other parts of the mine two shifts only were worked. The capacity of the mill has been greatly increased by the installation, in 1914, of an additional Lane mill of 40 tons capacity and a 40-ton cyanide plant and by the elevation of the flume to give a head of 54 ft. at the Pelton wheel, instead of the 35-ft. head formerly used. During the season of 1915 both mills were in operation only a part of the time there being either not enough water available to operate both or not enough ore mined to keep both working to their capacity. All the tailings from the mill are now treated by cyanidation. It is reported that even with the greater depth below the surface from which the ore is now taken the tenor of the tailings after amalgamation remains fairly constant and is much the same for tailings from rich and poor ores alike. This fact indicates that even at considerable depth the gold in the veins is likely to be present predominantly in the form of free gold, and the ore from even deeper levels will probably be free milling. Three aerial tramways are in operation—two extending to openings on the Smuggler-Union vein and one to the Eldorado vein.

Since this mine was last visited, in 1913, much underground work has been done on the upper of the two main veins on the property. On this vein, referred to previously as the Skyscraper vein, but now known as the Smuggler-Union vein, the main tunnel has been driven along the vein to its outcrop on the southeast side of the mountain, a total distance of

380 ft., and from it stopes and winzes have been made. Two additional tunnels on the same vein have been driven. The upper one, about 100 ft. below the main tunnel, is over 250 ft. long, and the lower one, 175 ft. below the main tunnel, is 175 ft. long. Both the vein and the ore shoots have been shown to be continuous between the several levels. The vein, so called, in reality consists of two nearly parallel veins, of which the upper is locally referred to as the hanging-wall vein and the lower as the footwall vein. These veins are in most places separated from each other by several feet of diorite, though they are connected by numerous quartz stringers. Locally they diverge somewhat or approach rather closely, but in general each of the two maintains its own individuality.

On the Eldorado vein, which is apparently the southward continuation of the Smuggler-Union vein, an incline now 40 ft. long has been driven, and from it an aerial tram leads to the mill. It is expected that considerable ore will be supplied to the mill from this claim.

Gold Bullion Mining Co.

The Gold Bullion mine was operated in 1915 throughout the open season, beginning June 3. During that period the stamps were dropping for 24 hours a day, and two shifts were worked at the mines. About 60 men were employed. No increases were made in the mill capacity, but a 45-ton cyanide plant, installed in 1914, was operated, all the tailings from the mill and a quantity of stored tailings being treated by cyanidation. As the length of the milling season is controlled mainly by the period of adequate run-off in Craige creek, from which water for power is taken, a dam 13 ft. high was built across the basin of that stream, thus forming a storage reservoir of 13½ acres. Two smaller dams above give additional storage capacity, and the water thus impounded was expected to be sufficient to keep the mill in operation for a season several weeks longer than heretofore.

A large amount of underground work has been done since the property was last visited in 1913. In the fall of 1915 the No. 2 tunnel had over 930 linear feet of underground workings, not including considerable stopes. From this tunnel about half the ore mined in 1915 was taken.

The new Gold Dust tunnel was 360 ft. long in 1915, and the nearby No. 1 Gold Dust tunnel 200 ft. long, and a large area of the vein between them was stoped out, furnishing about half the season's supply of ore. The No. 3 Gold Dust tunnel had been driven to a length of 139 ft., the No. 4 Gold Dust tunnel about 45 ft., and the No. 2 Gold Dust, which contains a large stope, 65 ft.

The result of this underground development has

*Mineral Resources of Alaska; U. S. G. S.

been to keep the mill supplied to capacity with ore during the 1915 season, and to block out considerable ore bodies for future mining. The Gold Dust No. 3 tunnel follows a thick, strong vein said to be exceptionally high in gold.

Independence Gold Mines Co.

The property of the Alaska Gold Quartz Mining Co. was taken over by the Independence Gold Mines Co. in 1914. Since the transfer no important changes have been made in the surface equipment, although plans have been made for the installation of a new crushing mill. In 1915 the mill was put into operation on May 19 and, except for some short stops for repairs, was run continuously until the cold weather cut off the water supply. About 18 men were employed in two shifts. Although sufficient ore to keep the mill running was mined, the developments of the year were directed primarily to blocking out ore, in order to determine whether or not the installation of a new mill would be justified. The main tunnel, on the Granite Mountain vein, was driven to a total length of 540 ft. along the vein, and at a point 400 ft. from the portal a winze follows the vein down the dip for 70 ft. These additional developments show little change in character or gold tenor of the vein with increase in depth, although the breast of the main tunnel is now estimated to be 300 ft. below the surface. The veins show the same tendency to pinch and swell that they display nearer the surface; the ore shoots continue, and the ore is apparently as free milling as that taken from shallower parts of the vein. The driving of a long tunnel, to tap the vein at a lower level, is among the plans now being considered.

The upper or Independence vein was opened in 1914 and 1915 by one tunnel 105 ft. long and another 15 ft. long, and 240 ft. of stripping was done on the vein outcrop. The vein is in places 3 ft. thick, but in general has not been found to contain as much gold as the Granite Mountain vein.

Mabel Mine.

At the Mabel mine development work has been continued. The adit tunnel, begun in 1913, was driven about 75 ft. to the vein, and short drifts were run along the vein in both directions. In these workings the vein pinches and swells within short distances, and the quartz ranges from a mere stringer to a band 1 ft. wide. On the surface the vein has been exposed by stripping and open cuts almost continuously for a distance of about 2000 ft. and shows a persistent quartz vein from a few inches to about 2 ft. in thickness. The assay values are said to be encouraging. An aerial tramway to extend from the vein croppings to the mill site is on the ground, and it was said that a 20-ton mill was to be installed during the winter of 1915-16, to be run by water taken from Reed creek.

Miscellaneous Claims.

The Rosenthal claims, on the ridge between the basins of Fishhook creek and Little Susitna river,

promise to become productive soon. Some additional underground work has been done since 1913, and the extent of the ore body is now fairly well known, as the flat-lying vein crops out around the mountain top and tunnels pierce almost through the center. The ore broken in driving the tunnels has been banked at the portal and in the drifts, and a considerable amount is ready to be trammed to the mill. Control of the property has recently been acquired by the Alaska Free Gold Mining Co., and it is planned to erect an aerial tramway from this ground to the mill in the valley of Fishhook creek.

Prospecting has been vigorously carried on during 1914-15 on the claims of the Oregon group. A winding tunnel with a total length of 150 ft. has now been driven along an irregular quartz vein. The quartz is said to contain only moderate quantities of gold, but the main objective of the tunnel is to crosscut a fault zone that may be traced along the surface for some distance. It is estimated by the owner that a distance of 50 to 70 ft. still remains between the breast of the tunnel and this fault zone. It is said that at a point about three-eighths of a mile southwest of the tunnel the fault zone was ground-sluiced off to a depth at which the clayey gouge began to give place to solid pieces of quartz. The whole zone, to a width of 60 feet, is said to carry several dollars a ton in gold.

Prospecting has been done for some years on ground locally known as the Jap claims, lying on the northwest side of upper Willow creek, opposite the Gold Bullion mine. It is reported that a small 1-stamp mill, with a daily capacity of 200 to 300 lbs. of ore, was installed and in operation part of the 1915 season, milling ore of encouraging gold tenor.

Some additional underground development work has been done on the Mammoth claims, in the upper Willow creek basin, since that property was visited in 1913. It is reported that a crosscut 100 ft. from the portal of the main tunnel has been driven an additional distance of 30 ft., and from it a 40-ft. raise has been made. About 30 ft. of miscellaneous raises and drifts were also opened.

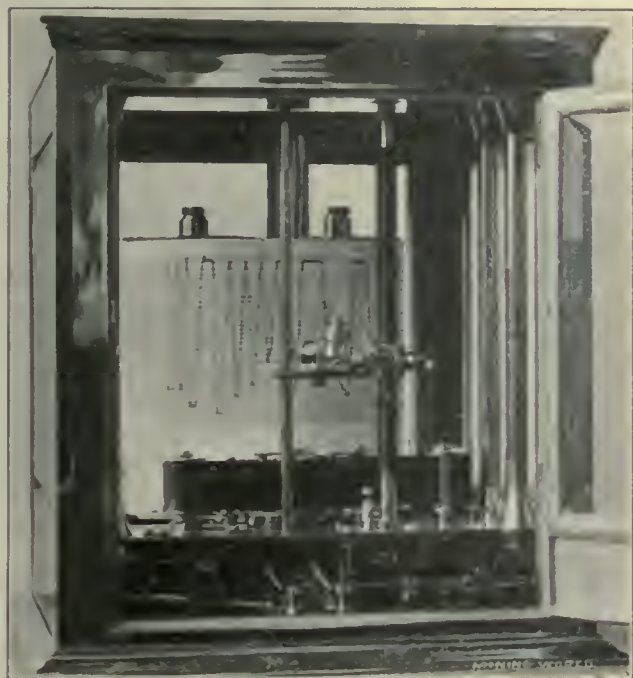
Gold Placers.

The only placer-mining operations of note within this district in 1915 were those on lower Grubstake creek and on adjoining portions of Willow creek. These operations were directed to prospecting the gravel benches, and hydraulic methods were available, as the hydraulic plant formerly used for mining on this creek is still in working condition. Work was carried on for only a part of the season.

British Iron-Ore Output in 1915—An estimate of 5,100,000 tons of iron ore obtained from quarries in 1915 brings the total iron ore mined in Great Britain to 12,976,105 gross tons which includes the 6,080,218 tons mined under the Coal Mines act and the 1,795,887 tons under the Metalliferous Mines act. The total in 1914 was 14,867,582 tons, and in 1913 it was 15,997,328 tons.

Hoist Recorder for Mine and Elevators

The accompanying illustration shows a unique hoist recorder for mines and elevators as developed by the Cleveland-Cliffs Iron Co. at its Salisbury mine, Ishpeming, Mich. This hoist recorder will furnish a complete record of the movement of the skip for each shift of 12 hours or less, showing the time taken in moving same from one point to another, showing all delays, the length of same and just where these delays occurred; also the number of loads hoisted from each level and the total amount hoisted daily. This record will also furnish valuable evidence in the case of accidents connected with the skip, delays and mistakes which occur from time to time, and which record will eliminate conflicting reports between men underground and engineer in charge of hoist, and a



HOIST RECORDER AT SALISBURY MINE.

record which may be filed and referred to at any time.

Where electric signalling is in use this machine will record the signal given, so that where different signals are used for the different materials, it can be seen just what material is being handled, and from and to what point—also the exact time signals are given, so that it can be plainly seen whether delays are caused underground or on the surface. Where "Pull Ball" signalling is used a contact can be arranged which will give the same result in recording signals as where electric signalling is used.

The position and attachment of recorder is important. It should be placed where there is sufficient room and at a height convenient to get at it, about 36 ins. to top of stand for recorder. The base measurements of recorder are 16 by 16 ins., height depending on the depth of mine, the recorders being

made in three sizes; 15, 18 and 24 ins. high. As different make hoists necessitates the attachment being made in different places, the recorder can usually be attached to one of the following shafts: At end of drum shaft, on reverse shaft, indicator shaft, or any shaft which runs true and moves and reverses with the hoisting drum. The recorder should not be placed too far from the shaft to which it is connected, so as to cause loose motion in chain.

The means of recording the movement of the skip is simple. There are two drums mounted on vertical spindles, one drum being driven by a clock, winds the sheet from the other drum, so that when skip is idle, sheet is being wound on the first drum; the plan and exact length of time idle being registered by a pen which is attached to a nut working on the screw noted in the foreground. When the skip moves up or down the pen records such movement, receiving its motion through the chain, shaft, bevel gears and screw.

As it is essential to know the working conditions, these recorders are of inestimable value to any mining company. This device records every movement of the skip, together with a record of the kind of signals, and the exact time same were given so that it can be seen just where delays occur and whether caused underground or by the engineer in charge of hoist. The charts being made so that the position of the levels and important points conform with the same in the mine, these records can be read very easily. The record of the signals given is also very plain, as it shows just where the skip was when the signal was given, and the kind of signal given, so that if there was a mistake or delay in moving the skip, same will appear by the movement of the skip.

Low Phosphorus Iron from High Phosphorus Ores.

The making of pig iron practically free from phosphorus and sulphur from an ore high in phosphorus is covered by a patent (U. S. 1,172,597, Feb. 22, 1916) granted to Paul L. T. Heroult, who died 2 years ago. Ordinarily molten pig iron from the blast furnace is transferred to an electric arc furnace where a basic slag, containing as much lime as possible and some oxide of iron, is applied to the bath with the current so regulated as to maintain a temperature sufficient to keep the slag molten and maintain a chemical reaction between the slag and the metal, leaving the carbon content of the metal unchanged or only slightly reduced. After the desired dephosphorization the first slag is renewed and a second substituted, consisting of lime and fluorspar with coke dust added, which removes nearly all the sulphur. It is claimed that this process produces from phosphoric ores a dephosphorized and desulphurized pig iron of the finest quality and at less expense than by any other process.

Yavapai County, Arizona, Mines and Mills

WILLIAM P. DE WOLF.

All of the mills and a majority of the mines in Yavapai county are working at capacity. The output of base metal and bullion—copper, tungsten, lead, zinc, gold and silver—is heavier than ever before. The output of ore is likewise greater than heretofore, and is steadily increasing as new ore bodies are opened and old mines for some time dormant are added to the active list. There has been no period when investors were so thoroughly interested in and capital was so generally available for the development of the mines here as now; and there has been no time when results were so thoroughly in keeping with the outlay of money, time and energy as now.

Local capital is responding to the development demands of the county's mines quite as generously as is capital from outside points. The condition is both commendable and noteworthy, as it demonstrates the confidence the local people have in their mines and their willingness to back their confidence. Neither they nor people from abroad are, however, investing their money in chimerical get-rich-quick mining schemes, such as have in past years cursed and cheapened the mining industry here. The Arizona Corporation Commission is inimical to them and they cannot gain a foothold here. As a result of the activities of the commission the mining industry of this county and state is being fostered along clean and progressive lines.

Among the mining propositions of this county which have of late received generous backing locally are the Loma Prieta Mines Co., Boston & Jerome Copper Co., Tip Top Con. Mining Co., the Tuscumbia Mining & Milling Co., Schuber Copper Co., Golden Dragon Mining & Milling Co., Bradshaw Development Co., Jerome Victor Extension Copper Co. and Venture Hill Mining Co. The last mentioned, although not of recent incorporation, is of late being reorganized by Prescott and Jerome mining and business men, most of whom have been holders of Venture Hill shares for a considerable period. These people have provided an initial development fund of \$18,000 and have pledged an additional \$12,000 for the same purpose, payable in 4 months. The company owns six patented claims in the United Verde copper belt at Jerome. At a meeting of the stockholders held in that camp on June 10 arrangements were made to resume mining operations.

The property of the Venture Hill Co. was first worked about 14 years ago. At that time, however, the price of copper was nominal; interest in copper issues was apathetic and the reduction charge was higher, with the result that the company, after varied financial vicissitudes, was forced to suspend mining operations. The holdings adjoin those of the Verde

Apex, Verde Con. and Hill Copper companies, and are adjacent to the United Verde and United Verde Extension companies. By reason of their proximity to the properties mentioned, the Venture Hill holdings are viewed favorably by investors and the company's shares are popular here.

Development work to date consists of a tunnel and a number of shafts of varying depth, many of which yield pay values at the present price of copper. The main copper-bearing dike lies about 100 ft. ahead of the present face of the tunnel, which has a length of 400 ft. The tunnel will crosscut this dike at a depth of 400 ft. A winze will be sunk at the intersection to determine the average grade of the ore below that point. Where sampled above, the dike yields pay values across a wide area.

Monthly dividend disbursements of 75 cts. per share continue to feature mining operations of the United Verde Co. The corporation started the current year by posting two dividends of 75 cts. each in January, since which time dividends have been paid monthly at the rate mentioned. W. A. Clark, owner of approximately 297,000 shares of United Verde, derives an income from dividends approximating \$222,750 per month, or \$2,673,000 per annum. The advance in the price of silver has of late been an important factor in the earnings of the company. The tonnage mined last year yielded 902,000 ozs. of silver, for which the company received an average of 50.607 cts. per ounce. This mine, first worked as a silver-gold property, has now reached the capacity of its new smelter at Clarkdale, which is to say the mine is now outputting 8000 tons of copper ore daily.

Superintendent George W. Salisbury of the Jerome Victor Extension Copper Co. has about completed unwatering the mine workings. Plans contemplate the lowering of the present shaft from a depth of 1225 ft. to approximately 1700 ft. Salisbury is well acquainted with the ore depositions at Jerome, having formerly been a member of the engineering staff of the United Verde Co.

The United Verde shaft is located within 1000 ft. of the Jerome Victor Extension shaft, and it is reported that the ore body on the 1500-level of the first mentioned has been stoped to the Victor Extension boundary line. It is also stated that the Victor Extension shaft was carrying stringers of 6% copper ore on the lower levels at the time the former owner—Haynes Copper Co.—was forced to close the mine owing to a lack of funds. One of the first acts of Superintendent Salisbury will be to determine the truth of these reports.

It is reported here that the pending deal has been closed for the passing of the control of the Arkansas

& Arizona Copper Co. to the Goodrich-Lockhart people of New York, and that the latter have taken possession of the mine holdings and books. The deal, as ratified, provides for the payment to the Goodrich-Lockhart people of 2,000,000 shares of Arkansas & Arizona for the properties of the Mowles Copper Co. and a year's option on 1,500,000 additional shares at 25 cts. per share. Reports from Jerome are to the effect that development work is immediately to be resumed.

Important Tungsten Deposits of Inyo County, Cal.

The demand for tungsten has recently led to an extremely energetic development of the tungsten deposits 8 miles west of Bishop, Inyo county, Cal. The deposits were discovered in 1913 but remained practically unknown until the spring of 1916. On April 7 the Standard Tungsten Co. began work. Trails and roads were built, ore bodies were opened up, a mill was erected and electric power was brought in. On June 7 the mill began to crush ore. The Tungsten Mines Co. started work on May 1 and by the later part of July had completed a mill of 300 tons daily capacity and was rapidly opening its main ore body, disclosing a lode as much as 60 ft. wide. This activity has greatly stimulated prospecting, and tungsten has been found in a belt 15 miles long.

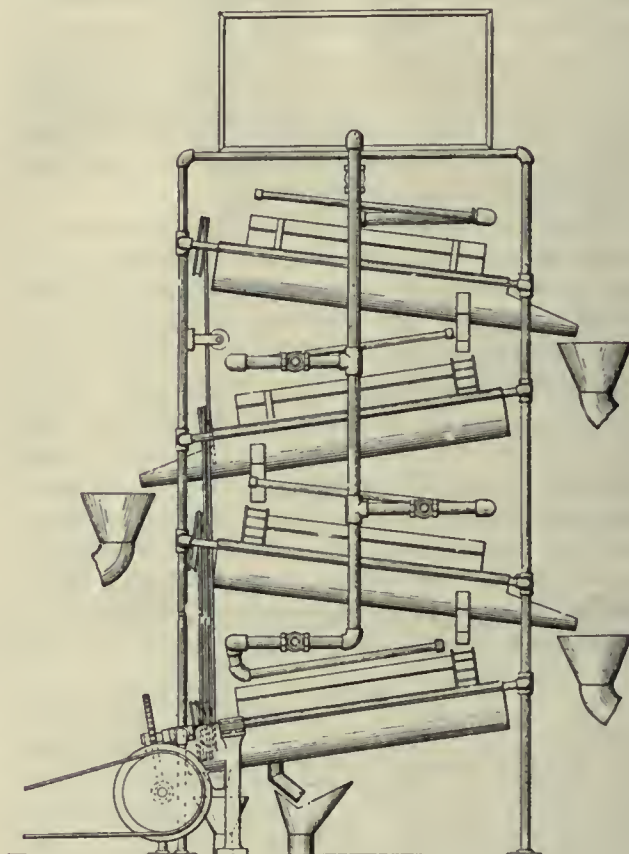
The ore bodies, which have been visited by Adolph Knopf of the Survey, are remarkable and in fact are of a kind not mentioned by the recognized authorities on ore deposits as a commercial source of tungsten. The ore consists of scheelite associated mainly with garnet, epidote and quartz. The general country rock is granite, but in it are scattered masses of limestone which became mineralized at the time when the granite cooled from a molten condition. The limestones were altered to masses of garnet carrying subordinate scheelite by the metallic vapors then given off, and these are the ore bodies now worked. They average about 2% tungsten trioxide (WO_3). The deposits, like those recently discovered near Lovelock, Nev., belong to the so-called contact-metamorphic class, a well known source of copper but not heretofore recognized as a source of tungsten.

The fact that the tungsten-bearing mineral—scheelite—is associated with garnet is a great help to the prospector, and all bodies of garnet rock scattered through the great granite masses of the eastern Sierra slope bordering Owens valley are being carefully examined and panned for scheelite.

Ferrous oxide (FeO) is a transitional product in the reduction of higher oxides and the oxidation of metallic iron. It is not known in the isolated state, owing to the readiness with which it combines to form higher oxides and salts. It is basic in character, forming easily fusible compounds with silica.

New Ore-Classifying Machine.

Selden I. Clawson, Salt Lake, Utah, describes in a recent patent an apparatus for classifying ore, in which the screens are cleansed with water, which is at the same time mixed with the material to assist in the process. The illustration shows a side elevation, the inclined screens being either rocked or revolved, according to type, by power supplied as shown. A system of piping carries water from the storage tank above to nozzles located above each screen. From



AN ORE CLASSIFYING MACHINE.

these nozzles the water is forced in jets onto the screens. In this patent are described a number of screens to cover all operating conditions. In one type, which rocks, partitions are arranged to retard the material in its passage. In another there is a screw which revolves and forces the material slowly along the length of the cylindrical screen. Underneath the screens are inclined troughs. Each trough collects material of a certain fineness and delivers it to a conveyor tube.

Fluxes are divided into three classes—acid, basic and neutral. Silica is the common acid flux. The basic fluxes are lime, magnesia, ferrous oxide, manganoous oxide and alumina, which is feebly basic. Fluorspar is a neutral flux.

Anode mud obtained in the electrolytic refining of copper is treated for the recovery of silver and gold.

Who Is Your Engineer?

By GLENVILLE A. COLLINS.*

When you attempt to present your project to the capitalist that is his first question.

Instead of being turned down at the outset, or told that your proposition was not presentable, why not start off on the right foot by having your proposition put in shape and thereby take no chances.

Many a fine mining proposition is going begging because it was not backed by a strong, honest, qualifying report signed by an engineer who knows and is known.

The engineer you want is the one who has a keen perception of real business as well as technical discernment. One who can state the case so concisely that there are no uncertainties left to qualify. One whose conception of principle is strictly ethical, unbiased and sound.

The engineer who writes a report on this basis needs no further qualifications. You can see his unquestioned reputation between each line.

There is unlimited capital for anything good. When you do not land your man do not blame him, but qualify your whole proposition by the report of an engineer who knows exactly how to present the matter in a masterful way.

Mr. Capitalist, Who Is Your Engineer?

When the gentleman with a proposition comes in asking for your help, why not ask him, Who is your engineer?

You owe it to yourself as protection. You may be very wise in business matters, but you do appreciate that a "mere detail," so-called, often determines the difference between success and failure.

A frequent question is, Can the bonds be sold? Many think the financier can answer, but after all it is the engineer who determines the point. The public qualify bond offerings these days and your best buyers consult their engineer.

Mr. Bond Buyer, Who Is Your Engineer?

Do you handle bond issues on properties that are not first analyzed by your own engineer?

How can you tell that the value is there and for how long? Why take the responsibility?

Bonds on any proposition indorsed by capable engineering advice are easier sold at better prices.

Mr. Mining Man, Who Is Your Engineer?

Did you ever sell a mine without an engineer's report, or did you ever operate one without technical advice?

The mine that pays dividends is one which manifests good engineering.

The man who says he has many worthless mining stock certificates never employed an engineer first.

*Mining Engineer, Seattle, Wash.

Safety first in mining means to be guided first and all the time by a talented and reputable mining engineer.

Public utilities, mines and industrial propositions are in demand, also their securities.

The channels for trade are wide open, but the travel is light and the conveyances are few.

New Electric Hoists for Butte.

Two new electric hoists of exceptionally interesting design will be installed shortly at the Black Rock shaft of the Butte & Superior Copper Co., Ltd.

The main ore hoist as first built will have two drums each driven through axial plate clutches. Drums will be 9 ft. diameter by 7 ft. 6 in. face, designed to wind 3000 ft. of rope, in two layers, with a maximum rope pull of 41,000 lbs. Rope speed 2250 ft. per minute. These drums are so constructed that after reaching the 3000 ft. level, new drum shells can be applied converting the drums into 12 ft. diameter by 10 ft. face, after which they will wind 5000 ft. of rope in two layers with a maximum rope pull of 52,000 lbs. Rope speed 3000 ft. per minute.

The hoist is first motion driven by a D. C. motor receiving its energy from a flywheel motor generator set. While the 9-ft. drums are used the hoist will be driven by one 1000-hp. motor. When the change over is made and the 12-ft. drums are put in use, a second 1800-hp. motor will be added to the other end of the drum shaft, and the flywheel set will be doubled up.

The cage hoist is similar in construction to the ore hoist, having 8 ft. in diameter by 7 ft. face, designed to wind 5000 ft. of rope in three layers, with a maximum rope pull of 24,000 lbs.; rope speed 1650 ft. per minute. This hoist is geared through a single reduction of Wuest gears to a D. C. motor, receiving its energy from the motor-driven flywheel set.

Both hoists, which are of the Nordberg Mfg. Co.'s design, will be built with steel plate drums, Nordberg axial plate clutches, parallel motion post brakes, brake posts constructed of boilerplate built up. The brakes and clutches on both hoists will be operated by oil under pressure with the use of accumulators, receiving oil from motor-driven triplex pumps. Hoist bearings will be of the two part ring oiling type, and in addition will be oiled with a gravity oiling system. Control of the hoists will be the Westinghouse standard type for limiting the rate of acceleration and retardation, same to be put in operation by cams directly driven through gearing from each drum.

In addition to the electrical control a Welch safety stop will be supplied with each drum, which will take full control and stop the hoists, should electrical equipment fail. A further reason for applying Welch stops on these hoists was due to their practice of lowering one drum on the brakes frequently, under which condition, where no electrical energy is in use, electrical control would have no effect.

The first motion motors will be coupled to the hoist shaft with rigid flange coupling integral with the motor and hoist shafts. The cage hoist motor to be connected to the pinion shaft by a Francke flexible coupling.

Chlorination Aided by Actinic Light.

In the chlorination of hydrocarbons such as gasoline, petroleum oils, benzol, toluol, etc., the action, in the absence of facilitating catalysts, depends largely upon the illumination. For some unknown reason, light causes chlorine to enter into substitutive reaction with the various hydrocarbons with the production of chlorine substitution products and HCl. But the trouble with the practical application of this fact is that the action is apt to be uncontrollable. It is, for example, very difficult to chlorinate any hydrocarbon, whether liquid or gaseous, to produce monochlor products (that is, products containing only one chlorine atom in the molecule) to the practical exclusion of di, tri, etc., compounds. Similarly, it is difficult to produce

capable of activating chlorine are absorbed by chlorine. Taking advantage of these facts, Benjamin T. Brooks, Harry Essex and Dillon F. Smith, all of Pittsburgh, Pa., have devised a simple, cheap and ready method of controllably chlorinating liquid hydrocarbons and other liquid bodies capable of dissolving chlorine and of reacting therewith under the influence of light. This method they have patented and assigned to the Gulf Refining Co., Pittsburgh.

It may, for example, be used for converting liquid hydrocarbons into the monochlor derivatives, for converting the monochlor derivatives into dichlor derivatives, and so on. In this they simply irradiate one end of a body of liquid hydrocarbon or other liquid to be treated from a source of actinic rays, while introducing chlorine at the other end, and causing it, or the solution it produces in dissolving, to approach the illuminated end. In practice, the illuminated end of the body of liquid, for obvious reasons, is usually the top, while the chlorine is introduced as gas at the bottom. Presuming a body of gasoline, or a fraction obtained by distilling gasoline, to be chlorinated, the oil is placed in an opaque vessel having means for controllable illumination at its end; such means being, for example, a mercury vapor lamp, or a nitrogen-filled tungsten lamp. The lamp is best provided with a rheostat whereby the amount of light emitted may be controlled. At the bottom of the container they provide means for introducing gaseous chlorine.

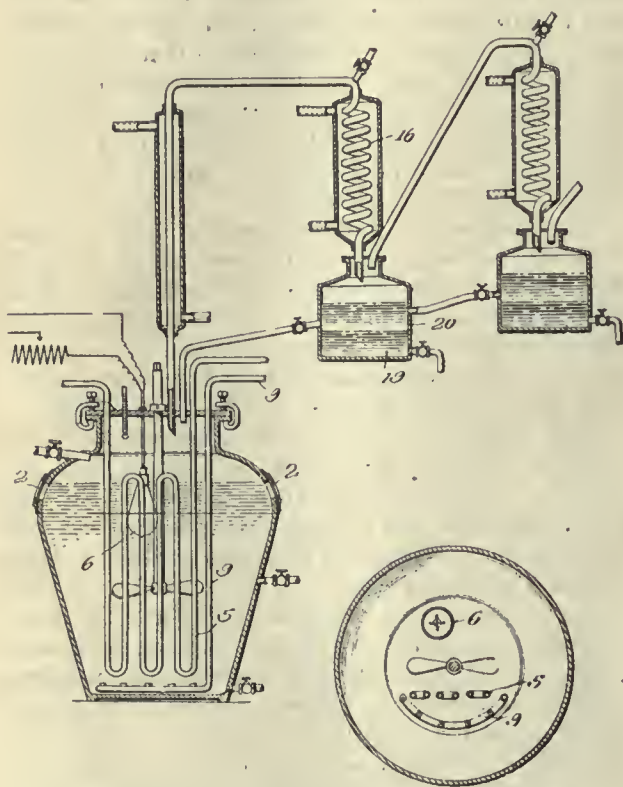
The chlorine dissolving in the oil colors it yellow and as the chlorine disappears from the solution by reaction with the liquid, the color in the liquid also disappears. With this disappearance, the striking down or absorbing of active rays also disappears; that is, the rays pass through the uncolored oil but not through the colored.

The container as shown in the drawing is of enameled iron or stoneware. Through windows (2) the color of the liquid may be observed. A cooling coil is indicated by (5) and the lamp is shown at (6). A propellor agitates the liquid.

The gaseous matter is collected and cooled by worm (16), the liquids being discharged into a receiver where the aqueous hydrochloric acid and oily liquids separate into layers (19) and (20) respectively. The former is drawn off and the latter returned to the reaction vessel. Such portion of the vapors as is not condensed pass on into another worm shown at the right where the process is continued. A train of these cooling and washing devices is maintained, as many as necessary, for the completion of the process.

The equipment of a mine should be up to the requirements for economical operation to a capacity which prospecting and development work has assured, but to equip lavishly before that stage has been reached is the height of folly.

Clay is formed by the natural decomposition of rocks of the feldspar group.



CHLORINATION AIDED BY ACTINIC LIGHT.

the dichlor compounds to the exclusion of the higher chlorinated compounds. Further, it is often difficult to prevent the reaction becoming so violent as in some cases to lead to the deposition of carbon, or, in the presence of sufficient chlorine, to explosion. Direct chlorination is therefore not as much used as the value of the products which may be obtained thereby would warrant. For this reason, where halogen substitution products are wanted for chemical purposes as a rule, another halogen, bromine, is used and bromine compounds are made, bromination being less difficult to control than chlorination.

The exact nature of the action which light exerts upon chlorine, rendering it more prone to combination, is not known; but it is known that the rays of the spectrum which produce this action lie toward the ultra violet end; and it is also known that the rays

What the Mining Companies are Doing

American Smelting & Refining.

Plans for the further enlargement of the Baltimore refinery of the American Smelting & Refining Co., now being perfected, will bring the capacity of this plant to 1,080,000 lbs. of copper a year. An addition to be begun immediately will add 5,000 tons a month to the output, at a cost of \$500,000.

An enlargement program at Baltimore now nearing completion will give the plant there capacity of 20,000 tons a month. This work is expected to be finished about close of this month. When undertaken the plant had capacity of about 13,000 tons a month.

Outside of Baltimore the American Smelting & Refining Co. has capacity to handle an equal amount of copper, or 480,000,000 lbs. a year. Enlargement of Tacoma plant has been completed and the plant is in full swing. Alaska ores, part of which for a time had to be sent to the Garfield, Mont., smelter, are now being handled at the Tacoma plant.

In view of prospective smelting and refining capacity of 1,080,000,000 lbs. next year it is interesting to note that when the smelting company entered the metal refining business in 1901 it had capacity of 60,000,000 lbs. yearly. Last year its capacity was 720,000,000 a year.

The construction and enlargement program still contemplates the expenditure of several million, but a considerable part will carry over into 1917. At the beginning of 1916 a program was outlined of \$6,000,000, but additions to this have since been made.

On the basis of business done by smelting in first 8 months of this year and outlook for the metal industry, it is expected that fully 30% will be earned on the \$50,100,000 common stock this year.

Alaska's Copper Shipments.

The Kennecott Copper Corporation is responsible for the position of Alaska as a copper producing section. Considerably more than 100,000,000 lbs. came to the United States from that territory in the 11 months to June 1.

Valued at \$23,203,540, there was shipped from Alaska 105,453,945 lbs. of copper in the period mentioned, against but 29,761,117 lbs. in the previous year.

Shipments from Alaska for a series of years have been as follows:

	1916.	1915.	1914.	1913.
January	9,365,733	2,149,476	2,784,802	1,668,328
February	10,913,458	3,678,880	1,859,360	660,250
March	10,992,707	2,149,272	2,133,980	472,293
April	12,992,523	2,845,980	1,319,110	1,730,252
May	12,405,421	3,525,600	603,492	1,771,508

As the Alaskan production of the Kennecott Copper Corporation has been approximately 10,000,000 lbs. monthly for some time, it would appear that the operations of the other shippers have not reached very large proportions.

American Zinc.

Upon the consummation of the merger of the Granby Mining & Smelting Co. into the American Zinc, Lead & Smelting Co., the latter will become the third largest individual factor in the zinc-smelting industry of the country.

Through subsidiaries the American Zinc, Lead & Smelting Co. already owns and operates three smelters having a total of 15,424 retorts. Through acquisition of the two smelters of the Granby Co. capacity will be increased to 22,404 retorts. Based on an average of 3½ tons of spelter per retort per annum this capacity would give the American Co. a yearly output of 78,414 tons—156,800,000 lbs.

This would be apportioned as below:

	Retorts.	Tons Spelter.
American Zinc Co., Illinois	4,864	17,024
American Zinc Co., Caney, Kan.	6,080	21,280
American Zinc Co., Deering, Kan.	4,480	15,680
Granby Co., Illinois	3,220	11,270
Granby Co., Kansas	3,760	13,160
Totals	22,404	78,414

Should an equitable basis be reached, another consideration, involving the American Co. and Butte & Superior Min-

ing Co., may take place later on, resulting in the largest zinc producing combination in the world. Butte & Superior already operates the largest zinc mine and the product from its mill now goes for treatment to the smelters of three different companies, as no one smelting corporation had sufficient capacity to handle the entire output of concentrates.

Con. Interstate-Callahan, Idaho.

The following statement has been issued at the close of the company's fiscal year, June 30, 1916:

Income—	Tons.	Value.
Lead ore	781	\$ 20,949.59
Zinc ore	9,498	611,271.60
Lead concentrates	3,723	128,414.57
Zinc concentrates	51,715	3,225,459.72
Totals	65,715	\$3,986,095.48
		27,076.34
Miscellaneous receipts		\$4,013,171.82
Expenditures—		
Mining and milling		\$ 727,164.35
Improvements		72,038.90
Operating and general expenses		113,477.29
Total		\$ 912,680.54
Surplus for year		\$3,100,491.28
Total accumulated surplus		\$4,061,640.66
Less dividends paid		3,254,930.00
Surplus June 30, 1916		\$ 806,710.66
Assets—		
Cash		\$ 143,573.46
Accounts receivable		46,596.68
Ore shipped		593,135.36
Ore on hand		3,153.58
Supplies on hand		55,112.01
Total		\$ 841,571.09
Liabilities—		
Mine vouchers payable		\$ 21,339.23
Mine wages payable		521.20
Taxes accrued		13,000.00
		\$ 34,860.43

Alaska's Low-Grade Gold Properties.

We are in receipt of the returns for the July operations of Alaska Treadwell, Alaska Mexican and Alaska United gold mining companies. We give figures below:

	Alaska Treadwell.	Alaska Mexican.	Alaska R. B. Claim.	United 700 Claim.
Tons ore crushed	77,721	14,385	23,660	21,350
Tons concentrate saved	1,752.12	390.11	572.67	358.58
Est. gross value of free gold	\$69,400.86	\$ 9,238.14	\$25,497.10	\$11,241.60
Est. gross value of concentrate	88,063.90	9,883.52	24,721.45	12,592.02
Est. tot. production	\$157,464.76	\$19,121.66	\$50,218.55	\$23,833.62
Est. total realizable value	155,890.12	18,930.45	49,716.37	23,595.29
Operating expenses	98,727.09	22,094.77	31,823.24	45,621.60
Est. operating profit	\$57,163.03	*\$ 3,164.32	\$17,893.13	*\$22,026.31
Construction expense	12,326.42	2,424.24	4,489.86	6,848.59
Est. net profit	\$44,836.61	*\$ 5,588.56	\$13,403.27	*\$28,874.90
Other income	11,281.00	3,730.00	†3,730.00	†.....
Yield per ton ore milled	2.03	1.33	2.12	1.12
*Loss. †Total for Alaska United.				

Chile Copper Co.

According to estimates of officials Chile Copper Co. has now developed 354,130,660 tons of 2% ore, an increase of 50,000,000 tons, since April, 1915. Increases in developed ore have been as follows:

	Tons.	% copper.
August, 1916	354,130,660	2
April, 1915	303,330,789	2.23
April, 1913	95,657,000	2.41
December, 1912	75,000,000	2.70

The 2.23% ore as of April, 1915, was considered as 2% to allow for dilution due to waste material and other causes. This doubtless applies to the latest estimates of reserves. The Guggenheim interests, controlling the Chile Co., believe at least 500,000,000 tons will ultimately be developed. Fur-

ther plant enlargement to the contemplated capacity of 30,000 tons of ore per day will call for new financing. On the basis of treating 30,000 tons of ore per day, present ore reserves give the property a life of over 30 years.

La Salle Copper Co.

The La Salle Copper Co. has filed with the Massachusetts secretary of state a statement of its financial condition, dated May 31, 1916, which compares as follows:

Assets—	1916.	1915.
Real estate	\$6,414,595	\$4,773,092
Tecumseh Copper Co., property	1,849,120	2,139,886
Machinery and equipment	49,994	.....
Merchandise, material, stock in process	126,524	2,620
Cash and debts receivable	48,266	104,868
Profit and loss	976,740	560,821
Totals	\$7,616,121	\$7,581,288
Liabilities—		
Capital stock	\$7,574,425	\$7,574,425
Accounts payable	31,696	6,863
Floating debt	10,000	.....
Totals	\$7,616,121	\$7,581,288

August Copper Figures.

During August American copper producers generally increased production over the previous month. Production figures of some of the companies are given as follows:

	August.	July.
Miami	4,698,795	4,310,000
East Butte	1,849,120	1,893,120
Anaconda	28,800,000	28,200,000
Inspiration	11,450,000	11,300,000
Kennecott	10,200,000	10,750,000
Old Dominion	3,600,000	3,852,000
Greene-Cananea	5,000,000	4,600,000
Arizona Copper	4,800,000	4,400,000

Miscellaneous Companies.

The Kerr Lake Mining Co.'s August production of silver was 244,020 ozs.

The Schumacher Gold Mines, Ontario, reports for the 9 months ended with June 30, 1916, as follows: Tons milled, 30,120; operating cost, \$131,719.42; bullion produced, \$161,949; net profit, \$30,229.59.

The Tonopah Belmont Mining Co. reports for July as follows: Number dry tons milled, 11,828; ounces gold bullion produced, 2413.706; ounces silver bullion produced, 235,045.16; net profit for July, \$107,000.26.

The McIntyre Porcupine Mines, Ltd., reports for the quarter ended June 30, 1916, as follows: Tons milled, 30,452; gross value, \$252,530.35; recovery, \$241,650.05; operating costs, \$128,847.36; operating profits, \$112,802.69; from treating custom ore, \$9262.15; total, \$122,064.84.

The semi-annual report of the Chief Con. Mining Co. shows a balance on hand July 1, 1916, of \$381,589, compared with \$210,340 on Jan. 1, 1916. Two dividends were paid calling for \$88,282. In the 6 months shipments were 8,450,932 lbs. lead, 519,798 lbs. zinc, 1795 lbs. copper, 843,535 ozs. silver and 5225 ozs. gold, showing net profit of \$355,701.

The Tonopah Mining Co., in its report of net earnings for the month of July, shows that a profit of \$26,763 was made during that period. Though this amount is still far below normal, yet a substantial increase is shown over the earnings as reported for June, which were \$19,950. Operation resulted as follows: Dry tons milled, 8019; average value per ton, \$12.40; gold and silver bullion shipped, 111,565 ozs.; total value of bullion, \$94,485.

Despite the chaotic conditions in Mexico there is every reason to believe that the Greene-Cananea Co. will have a record-breaking year in 1916. The company rounded out the first half of the year with an output of close to 30,000,000 lbs. of copper, by all odds the best showing ever made in a similar period. The big improvement in condition in the vicinity of Cananea is shown by the fact that in the entire 1915 year the plant worked only 151 days and produced only 16,000,000 lbs. of copper. In 1914 the output amounted to about 21,800,000 lbs. Greene-Cananea has a normal capacity

of 60,000,000 lbs. a year, although in March, April and May the property showed its ability to better this rate, with the result that below-normal output in January and June was wholly offset. Costs have recently been averaging about 11 cts. per pound, which with a 60,000,000-lb. output and a 25-ct. copper market would produce net of \$8,400,000 per annum, or \$18 per share on 474,100 shares outstanding. Barring some unforeseen contingency, therefore, there seems every reason to expect at least a continuance of Greene's present dividends of \$8 per share per annum.

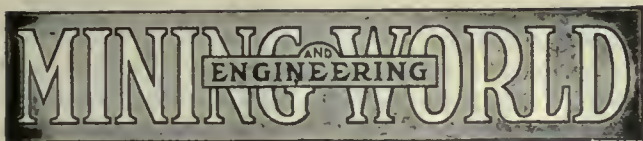
The Kennecott Copper Corporation has declared its regular quarterly dividend of \$1.50 a share, payable Sept. 30 to stock of record Sept. 18. Three months ago \$1.50 was declared; initial dividend of \$1 was declared 6 months ago. After the Kennecott meeting the following statement was issued: "At this meeting a statement was submitted showing cash, short time notes and copper on hand, all of which copper has been sold, amounting to \$22,058,000, but this does not include Kennecott's interest in cash and copper on hand of Braden Copper Mines Co. or Utah Copper Co."

After the payment of dividends on Sept. 30 of \$6.25 a share the Butte & Superior Mining Co. will have approximately \$2,000,000 cash in its treasury. Quick assets should approximate \$5,000,000. The company now has outstanding 290,197 shares, of which 17,500 were recently issued for 35,000 shares of common stock of the American Zinc, Lead & Smelting Co. For the current quarter alone the advanced rate of \$1.25 and extra of \$5 will necessitate the disbursement of \$1,813,731. Three months ago the 75-ct. "regular" and \$10 "extra" called for \$2,931,293 on 272,697 shares. Butte & Superior's output in August was 34,000 tons of ore producing 10,500,000 lbs. of zinc from 9600 tons of concentrates. Silver production was 200,000 ozs.

There is every reason to expect that the Nevada Con. Copper Co. will produce at least 50,000,000 lbs. of copper during the last half of this year. During the first half 43,000,000 lbs. was produced. Earnings during the first half netted \$7,500,000, or \$3.75 per share on its 2,000,000 shares. With copper at 25 cts. per pound and above, coupled with Nevada's recently proved ability to speed up production to the present rate of 100,000,000 lbs. per annum, has caused a revision upward in estimates of the value of its shares. Of equal importance was the addition in the 1915 year of 9,500,000 tons to the company's ore reserves, bringing them up to 50,500,000 tons, the highest on record, notwithstanding that in that year ore mined also touched a new high mark.

The Ohio Copper Mining Co. stockholders' meeting, to be held in New York Sept. 15, is expected to result in plans being formulated for the rehabilitation of the company. The Ohio Copper Mining Co. was adjudicated a bankrupt in September, 1915. The mortgage of the company securing the issue of bonds to the extent of about \$1,242,000 was foreclosed upon a default of about 6 months' interest. The property was sold at public sale under the decree of foreclosure on Aug. 30 last at Salt Lake City, Utah, and purchased by the bondholders' committee for \$750,000. The right to redeem the property was also purchased by the bondholders' committee for \$40,000, but an order has been obtained from the Federal court staying the confirmation of the sale until Oct. 13.

There was produced by the Chile Copper Co. during the first half of this year a total of 19,724,385 lbs. of copper. These figures are the first of their kind to be published concerning this company. It has been decided by the management to issue monthly reports of production hereafter. In carrying out the proposed plan for enlargement of the plant new financing will probably have to be arranged. No decision has actually been reached as to the form of new securities to issue, although \$10,000,000 has been mentioned as the amount to be raised. Up to the end of last August there had been spent on construction and equipment \$13,000,000, since which time no financial statement has been made public. The company has outstanding \$95,000,000 capital stock, and \$15,000,000 convertible 10-year 7% bonds. The floating debt last August was about \$5,000,000. Plans of the management call for a plant which will eventually handle 30,000 tons of ore daily.



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*Illustrated.

August Copper Figures.

It was generally expected that copper production in August would show an increase over the record production in May when 190,000,000 lbs. was outputted. Production, however, fell below 160,000,000, due to various causes.

Not only were refinery operations cut down, but production at smelters was retarded largely on account of slow deliveries of equipment, chiefly electrical machinery. This was reflected in smaller shipments of blister product to the refining points. Not much before the end of October do producers look for much improvement or an increase in marketable copper.

While negotiations for a big tonnage of copper to be shipped to the allied governments during the first half of 1917 came to naught during the past week, it did not prevent the placing of further orders for foreign account for metal to be shipped to individual manufacturers abroad. It also came to light that there has been a large buying movement for finished material, of which copper is a base, against which domestic manufacturers either have already or must soon lay in supplies of raw material.

That the 1917 production will be well cared for as to demand and price is the opinion of a representative of one of the largest agencies in the country who claims that domestic and foreign consumers will take all the increased 1917 copper production at 27 cts. a pound and higher. He continues:

"Sales are now being negotiated for a heavy tonnage of the first quarter of 1917 metal at prices ranging from 27¼ to 27¾ cts. a pound, the exact price hinging on the delivery month. From present indications it appears that contracts shortly will be placed for the biggest part of the copper available for delivery before July at better than 27 cts. a pound."

Large dealers and sellers generally are sanguine over the outlook, agreeing that all copper available for this year's delivery soon will be eliminated from the market.

Record Payroll for Butte.

With the average price of copper for August above 25 cts. Butte miners will enjoy a \$4.50 a day wage scale, which will result in their receiving a total of \$2,350,000, the largest amount ever paid to the miners of that camp.

August, with 31 days and only four of them Sundays, will show the largest number of shifts ever worked in the mines of the Anaconda. While the exact amount of the payrolls has not been determined, very close estimates have been given out.

The estimate of the mine payroll of the Anaconda Co. alone is \$1,630,000. The July roll was \$1,520,-

500. This shows an increase of over \$100,000 for this company alone.

The increase in Anaconda and Great Falls at the smelters and reduction plants will also amount to a large sum. The Anaconda rolls of the company are estimated at \$606,400 as compared with \$587,100 for July. At Great Falls the company's payrolls for August will be approximately \$280,750. The July payrolls there were \$290,400. The decrease was due to the completion of construction work.

The Butte & Superior Co. will pay about \$230,000 for August, compared with \$258,000 in July. The decrease was due to the 10-day shutdown—the result of an accident in the shaft.

The East Butte Co. payrolls for August will exceed \$130,000 as against \$128,000 in July.

The North Butte payrolls for August will be close to \$165,000 as against \$144,335 in July, an increase of over \$20,000 and almost alone making up for the decrease in the Butte and Superior rolls.

The Elm Orlu Co. will pay for August about \$40,000 and the Timber Butte Co. about \$30,000, or a total for these two Clark companies of \$70,000, as against about \$65,000 in July.

The payrolls of the Davis-Daly, Tuolumne, Colusa, Leonard, Butte Great Falls, Butte & London, Butte & Zenith City, Greater Butte and other companies, will add over \$100,000 more to the mine payrolls of Butte.

The mining industry alone will pay out in Butte \$2,350,000. The payrolls of Anaconda and Great Falls in the mining industry will add \$900,000 more to it, making a total for the mining industry alone of \$3,250,000.

Placer Mining of Today.

Placer mining in the pioneer days of the west meant rich deposits contained in limited areas, usually a narrow gulch, presumably close to the source. Values were sufficiently high in coarse gold to make a good return even with the primitive methods at that time. This was what might be termed the "cream of mining," and was the source of many stories of romance and crime; also the foundation of a large number of fortunes. It, however, peopled the west and was the basis of an industry which has added billions to the world's wealth.

Time came, however, when values would not return a profit by hand work, or even by the later hydraulic methods, and mechanical effort as represented by dredging, was successfully developed. This development neglected one class of deposits, however—the shallow, moderate value placers, too lean for hand work, without dump or water (either or both) for hydraulic work, and, out of consideration for dredging, frequently containing black-sand values which must be recovered to make operation profitable and quite as often carrying values in fine gold not

recoverable by well-known methods. Their shallowness and usual location makes dredging out of the question, so that all told a problem was apparent, but it is only within very recent years that this has been recognized, or that satisfactory results have been obtained in solving it. One of the most potent causes of this situation is failure due to lack of realization of conditions as shown by the continued fruitless attempts to apply the early methods, apparently forgetting that they were inefficient even when financially successful. Either this, or the worst sort of negligence in the preliminary investigation, and there is ample evidence to show that this has been often the trouble. There is something wrong when a method will be duplicated on ground in the same region after the first has most signally failed.

With very excellent results as encouragement, it is surprising that some lessons have not been learned earlier from the development of milling methods. Placers are in substance deposits of free metal on which the crushing and grinding has been done by nature's efforts, leaving concentration and recovery as the necessities to make a realization.

With its quarterly dividend payment of \$20 per share Sept. 22, the Calumet & Hecla Mining Co. will have paid already in 1916 \$5,000,000. Since its first dividend in 1892 this company has distributed among shareholders the enormous sum of \$134,250,000, or \$1342.50 per share, a return equivalent to approximately 1970%. The company has not missed a year in paying dividends, the largest year's total being in 1899 when \$100 per share was paid. The smallest was in 1894, when a total of \$15 per share was paid.

One of the achievements of American chemistry, to be demonstrated at the forthcoming Chemical Exposition to be held in New York, is the manufacture of porcelains by American pottery manufacturers. Heretofore our supply of porcelain was largely furnished by Germany, but with the outbreak of the war this source was cut off, and it was up to American chemists to get busy. This they have done with the result that the manufacturers are turning out a product fully equal to that of any produced in Germany.

An interesting compilation has been published showing the source of revenue (dollars) of American railroads. The mines are credited with contributing the greatest amount, 23.86 cts. Passenger traffic is next largest with 22.20 cts. Other income is given as follows: Manufacturers, 15.10 cts.; agriculture, 11.72 cts.; forest, 7 cts.; merchandise, 4.32 cts.; animals, 4.15 cts.; miscellaneous freight, 3.32 cts.; miscellaneous passenger, 3.99 cts.; express, 2.37 cts.; mail, 1.97 cts.

From Montana comes a report that a campaign will be instituted soon by the United Mine Workers of America for a national shorter workday, either for 7 or 8 hours from "bank to bank," that is, from the time the men enter a mine until they emerge.

PERSONAL.

Captain Jas. Hoatson of Calumet, Mich., is in Chicago this week.

A. H. Gracey, former mine operator of Nelson, B. C., is now in Kingman, Ariz.

A. E. Drucker, consulting engineer, formerly of London, has removed to New York.

Norman C. Stines, mining engineer, will remain in Polevskoj, Siberia, for another 3 years.

J. C. Bjorn, superintendent of the Copper Giant Co., Clarks Fork, Idaho, is in Chicago.

Frank L. Sizer, superintendent of the Mascot Copper Co., Dos Cabezas, Ariz., is in Butte, Mont.

B. L. Thane will remain as general manager of the Alaska Gastineau Mining Co., Juneau, Alaska.

Nelson Dickerman, general manager of the Pato Mines, Ltd., Barranquilla, Colombia, is now in Bolivia.

A. P. Coleman, University of Toronto, Ont., is now making professional investigations on the coast of Labrador.

Harry Guess, consulting engineer for the American Smelting & Refining Co., New York, is in Spokane, Wash.

A. S. Ross, president of the Pittsburgh-Idaho Co., Salt Lake City, has been visiting the property at Gilmore, Idaho.

F. J. Longworth, superintendent of the British Columbia Copper Co., Greenwood, B. C., has returned from Colville, Wash.

Walter Barrows, Jr., iron mine operator, Brainerd, Minn., has been elected president of the Thomas Iron Co., Easton, Pa.

F. O. Williamson, mining engineer, dealing in machinery, Chicago, has left for a tour of the west. He will be gone 3 months.

George W. Evans, consulting mining engineer, Seattle, Wash., is visiting eastern cities and on returning will leave for Alaska.

S. D. McDonald, owner of a large zinc property at Danby, Cal., is in Los Angeles on business connected with his property.

Chas. J. Walker, St. Louis, secretary and treasurer of Down Town Mines Co., Leadville, Colo., was at the latter place recently.

George B. Holderer, recent manager of the Furlough Development Co., Arizona, is now with the General Chemical Co., New York.

Charles Hayden and D. C. Jackling have completed inspecting the Alaska Gold Mines Co.'s property and have left for Seattle, Wash.

C. T. Lupton has resigned from the U. S. Geological Survey to accept a position as geologist with the Cosden Oil & Gas Co., Tulsa, Okla.

M. H. Kuryla is in charge of construction of the electrolytic zinc plant being built at Park City, Utah, by the Judge Mining & Smelting Co.

H. B. Sharps, assistant manager of the Big Casino property near Searchlight, Nev., is now in Philadelphia on business connected with that company.

F. B. Miller, Jr., of Searchlight, Nev., is at the Clarkdale smelter of the United Verde Co. arranging for the reduction of the copper ores now being produced by the Quartette mine.

S. G. Lilja, engineer with Hamilton & Hansell, Stockholm, Sweden, has returned from a trip to this country, where he was examining electric furnaces.

W. G. Miller and T. F. Sutherland of the Ontario Nickel Commission are in Sydney, Australia, and will return to Toronto, Ont., some time in October.

W. H. Eardley, general manager of the U. S. Smelting & Refining Co., in Kansas, has been in Salt Lake City, Utah, from his headquarters at Kansas City.

W. S. Grether, mining engineer with the Butte & Superior Mining Co., Butte, Mont., is superintending operations of the Hudson Bay mine, Salmo, B. C.

Samuel H. Dolbear, consulting engineer, San Francisco, has returned from a trip to New York and Washington, D. C., and is now at Grants Pass, Ore.

Ivan P. Tashof, instructor in mining at the University of Kentucky, has resigned and will locate with Byrnes, Townsend & Brickenstein, Washington, D. C.

Walter M. Brown, E. M., of Searchlight, Nev., is now in New York on business connected with the Dupont Copper Mining Co., of which he is the manager.

W. W. Wishon of Los Angeles has returned from an extended trip covering 2½ months through northern Nevada and central California on professional business.

Rod. Leggatt, one of the oldest of the old-time prosperous mining men of Butte, Mont., was a Chicago visitor this week. Although in his 77th year, Mr. Leggatt is unusually active and enjoys life to the utmost.

Rowland King, graduate of the Michigan School of Mines, has accepted the appointment of general superintendent of the mine and mill of the Highland Mining and Development Co., near Ashcroft, B. C.

Alexander Leggatt, who graduated with honors from the Michigan School of Mines, Houghton, Mich., and who has recently settled down as host at the Leggatt Hotel, Butte, Mont., was in Chicago this week.

William Scallon, at one time president of the Anaconda Copper Co., now a prosperous mining attorney at Helena, Mont., stopped off in Chicago, returning from a visit with a brother in Hancock, Mich., this week.

Matt W. Anderson left this week for Honduras, Central America, to make examination of a large placer property. He will be absent several months and during this time his address will be Catacamas, Honduras, Central America.

OBITUARY.

George W. Riter, mining engineer, Salt Lake City, Utah, died in that city on Aug. 20, 1916. He was born on Feb. 22, 1870, in Salt Lake. He was a member of the American Mining Congress, and an officer of the Utah Section of the American Institute of Mining Engineers. He attended the University of Utah and was graduated from the Stanford University, California, in 1896. He was secretary of the Eureka Hill Mining Co. for some years after graduation; was city engineer of Salt Lake from 1904 to 1906.

Edgar Dewdney died of heart failure Aug. 8, 1916, at his home in Victoria, B. C. He was 81 years old and was born in Devonshire, England. He received the degree of civil engineer from an English college and came almost immediately to British Columbia, this occurring about 1860, with the big excitement of the gold finds in the Cariboo district. He spent most of his life in the province and during his earlier years made trails through to some of the more important camps of the province. Among the more prominent companies with which he was affiliated is the Britannia Mining & Smelting Co.

SCHOOLS AND SOCIETIES.

Iron and Steel Institute, Great Britain.—The autumn meeting of the Institute will be held at the Institution of Civil Engineers, London, Sept. 21 and 22, 1916. The following papers will be submitted:

H. Brearly: "Some Properties of Ingots."

Professor E. D. Campbell: "Influence of Heat Treatment on the Thermo-Electric Properties and Specific Resistance of Carbon Steels."

Dr. H. M. Howe and A. G. Levy: "Heat Treatment of Eutectoid Carbon Steels."

J. N. Kilby: "Steel Ingot Defects."

Herbert K. Scott: "Manganese Ores of the Bukowina, Austria."

Dr. J. E. Stead, F. R. S.: "Influence of Elements on the Properties of Steel."

Dr. J. E. Stead, F. R. S.: "Notes on (a) Nickel Steel Scale. (b) On the Reduction of Solid Nickel and Copper Oxides by Solid Iron. (c) On Effect of Blast Furnace Gases on Wrought Iron."

G. F. Zimmer: "Use of Meteoric Iron by Primitive Man."

Iron and Steel Electric Engineers.—Central station power for steel mills, the operation of the Heroult electric furnace, the electric reversing blooming mill and portable electric tools in the iron and steel industry are among the subjects to be discussed at the coming annual meeting of the Association of Iron and Steel Electric Engineers, to be held at the Hotel La Salle, Chicago, Sept. 18 to 22, inclusive. Following a business session on Monday morning, Sept. 18, there are to be afternoon and morning technical sessions and plant visitations as follows:

Sept. 18, 2 p. m.: "The Value of Records to an Operating Engineer," by Ray S. Huey and "Cost Versus Upkeep of Direct-Current Motors," by A. M. MacCutcheon.

Sept. 19, 9:30 a. m.: "Central Station Power for Steel Mills," by the Central Station Power Committee, and "Design of Structures for Steel Mills," by Charles A. Randorf. Arrangements have been made to visit the power stations of the Commonwealth Edison Co. in the afternoon.

Sept. 20, 9:30 a. m. (joint session with American Institute of Electric Engineers): "Underground Distribution Systems," by George J. Newton, and "The Unaflo Engine," by Prof. W. Trinks. 2 p. m.: "Steel Conductors for Transmission Lines," by H. B. Dwight, and "The Advantages of Modern Types of Direct-Current Machines," by David Hall. 7 p. m.: Annual banquet and ball.

Sept. 21, 9:30 a. m.: "Mechanical and Electric Operation of the Heroult Electric Arc Furnace," by George W. Richardson, electrical superintendent American Bridge Co., Pensoyd, Pa., and "Operating Characteristics of an Electric Reversing Blooming Mill," by E. S. Jeffries, 2 p. m.: "Control of D-C and A-C Motors as Applied to Cranes," by Paul Caldwell, General Electric Co., Pittsburgh, and "Portable Electric Tools as Applied to the Iron and Steel Industry," by A. M. Andresen.

Sept. 22: Arrangements have been made to inspect the following steel plants: Illinois Steel Co. at Gary and South Chicago; American Sheet & Tin Plate Co. at Gary; Wisconsin Steel Co. at South Chicago, and Inland Steel Co. at Indiana Harbor.

pages of the report are on the mining and metallurgy of the metal with a small space given to discussing the metal's uses.

Petroleum Withdrawals and Restorations Affecting the Public Domain. Max W. Ball. Washington, D. C., U. S. Geological Survey. Bulletin 623; pp. 427.

The purpose and history of withdrawals is given, with a review of oil-land law. The correspondence relative to withdrawals and restorations is reproduced and precise information is given on the location of areas which have been both withdrawn and restored.

Coeur d'Alene Mining Information. By William Wagner. William Wagner, Wallace, Idaho. Book; pp. 174. For sale by Mining World Co. \$4.

For the greater part the book is a complete index of the companies operating in the district. In taking up each company separately the principal place of business, officers, owners and a brief description of the holdings and mine workings are given. Shipments made, but not showing the profits made, are given for some of the companies, while under another heading, including four pages, costs and financial statements of some of the companies are given.

A Study of the Inductance of Four-Terminal Resistance Standards. By Francis B. Silsbee. Washington, D. C., U. S. Bureau of Standards. Scientific Paper No. 281; pp. 52; illustrated.

The paper deals with the inductance of electrical resistance of less than 1 ohm. New methods of measuring alternate current require small resistances in the laboratory tests. Even very small errors in a standard would introduce serious errors in resulting measurements. This represents an important and practical contribution to precision measurements.

The Alaskan Mining Industry in 1915. By Alfred H. Brooks. Washington, D. C., U. S. Geological Survey. Bulletin 642-A; pp. 71.

This is the twelfth of a series of annual bulletins summarizing the results and important economic findings made during the year. Gold, silver, copper, tin, antimony, lead and mineral fuels are reviewed under separate headings. Separate reviews of the different districts are also given and a complete account of the law controlling coal mine and lands leasing is taken up. Inclusions of production statistics are made in various parts of the report.

Antimony Deposits of Alaska. By Alfred H. Brooks. Washington, D. C., U. S. Geological Survey. Bulletin 649; pp. 67; illustrated.

With the increasing demand for antimony this bulletin has been published and is not the result of field-examination entirely, but rather a bringing together of information from various sources. The presence of stibnite is known in 67 localities in Alaska and the first part of the bulletin deals in general with the geology of stibnite lodes. This is followed by more detailed descriptions of the districts, taken separately, among which the most important is the Fairbanks district. The information on this district was mostly obtained from recent investigation by the author.

Volume Effect in Silver Voltmeter. By E. B. Rosa and G. W. Vinal. Washington, D. C., U. S. Bureau of Standards. Scientific Paper No. 283; pp. 11; illustrated.

This paper is a continuation of the Bureau's researches on the silver voltmeter, which is the primary standard for the measurement of the international ampere. It has been found that when the electrolyte for the voltmeter is not sufficiently pure that the deposits in the large voltmeters are in excess of those in the small voltmeters in series with them. This phenomenon has been called the "volume effect." The present paper shows that this effect is due to the impurities of the electrolyte and not to other causes, as was thought by several previous observers. It is also shown that the effect is the same in all forms of the silver voltmeter which the Bureau has tested. A theory to account for the effect is given. This phenomenon affords a valuable criterion of the purity of the electrolyte used in the voltmeter.

NEW PUBLICATIONS.

Platinum and Allied Metals in 1915. By James M. Hill. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 1:6; pp. 19.

Production, imports, market conditions and prices make up the material for the first part of the report and covers United States and foreign countries in general. Brief descriptions and notes are then given on different mines of the world. For foreign countries these are classified by the country in which the mine is located, while in the United States the classification is made by states. The concluding

Progress Made in the Manufacturing Industries

A Hyatt Departure.

The time is fast coming when all through the industrial world the truth of the anti-friction proposition will be accepted, just as it has been accepted by the automobile builder. Mine operators in particular are realizing that haulage is fast becoming one of the most important problems that confronts them today. Old methods are giving way to new methods. Anti-friction bearings are getting the operator's attention, because they not only make an easier pushing or pulling of the mine car, but decrease oil and maintenance cost. Certainty of operation is also a big factor with a piece of machinery as well as meaning a great deal to the mine operator. Good anti-friction roller bearings have been tested under the most severe conditions—by far beyond ordinary practice—and they have stood up every time. To meet the conditions that will result from the above knowledge the Hyatt Roller Bearing Co. has changed its Commercial Sales Division to the Industrial Department, to be located at the company's factory in Newark, N. J. This change will result in the better handling of the company's increasing business.

TRADE PUBLICATIONS.

Pelton-Doble Centrifugal Pumps. The Pelton Water Wheel Co., San Francisco. Bulletin No. 9; pp. 6; illustrated.

In the text of the bulletin the construction, uses, applicability and features of the pump are brought out. Among these things are noted the uni-diffusion of the volute which it is stated makes possible a high efficiency. Another feature is the pump's over-hung pulley system, which is referred to as a convenience, together with the fact that the belt and direct connected types are interchangeable. In this way it is said that the pump can be belt-driven before electric power is installed and later connected to a motor for direct drive by removing the belt pulley and replacing it with half of a flexible coupling.

Burd Piston Ring Directory. Burd High Compression Ring Co., Rockford, Ill. Directory; pp. 180. Price 50 cts.

All the different makes of gasoline engines and appliances using engines have been assembled in this directory in tabulated form. In this columns have been made in which the year, make, model, rings per piston and number of cylinders are given. This tabulated data are completely indexed in alphabetical order according to the name of the engine maker or machine using a gasoline engine, including trucks, automobiles, separate engines for mine and plant duty, etc. In the concluding pages a review with diagrams is made showing how to install rings and explaining various other phenomena apt to be encountered.

Centrifugal Pumps. Terry Steam Turbine Co., Hartford, Conn. Bulletin 19; pp. 64; illustrated.

As a foreword it is stated by the company that the purpose of this bulletin is to set forth as impartially as possible the advantages and limitations of turbine-driven centrifugal pumps. In view of serving as a text on centrifugal pump design, operation and practice, the bulletin has filled its place as well as possible, for considerable unbiased information on this class of pumping practice and design is given. The Terry pumps are shown in sectional drawings, views and illustrations of plant installations. The use of centrifugal pumps for various classes of work is discussed separately for the different classes. Complete layouts for pumping systems and plants using turbine-driven centrifugal pumps are shown.

The Belt Book. By A. Eugene Michel. Cling-Surface Co., Chicago. Book; pp. 92; illustrated. Price \$1.

A treatise on the scientific care of belts, transmission ropes, etc., is the subject on which the text dwells. The book is a trade publication only in that where belt dressings, etc.,

are spoken of products of the Cling-Surface Co. are mentioned. Many illustrations are shown of installations in connection with the text. Curves on which the results of tests have been plotted are reproduced and diagrams are given to clearly bring out correct practice and the reason for preference to various particular methods. Tests made to show the results obtainable with Cling-Surface treatment are reviewed and in all cases specific data are given. Besides this simple methods which may be used for testing in a practical way at the plant are described.

INDUSTRIAL AND TRADE NOTES.

H. V. Croll, sales engineer for Traylor Engineering & Manufacturing Co., Allentown, Pa., recently visited San Francisco, stopping at Salt Lake en route east.

A Jeffery Quad truck of 2½ tons capacity, together with a 5-ton trailer, have been received by the Judge Mining & Smelting Co. to haul gravel to its new zinc plant at Park City, Utah. They will be used later for hauling ore, as it is thought that they can be run all winter.

On account of change from steam to electricity, the steam power plant of the AV plant of the American Smelting & Refining Co., at Leadville, has been purchased by the Morse Bros. Machinery & Supply Co., of Denver, Colo., and will be removed to their Denver warehouse for resale.

The Cutler-Hammer Mfg. Co., Milwaukee, owing to its steadily increasing Eastern business, has leased larger offices in New York city. The new offices are on the nineteenth floor of the Hudson Terminal, 50 Church street, the space being nearly double that previously occupied. W. C. Stevens is manager of this office.

The Crocker-Wheeler Co., Ampere, N. J., announces that its San Francisco district office, of which W. K. Brown is manager, has been removed from the Crossley building, 619 Mission street, to the ground floor of 87 New Montgomery street. A large assortment of motors, generators and transformers will be carried in stock for the convenience of Pacific coast buyers of electric equipment.

The General Testing Laboratory has been organized to do a general chemical and physical testing and metallurgical investigation business with offices and laboratory at 1122 Grand avenue, Kansas City. Their newly equipped laboratory is in charge of and under the personal supervision of A. C. Lyon, B. S. Ch. E., who was for ten years chief chemist and vice-president of the Kansas City Testing Laboratory Co. of Kansas City. Previous to this Mr. Lyon was with the Carnegie Steel Co., expert chemist of the War Department, and instructor in chemistry, University of Missouri. The new company is prepared to test and analyze asphalt, cement, metals, alloys, coal, paints, and dgeneral physical tests.

An order for the electrical equipment for a big new mill and two sub-stations of the Alaska Juneau Gold Mining Co. at Juneau, Alaska, has recently been received by the Westinghouse Electric & Mfg. Co. of East Pittsburgh, Pa. The order, which covers every piece of electrical apparatus required for all operations from the time the ore is taken out of the mine to its transition into pure gold, includes: Two, 300 kw. rotary converters with transformers; two 18-ton tandem locomotives; two 400-hp., thirteen 225-hp. and thirteen 150-hp. induction motors; two 350-hp. synchronous motors and exciters, two 300 kva., synchronous motors; fifteen smaller motors; one 100-kw. motor-generator set, and a 17-panel switchboard. The order represents the equipment for only a first section of a mill. When complete the mill will be four times its present size and will be the largest, most complete, and most modern installation anywhere in America.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Skagway.

Under Supt. J. E. McFarland a force of 14 men are working at the Venus mine. Promising shipments have been made. Under the present working conditions McFarland reports that shipments will be made at least every 2 weeks. The miners are working stopes from the main tunnel, which has been drifted in 2000 ft. Present plans call for the installation of modern machinery. At present the ore is shipped in sacks, but later it will be possible to ship in bulk.

Seward.

The Reynolds-Alaska Corporation has been incorporated in Alaska with 1,000,000 shares and no par value. The stock is all treasury and is being sold at \$5 per share in blocks of 20 shares or more. The corporation can engage in any form of enterprise except banking. At present the company will acquire developed and partially developed property under perpetual lease, with the royalty not to exceed 15%. The properties are the Iron Mountain mine, Horseshoe Bay and the Wilson-Little mine, Wilson Bay, both on Latouche island. The Sulphide gulch and Trout bay mines, also under the same control, are included in this lease. Copper-sulphide ores now blocked out on the several properties are estimated at 800,000 tons. At present the company proposes to raise \$250,000 from the sale of stock. This will be used to erect a pyritic smelter near Seward. It also intends to make application for coal lease in the Matanuska field and mine its own fuel. The coal can be brought from this field over the new government railroad.

Nome.

The Pioneer Mining Co. has cleaned its hydraulic elevators at the Fox-Brown claim on Kattie creek, and announced the total at \$200,000. Five elevators are working full time, and work will be begun at once on the Fox-Portland benches.

The cleanup on J. C. Brown's discovery claim on Little creek yielded \$200,000 in gold. Machinery has been installed and the old workings are being mined over again. It has been reported that there is plenty of water in the district this season and that operations are extensive.

Ketchikan.

At the Goodrow mine near Kasaan work is progressing. S. J. Goodrow states that at his place 10 men are employed, or will be as soon as he can secure that number. A survey of a water power has been made, and the owners have made plans to install a mill soon. The last 30 days over 900 tons of good ore have been shipped and he has several hundred tons more to ship from the present level. This must be accomplished before another machine can be put in to work with advantage.

ARIZONA.

Bisbee.

As a result of churn drilling, which has been in progress for some time, a large ore reserve has been blocked out by the Copper Queen on Sacramento hill. The tonnage estimate is from 9,000,000 to 12,000,000. A new 2500-ton concentrator is being considered. For mining four systems have so far been considered. Top sluicing has been in use at the Czar and is very practicable in the mining of big high-grade ore bodies. This method is also used at Miami. Another method which has been considered is the shrinkage caving

system, in use at Ray. The Inspiration system breaks the ore from inclined raises into chutes. The raises extended like the branches of a tree into a body of ore and the rapidity with which ore may be taken out accounts for the large production of the Inspiration Co. Last is the steam shovel method. There is a considerable overburden which must be removed from the ore bodies, and another drawback is the irregularity of the bodies.

Globe.

Superior & Boston is down with its shaft about 60 ft. from the 12th level and is progressing with the sinking at the rate of 75 to 100 ft. a month, through diabase; its goal is, of course, the 14th level. As all of its neighbors to the east—its operations being next to its eastern boundary—the Arizona Commercial, Iron Cap or National, and the Copper Hill are taking out ore at a good profit at the 14th level or higher, there seems not to be any doubt but that the Superior & Boston will run into it in its descent. The Arizona Commercial is said on good authority to be earning at the rate of \$60,000 monthly and the Iron Cap's profits will run to \$25,000 to \$30,000 for the same period. The New York buying a short time back, which originated with some New York parties who visited Globe and inspected this mine, has been continuing, and it comes from a reliable source, that some of the Phelps & Dodge people have been among the purchasers.

Mayer.

The Silver Belt mine, one of the oldest properties in Yavapai county, is shipping ore to the plant of the Gray Eagle Reduction Co. at Mayer. In fact, the Silver Belt mine was the first patron of that recently established reduction works. The ore shipped is complex and runs about \$25—principal values being lead, silver and zinc. The large tonnage of ore on the old dumps at the Silver Belt is first to be marketed.

Sheelite ore having a value of \$340 per ton, exclusive of silver and gold contents, was recently discovered in the Flora mine in the Hassayampa country. The find was made in the face of a 200-foot tunnel and is said to present unmistakable indications of permanency. This tunnel is to be extended 200 ft. further into the hill, where it will have a depth from surface of 300 ft. on the vein. The owners of the Flora, Valentine Albarrado, John Bernard and Louis Bernard, have been working the property for the past two years as a silver proposition with considerable success. It is located near the old Mescal millsite, about 10 miles south of Prescott.

Crown King.

Colorado Springs capital is interested in the development of the property of the Montezuma Mining Co. in the Bradshaw mountains, near here. The acreage has an excellent mineral-showing, and the Coloradoans have supplied sufficient money to open it at depth and to provide the necessary mine machinery. A camp is being established and a dozen camp buildings are under construction. J. P. Waldron, a former Colorado mining man, is in charge of the company's affairs. The Montezuma property had been undergoing development for 8 years before the present outfit became identified with it, and during that time large and valuable silver-gold ore bodies were opened up. These ore bodies, aside from their precious metal contents, carry pay values in lead and zinc. Among the improvements the management has in view is a reduction plant. David Gemmill of the Randolph-Gemmill Reduction Works at Crown King has solved a treatment by flotation for the base ores of that section and is utilizing it with success at his plant.

The Gemmill improvement to the oil-flotation process has, more than any other single factor, been instrumental in the renewal of mining operations in the Bradshaw moun-

tains. High-grade ore has in the past been the rule rather than the exception in the mines throughout the Bradshaws, and now that a treatment adapted to the sulphide ores disclosed on their lower levels has been evolved, many of the old-time producers are again on the active list. Among them are the Crown King, Wildflower, Fairview, Nelson, Lincoln, Tiger Gold, Tiger Silver and War Eagle-Gladiator. During the heyday of their prosperity these and other mines in the Bradshaws produced ore carrying from \$250 to \$1000 per ton in silver and gold.

A camp has been established at Hell Hole by the Algonkian Mines Co., a corporation which is backed by Philadelphia capitalists. Work is being prosecuted under the supervision of A. J. Heath, a former Utah mining man. The company's holdings were originally developed by the Shurtleffs and resulted in the opening of commercial ore in considerable tonnage. The property lies a few miles to the east of Crown King station. The plans of the company include the building of a narrow-gauge railroad to connect with the plant of the Randolph-Gemmill Reduction Co. at Crown King.

Jerome.

Four Jackhammers and two shifts of miners are employed in deepening the shaft on the property of the Jerome-Portland Co. The shaft has at present a depth of 110 ft. and is being sunk at the rate of 3 ft. per shift. Yellow sulphides are frequently encountered. The hoist, compressor and other mine machinery recently installed are working satisfactorily.

The mill on the Copper Chief Co.'s property is treating 130 tons of gold ore daily and is making an excellent recovery of values by means of the cyanide process. The company will resume shipments of copper ore to the Humboldt smelter as soon as the sampling works at that plant is rebuilt. The latter was recently destroyed by fire.

A dozen camp buildings are under construction near the site selected for the main working shaft on the property of the Green Monster Mining Co. The buildings include two bunkhouses with accommodations for 40 men, boarding house, storehouse, office building, residence for the superintendent and a clubhouse. The new shaft will be sunk on the diorite side of the main contact about 300 ft. distant from the Revenue tunnel. The work will begin just as soon as the machinery, now en route to the property, has been installed. It is expected to deepen the shaft at the rate of 125 ft. per month.

CALIFORNIA.

Jackson.

The leading mining companies of Amador county have posted a notice warning the miners that a general strike will be the signal for the closing of all the mines for an indefinite period. This includes the Argonaut, Bunker Hill, Kennedy, South Eureka, Central Eureka, Plymouth Con., Original Amador and Keystone properties. It is stated any further advance in wages is beyond consideration, as many of the companies are operating on small profit margins. The labor leaders demand \$4 per day for miners, \$3.75 for muckers, and that all mines be entered and left by the men on the time of the company. The more conservative leaders assert that no strike is contemplated at present.

Placerville.

The Mt. Pleasant Mining Co. has been reorganized under the title of the Grizzly Flat Mining Co. with a capitalization of \$250,000. New York people are stated to be interested. The mine has been opened to a depth of 1100 ft. by a shaft and good ore is said to be exposed on several levels. Under the new ownership developments will be vigorously conducted and a mill may be installed.

Weaverville.

Lessees are still operating the Union Hill hydraulic mine of the Trinity Con. Co. and making good cleanups. Considerable water is still available and the present season is proving an exceptionally profitable one, the result of the heavy snowfall of last winter. It is understood the parent company will operate next season. At the La Grange a heavy yard-

age of excellent gravel continues to be hydraulicked. The company is commencing to repair its flumes and ditches and arranging for working of much new ground with arrival of winter storms.

Prospecting of placer ground for dredge mining continues actively along the Trinity and its tributaries. The Trinity Development, Pacific Dredging and other strong companies are particularly active. The Pacific Dredging and Valdor dredges will go into commission within a few weeks. Prospecting is particularly active in the Carrville, Lewiston and Weaverville fields.

Sonora.

The Little Wonder quartz mine has been bonded to John Hassell and associates of New York, and preparations are being made for comprehensive developments. The mine lies within the corporate limits of Sonora and adjoins the Faxon mine on the south. Some high-grade ore has been extracted, but the bulk of developed material is of medium grade.

Quincy.

It is reported that the owners of the Poormans Creek hydraulic mine have completed arrangements for resumption of activities after a long period of idleness. A large restraining dam is to be erected, the reservoir enlarged, and other work completed. The mine formerly ranked among the leading placer producers of the state.

Yreka.

The owners of the Eliza mine are planning to work the property along broader lines. On No. 5 level, in 1700 ft., a large amount of free-milling ore has been disclosed and it is planned to drive a lower tunnel and open the ore bodies to better advantage. Approximately 70,000 tons of ore averaging fully \$5 have been blocked out. Equipment includes a 10-stamp mill, and it is probable that the capacity of the plant will be largely increased. The property is owned by R. H. De Witt, A. E. Junker, and W. B. Shearer of Yreka. O. H. Lawson is manager.

Grass Valley.

The California mine is being reopened under supervision of E. C. DeGolyer and equipment will be installed as soon as possible. The property was recently taken under bond by King C. Gillette for \$80,000, the payments to be made in three annual installments.

The old mining camp of You Bet was recently visited by fire and practically destroyed. The You Bet placer mine is still operated by a Chinese company, working under leasing arrangements with the Colorado owners. The gravel is worked by the drift method.

Quincy.

Heavy shipments of chrome ore are going out from the Onion Valley district, and from the vicinity of Claremont. W. T. Baldwin of Oroville and associates are interested in the Claremont deposits and contracts have been signed for immediate shipments. While a number of deposits throughout this section have proven shallow, a few are of more persistent type. Motor trucks and mule teams are hauling to stations on the Western Pacific railway.

Downieville.

The channel recently intersected in the White Bear mine is steadily widening as its dip is followed, and the gold is becoming coarser and more plentiful. In the drift from the main raise the channel is 2 to 3 ft. wide and arrangements have been made to sink a winze. Two shifts are engaged.

The ledge in the City of Six mine has been tapped and work is proceeding to demonstrate its value and extent. As soon as this has been done a lower adit will be extended and lateral work pressed. The tunnel was extended 111 ft. in hard serpentine in 26 days, with only one shift employed at times. Sol Camp is in charge of operations.

COLORADO.

Cripple Creek.

In reviewing operations for the district during August the mill of the Portland Gold Mining Co. reported an in-

crease of 1000 tons over July, and this ore was \$1.50 a ton higher value. The Independence mill treated 2400 tons more ore than in July. This plant is closed down temporarily and will remain closed until the proposed improvements are completed. It is planned to double the capacity of the Independence from 600 tons to 1200 tons. The mill and the new sampler will start up at the same time. It is expected operations will be resumed at the mill and the sampler about Jan. 1. The Caley mill, located on the property of the Jerry Johnson Mining Co., resumed treatment in the closing week of July and was operating steadily all through the month. The plant treated 60 tons per day of low-grade mine and dump ore from the Jerry Johnson. The Ironclad Hill mill of the Rex Gold Mining Co. resumed treatment last month and tested the low grade ores on its property, with profitable results. Both the Reed and the Worcester mills were shut down for some time during the month, due to breakdowns. The closure, however, was but temporary and both plants are again in operation. The Wild Horse mill of the United Gold Mines Co.; Isabella mill, Isabella Mines Co., and the Blue Flag Gold Mining Co.'s mill remained inactive. The ore production from the active mining properties totaled 95,268 tons with a gross bullion value of \$1,294,343.52. The average value of all ores treated was \$13.60 a ton. As compared with the July figures, material increase is shown in both tonnage and valuation, amounting to 10,368 tons and \$109,936 in value. There was but slight difference in the average value of the ore treated, the July ore averaging \$13.96 and the August valuation \$13.60.

The Roosevelt tunnel broke previous records during August when 437 ft. were driven. The former record of 400 ft. was made in dry ground where within the ground now being worked is extremely wet. The main shaft of the Golden Cycle mine is the terminal point of the tunnel and is 6400 ft. east from the present heading, which heading is now 1294 ft. east of the Elkton Con. main shaft. T. R. Countryman, Deputy U. S. Mineral surveyor, gives his report for August as follows: During the month 27 days of three shifts each were worked. Some delays occurred on account of accidents in the Elkton shaft. The breast of the tunnel is now 1294 ft. east of the Elkton main shaft. It is still in the Comstock lode and about under the easterly side line of the Fido lode. At a point about 30 ft. from the breast a small vein was cut running N. 49 30 W. and dipping west 77°. A short distance west of it a phonolite dike about 15 ft. thick was passed through, running N. 35 30 W. and dipping about 72°. The country rock is a very hard, tough, fine-grained breccia, requiring usually about 30 holes to a round. No additional water courses of any consequence have been encountered. The total flow from the portal is now 10,350 gals. a minute.

Telluride.

Ore shipments for August, 1916, was 19 cars greater than 1915. Last month the shipments were: Tomboy, 45 cars; Smuggler, 32 to Durango and 20 to Blende, a good part of which was Black Bear ore; Liberty Bell, 19 cars; Columbia Leasing Co., 2 cars; William Anderson, 1 car; total, 129 cars, nearly all of which were concentrates.

The management of the Matterhorn Mining & Milling Co. is timbering a crosscut on Butterfly ground, through which it intends driving on its property later. This crosscut is now in over 4000 ft., and the Matterhorn expects to drive in another 600 ft. to open one of its leads.

The Highland Mary Mining Co. struck 2 ft. of good shipping ore in their property on Swamp canon, near Ophir.

Leadville.

A large body of iron-manganese ore has been uncovered at the Jason mine. Ore has been opened in several places and assays from 21 to 25% manganese and 27 to 30% iron, with only a small percentage of silica. The stope has been opened in places to a width of 10 ft. and is increasing in dimensions. Preparations are being made to produce a large and steady tonnage, which has been contracted for by the steel works at Pueblo. It is reported that an output of 50 tons daily will be maintained. The ore was opened on the 250 level, where a drift cut the shoot after driving 50 ft. It appears that the drift cut into the middle of the ore, as its

boundaries have not been definitely determined as yet. The property had been idle a few weeks. The shoot is an entirely new one.

IDAHO.

Wallace.

According to rumors circulating both locally and in the Coeur d'Alenes, the Tamarack & Custer Mining Co. has purchased the Frisco mill, near Gem, from the Federal Mining Co. and will take possession immediately. No authoritative confirmation of the report is obtainable from either the Federal or the Tamarack & Custer managements, but the belief prevails generally that the deal, pending for several weeks, has been closed. To connect the Tamarack & Custer workings with the Frisco mill a 3-mile aerial tramway, traversing the divide between Nine-Mile and Canyon creeks, will have to be installed, but it is said that plans for the carrier already are prepared, and that construction can begin as soon as material is assembled. The Tamarack & Custer properties have been closed down for several weeks, following the surrender of the Rex mill and tramway to the Rex Con. Mining Co., and it is believed that every effort will be made by the management to get production inaugurated again as soon as possible. The Tamarack & Custer Co. has been treating its output in the Rex mill, which it had under month to month lease, and the tramway had been removed to connect the Tamarack & Custer workings with the plant. The carrier now is being restored to its former location, and reports received recently from President M. J. Sweeney of the Rex Co. state that the mill has been overhauled in preparation for treating the Rex ores, and that shipments probably will begin by Sept. 15.

At the first annual meeting of the reorganized Vienna-International Mining Co., held recently in Wallace, Dr. Charles R. Mowery, mayor of Wallace, was chosen president; A. H. Featherstone, vice-president, and R. A. Marshall, secretary-treasurer, the two last named also of Wallace, and Frank C. Bailey of Spokane, general manager. The holdings of the company, recently acquired by Bailey and his associates, are in the Placer creek district of Shoshone county, and the new owners are planning extensive development as soon as a compressor plant and power equipment, already ordered, are installed.

Recent reports state that three large ore shoots have been developed in the Ray-Jefferson mines, and that a fourth is being opened. The reserves are said to be sufficient to assure steady production when active operations are begun. The 450-ft. raise, connecting the No. 1 and No. 2 levels, was finished last week, exposing 12 ft. of ore, with only one wall in sight.

The Hercules mine, the premier silver producer of the northwest, closed down for several days, has resumed production on the 5th on a small scale, but the output will be increased to the normal rate as soon as new and larger electric transformers are installed in the concentrator. The old transformers are being removed to the new mill being constructed at the confluence of Beaver and Carbon creeks by the Ray-Jefferson Mining Co., and which will be ready to operate soon.

Kellogg.

The net earnings of the Caledonia Mining Co. were \$287,932 for the quarter ended June 30, according to report of Secretary Charles McKinnis, mailed to stockholders with the monthly dividend checks on Sept. 5. Dividend disbursements for the 3 months were \$234,480, leaving the surplus for the period \$53,453. Shipments during the 3 months were 4079 dry tons of ore and concentrates having a gross value of \$435,346, made up as follows: Lead, 2,574,680 lbs., \$188,146; silver, 294,242 ozs., \$200,578; copper, 167,233 lbs., \$46,622. Smelter deductions for freight and treatment totaled \$110,927, making the net smelter returns \$324,419. The operating cost was \$36,486, of which \$29,726 was for mining, \$5852 for milling and \$907 for shipping. Regarding mining operations during the quarter the report says: "Since our first quarterly statement, issued May 1, we have continued the development

work on the Keating tunnel level. So far this has been unsuccessful. We have found neither the ore nor the vein. We propose to continue the search so long as there is a possible chance of success. Since our former statement there has been no development that would justify us in changing the estimate made at that time of the probable future of the mine." According to the statement made by the company in May, there was nearly two years' ore in sight and could be expected to continue the payment of 3-ct. dividends for 7 months, after which, perhaps, the dividends would be 2 cts. a month for another year.

The vein in the Highland-Surprise mine has been recovered beyond the Big creek fault, where the Surprise lead was lost a number of weeks ago, and a report from President W. W. Papesh of the Highland-Surprise Co. states that the conditions are much better than at any previous period of development. The new shaft now is down about 40 ft., following an ore stringer 30 ins. wide, carrying 14% lead, 28% zinc and 10 ozs. silver. Diamond drilling has disclosed a 4-ft. vein 200 ft. below the shaft, and the sinking is being done to open this deposit. The mill at the property is operating 10 hours a day, and President Papesh states that the recovery has been increased approximately 33 1/3% since the new ball mill was installed.

Hailey.

The new 300-ton mill being constructed at the North Star-Triumph mine will be ready to operate about Oct. 10, according to Frederick Burbidge, general manager of the Federal Mining & Smelting Co., which recently acquired the property under lease and bond. The mine has been unwatered, and Burbidge states that the conditions in the lower levels are equally as good as those in the upper workings. A branch railway, connecting the Oregon Short Line system with the mine and mill probably will be constructed and operating in the next 5 months, the building costs to be borne jointly by the Federal and O. S. L. companies, but pending the installation of the line the output of the property will be transported to the shipping point, 6 miles distant, by wagons.

Adair.

Shipments from the Richmond mine, suspended last December, have been resumed, and two 4-horse teams now are hauling ore to the railway at Saltese, Mont., 5 1/2 miles from the property. Only the ore extracted in development is being forwarded, and two grades are being mined, the second-class, averaging between 5 and 6% copper and about \$10. gold, being sent to the Anaconda Copper Co.'s Washoe smelter, and the high-grade, running about 20% copper, is going to the British Columbia Copper Co.'s plant at Greenwood, B. C. "During the time that shipments were suspended development was continued, and from 12 to 20 men have been employed," said Charles Heidenreich, general manager. "We have a considerable tonnage in reserve, and we feel confident that we will be able to maintain shipments at the rate of a car a week to Anaconda, and a similar amount to Greenwood. The ore is being taken from an upraise from the main lower tunnel, now in about 1650 ft. and with a vertical depth of 400 ft., being driven to connect with the old surface shaft. We will have to raise about 280 ft. to make the connection, but the raise is in ore all the way and will provide plenty of material for shipments. The Richmond is one of the old properties of the Saltese region, and quite extensively developed. The forest fires that swept the district in 1910 destroyed the surface equipment, including the camp buildings, compressor plant and hoisting machinery, and the shaft was allowed to flood. I succeeded in associating new interests with me a number of months ago, and since then we have extended the underground system and have opened immense bodies of commercial ore."

LAKE SUPERIOR.

COPPER.

Houghton.

Ahmeek has found good grades of copper in the Kearsarge Conglomerate, which lies about 1500 ft. west of the Kearsarge amygdaloid, on which the Ahmeek mine is now

working. The width of the lode was about 30 ft. and the commercially mineralized part has a good width; the opening was made on the 10th level of No. 2 shaft, which is the northern of the two earlier shafts located at the south end of the property.

New Baltic has concluded the exchange for 10 acres that belong to the Johnson heirs which it desires for a shaft site. This final settlement of the negotiations that have extended over a period of several months is very advantageous to both parties. It is adjacent to the 2 acres purchased earlier in the year to the north. The company will begin to sink immediately the shaft to open up the property.

Cass' first diamond drill hole is now down over 1600 ft. The second hole is now being started so as to continue the crosscut over the strike of the Forest lode, on which the Victoria is now mining. Very little is known of the formations at this end of the series and much valuable geological knowledge is being obtained. Dr. L. L. Hubbard, formerly state geologist, and Supt. A. H. Menche, formerly assistant state geologist, have charge of the work.

Houghton Copper has about 110 ft. of good ground in the northern drift on the 12th level, the bottom of the exploratory winze on the Superior lode, this being the whole distance opened. On the West vein, where drifts have driven for about 60 ft., there is but little copper except in the one stretch of 20 ft. On the 4th level, where the Superior lode has recently been cut into by a drift, the showing is not now of commercial grades. The 6th level stopes are in fair ground.

New Arcadian is getting some excellent coarse-grade amygdaloid rock at the shaft on the newly found lode thought to be the Old Arcadian, which it is sinking from the 50-ft. level to the 100. The openings at No. 1 shaft are displaying good rock, especially at the 250, the 900 and the 1250 levels. The shaft at No. 1 is down over half way, or about 140 ft., to the 1500 level from the 1250.

Isle Royale has stopped its work of cleaning out the bottom of No. 1 shaft, so as to use all the men in getting out the rock; it has eight drills in operation, the most of them on the Portage lode. At No. 7 shaft, though it has been holed down to the 7th level, it has not been cut out to full size only to a short distance below the 4th level. In holing by means of raises it is cheaper to get through with a small passage as possible and then to widen out to the required width by breaking down the rock and using the passage as a shoot.

South Lake has had only one crosscut to the Butler lode, on the 3d level, but is now cutting another on the 6th. The rock there is still running high and has a depth on the lode of about 2000 ft. The work has exhausted the money raised by the last assessment, but none will be called now, as there will be from \$25,000 to \$30,000 coming from the smelting of the mass and mineral. Then when No. 3 lode is cut through to the Lake mine a constantly rising tonnage will be available.

Calumet & Hecla is doing better in its daily tonnage this month owing probably to the slight return of the men from outdoor occupations, and is averaging about 9960 tons as compared with 9400 for the last part of August; there will be slight increase at least this month, and probably a still greater in October.

Allouez, according to a most dependable insider, is in the very best condition underground in its history; the openings are now disclosing their highest grades, and this means from the North Kearsarge boundary to the south to the Ahmeek line to the north. The costs are about at their lowest, and the construction costs will be very small for quite a long time to come. Men here have not been so scarce as at many of the other properties, and the tonnage is being kept up to the 2000 tons a day standard.

Quincy is forwarding its normal, which is also its maximum, of about 4000 tons daily; the nearness to the city of Hancock assists greatly in holding and attracting men; moreover, the company is pretty well supplied with houses.

Franklin had its best yield in refined copper in August and about as high a tonnage as at any time since the reopening of the Allouez Conglomerate. The southern drifts are

still meeting with the better grade with occasionally the spectacular stretches.

IRON.

Duluth.

The Mines Efficiency Co. has been formed in Duluth for the purpose of giving consideration to geological, mining and metallurgical engineering problems in the Lake Superior and other regions. Particular attention is to be given to the beneficiation of iron and manganese ores. Mr. Newton, of the company, has spent 4 years studying the latter phase of the company's specialties. Of the firm is Harlow H. Bradt, who spent some time in Ishpeming with the Pittsburgh & Lake Angeline Co.

Virginia.

Many new open pit mines have been opened in the western part of this range during the season. It is of note here that most of the mines were shipping 6 months from the time development was started. The Oliver Iron Co. is stripping the Arcturus mine. This property received the first experiments as regards the concentration of iron ore. The mine will not ship this year and much of the present activity has been confined to getting the property ready for stripping next winter. Most of the stripping was done by Butler Bros. Operations at the Lamberton property started last winter and the mine was producing the first of July. At Nashwauk the Mace No. 2 mine was developed by the Longyear-Bennett interests. This was an open pit stripped with a 370-ton Bucyrus shovel. It is a small property to which shipment of 200,000 tons was assigned for the present season by its owners. West, the Harrison mine has been developed and mined by Butler Bros., who are selling much ore to the Jones & Laughlin Steel Co. The big shovel at the Mace is operating at this mine. The Kevin is being developed. This is a state lease also stripped and mined by the Butler Co. Stripping operations were started last winter and the mine shipped its first in August.

MISSOURI-KANSAS.

Joplin, Mo.

In addition to the heavy curtailment of ore production by the ore producers during the last 2 months, the smelters in the Pittsburg field are now following suit and are closing down their plants so that the metal output will be curtailed. It was reported that all the coal-burning plants in the east Kansas belt were closed Saturday, with the exception of parts of two, both of which were preparing to also close as soon as the ore supply was exhausted. The lowering margin of profit is said to be the cause of the shutdown.

Ore producers in the Joplin field continued their policy of closing down more plants. The production has received drastic cuts now for a number of weeks and it is believed that the output is not over 4500 tons, or certainly not over 5000 tons. But with the small volume of sales there is not very much relief from the big surplus stocks that have been held now for several months. It seems now that the surplus stocks of ore have dropped to a little below 30,000 tons, but this is a huge tonnage for this field.

In the camp of Blendeville southwest of Joplin there is a revival of operations and prospecting that is bringing in a number of new producers. J. C. Vaughn and associates have just made a strike of lead and zinc that has shown a recovery of 30% over a custom plant. This strike has caused considerable excitement and a number of other leases have been taken and work resumed in that vicinity. Short & Co., on an adjoining lease, has taken out ore that has yielded 12% for some time. A number of new milling properties promise to be erected in that vicinity before the winter season sets in.

Another new milling plant has been added to the Bell Center portion of the Joplin camp on the Linderman land. The Mary O'Reilly Mining Co. has just completed a 100-ton plant on a lease south of the Lucky George mine. Here at a depth of 147 ft. the company has developed what is believed to be a very good run of ore. Also at 108 ft. the company is taking out considerable ore. A part of the ground is what is considered soft ground and part of it

hard ground. For the present only the soft ground deposit is being worked.

Webb City, Mo.

The new Coahuilla mill at Duenweg has just been completed and has gotten under way. It is designed to handle in the neighborhood of 1500 to 2000 tons per 24 hours' run, and it has been giving results of approximately 1800 in the first week of its operation. It is believed when the plant is going right fully a car of concentrates per day will be turned out. C. A. Smith, who has long been general manager of the property, designed the new mill.

The Onamena plant No. 3 at Duenweg is now getting well under way after a period of preliminary work due to the necessity of cleaning out the old drifts which had long been under water. In addition to this work the company has also sunk a new shaft to open up a deposit of ore which a drill hole showed to be very rich in a recent prospecting campaign. The shaft is just now reaching the ore. Geo. J. Kusterer is the general manager of this property.

On a lease of Haywood Scotts, near Duenweg, a recent drill hole showed a run of ore which averaged 9.94% zinc for a distance of 42 ft. The ore was encountered at 231 ft. and continued in it to 273 ft. The hole was put down to test out a hole put down a number of years ago, which was reported rich, but was never developed. The Scott Mining Co. will now put down a new double compartment shaft on the new hole.

Commerce, Okla.

In the Commerce camp the Bethel Mining Co. has started its new mill and has turned out its first 2 cars of concentrates. A car of lead and a car of zinc blende were sold, the first showing concentrates carrying 84% lead and the zinc showing 61%. The new mill is recovering high percentages. The company also has the Croesus mine and mill and is unwatering the ground. The company has 2 ore levels, the upper one at 160 and the lower at 180 ft. Every effort is being made to get this plant ready for operation by the time there is a recovery in prices.

An arrangement was made the past week whereby the half interest in the Iowa & Oklahoma Mining Co., which was owned by Major William Grimes, was taken over by Shewey & Sullivan of Joplin, and arrangements were made at once for a revival of operations on 500 acres of mining land right in the heart of the old Quapaw camp. This land has been in litigation for a number of years and this has prevented any active operation until this was cleared up and the present arrangement provides for this. Leases were let upon part of the land this week and operations will be resumed as rapidly as the ground can be gotten in readiness.

Another mill will soon be added to the active list of producers in the Pilcher camp on a sublease of the Pilcher Co. land when the Piokee Mining Co. completes a 300-ton mill. The land has been thoroughly drilled out and a shaft will be sunk and the ground opened up as rapidly as possible. Just as soon as the ground is in such condition as to show the necessity of the mill it will be constructed. The assays of the prospect drill cuttings showed a zinc content running from 5 to 24%. Those interested in the lease are H. O. Abbott and A. C. Happock, Lebanon, and J. H. Wright of Joplin.

Out of five drill holes put down on a lease of the Admiralty Co.'s lease, the B. L. & G. Co. have made as many strikes of ore. In every hole put down the company has encountered rich ore, running from 5 to 20%. The prospecting is being continued and a shaft will be started soon.

MONTANA.

Butte.

With the average price of copper for August above 26 cts., an increase of 25 cts. per day will be applicable to the August wage scale of mining companies operating in the Butte district. This increase will make payrolls of these companies probably the largest in the history of the Butte district. The Anaconda Co. alone will distribute \$1,630,000

in wages to Butte employes, and this, with settlements of other companies, will bring the total up to a figure in excess of \$2,250,000, a gain of nearly \$150,000 over July. The Anaconda's Butte payroll for July was \$1,520,500 in round figures, so that the increase shown by this company alone due to the advanced wages is approximately \$110,000. In view of the fact that the increase of 25 cts. per day is applicable to employes at Anaconda and Great Falls as well, a proportionate increase in the payroll is shown by the former, while at the latter, due to cutting off of construction work and employment of fewer men, there is a slight decrease. Anaconda payrolls at Anaconda will aggregate \$606,400 for August, compared with \$587,100 for July. At Great Falls the company's August payrolls will aggregate \$280,750, as compared with \$290,400 for July, the increase in wage scale, however, doing much to compensate for the smaller number of men employed. Approximate estimates of August payrolls furnished by companies other than the Anaconda operating in Butte show that they will distribute something like \$700,000. This, compared with approximately \$675,000 distributed in payment of July wages, hardly affords a fair basis of comparison, in view of the fact that the Butte & Superior Co., one of the big producers, suspended operations for 10 days in August, during which their tonnage was considerably decreased, and other companies report larger forces employed in July than in August.

The Butte-Zenith is now down to 1000-ft. depth. An electric pump of 600-gal. capacity, manufactured by the Imperial Iron Works and similar to the one on the 1600 level of the Butte & London, will be installed. Hard ground has been encountered since the 750-ft. was passed. All of the water was caught on the 800 level and was thrown to the 500 with a Cameron pump, where the electric pump lifted it to the surface. On the 1000-ft. level crosscutting will be started by Oct. 1 and within 200 ft. it is expected to cut the first vein, known as the "Economical" ledge.

The output of the Butte & Superior mine and mill for August was reduced almost a third from the normal on account of the accident, which caused the closing of mine and mill for 10 days. The production of ore was 34,000 tons against a usual production of slightly over 50,000 tons. The production of zinc concentrates from this ore amounted to 9600 tons as compared with 14,000 tons in July. The zinc in concentrates amounted to 10,475,000 lbs. as compared with 15,000,000 lbs. in July. Recoveries for August were 94.5%. There were 300 tons of lead concentrates and 192,000 ozs. of silver produced.

Great Falls.

Delay in filling orders for the machinery parts required in both the new zinc concentrator and the new zinc refinery are responsible for the delay in getting these new departments of the Anaconda at the Washoe and Great Falls plants into operation. The refinery cannot start up until the concentrator is operating and can furnish the necessary concentrates. One of the five sections of the big zinc refinery at Great Falls has been started and is being tried out. This will take several days and officers of the company state that it will be the middle of September before the entire plant can be put into operation. The one section that has been started is proving most satisfactory and comes fully up to the expectations of Mr. Laist, who practically worked out the new zinc refining method that is being put into effect.

Maxwell.

The Northwestern Mines Con. Co. is sinking a double compartment shaft about 700 ft. from the portal of the main tunnel level. At a depth of 40 ft. the shaft passed through a vein of copper sulphide 8 ft. wide, carrying values of from 6 to 10% copper, 4 ozs. silver and a trace of gold. Six cars of concentrates and low-grade ore were shipped to Anaconda during July at a net return, above freight and treatment, of approximately \$3000. Recently a cloudburst damaged the dam of the Granite County Electric Power Co., necessitating the closing of the Consolidated 100-ton mill. The damage will be repaired within a few days, however, and it is expected that the plant will then commence a long full-time run.

Elliston.

Ore said to run as high as \$60 is being picked from the dumps of the Julia mine, 9 miles from Elliston. It is stated

that two men living in that vicinity have been able to pick out as much as a ton a week. The ore contains silver, gray copper and lead. The Julia properties were located about 10 years ago, and since then about \$120,000 has been taken out. They are owned by the Montana-Clinton Co. The development work includes a shaft about 300 ft. deep, a tunnel 600 ft. long, besides various crosscuts and drifts. It is probable that a 2000-ft. tunnel will run in to tap the larger ore bodies and to make it easier to pump out the water and hoist the ore. The company also has an interest in the Monarch mine, 5 miles distant, and a plan to erect a plant on Telegraph creek to generate electricity for the operation of both properties is being considered.

NEVADA.

Tonopah.

A narrow vein 6 to 8 ins. wide has been intersected on the 1400 level of the Belmont, west of the shaft. It runs high in gold and work is proceeding to determine its extent. The company is preparing to prospect the East End group, of which control was recently acquired for \$50,000. It is said explorations to a depth of 2500 ft. will be carried on with diamond drills. The company has definitely surrendered its option on the Bull Moose property at Carrara, after several months of explorative work.

Tonopah Extension has installed a small hoist on the 1540 level of the Victor shaft and is sinking to the 1850-ft. point. The Murray vein continues to average 13 ft. wide on the main levels, and the North Merger ledge maintains a uniform width of 10 ft. A quarterly dividend at the rate of 15 cts. has been declared.

The output of Tonopah Mining is again exceeding 2300 tons per week and the grade of ore has increased to \$15. The best ore is coming from the Sand Grass claim, with the Upper Sand Grass and Breccia veins yielding the richest product. On the 1640 level of the Silver Top claim, west of the shaft, a 3-ft. shoot of excellent ore has been intersected.

Rochester.

New work has begun on the 250 and 420 levels of the Rochester Mines group. On the 250 level ore of splendid grade is exposed and the drift is advancing along the East vein. The same vein is undergoing development at the 420-ft. point. The capacity of the mill is being increased and the plant will be handling approximately double its present tonnage before the end of fall.

Goldfield.

The southwest drift from the 250 level of the Lone Star has entered the quartz zone and is being extended to seek the shoot which yielded rich ore when worked by the old Patrick lease. If results prove satisfactory the management intends to prosecute work at several promising points.

The west crosscut from the 1750 level of the Atlanta has intersected what appears to be the hanging wall of the Consolidated vein. Low assays in gold and copper are being obtained and crosscutting continues to open the main ledge. The work is designed to open the extension of a shoot which on the 1500 level assayed \$30 to \$70. The company has increased its working force and is prosecuting developments with renewed vigor.

Sinking of the shaft of the Silver Pick is again proceeding rapidly. The new No. 7 Cameron pump is easily handling the water and within a few days the shaft is expected to enter the main ore zone disclosed by the Calyx core drill. Later on the vein of \$25 ore intersected at the 875-ft. point will be developed. The Calyx drill has reached a depth of approximately 1200 ft., 450 ft. west of the main shaft, without any indication of the shale formation. It is stated three distinct veins have been penetrated, all yielding good assays.

Yerrington.

A promising copper discovery has been made a mile south of the Mountain View mine by James Adams, R. V. Taylor and D. W. McKenzie of Yerrington. Assays average 16% copper, and a little silver also occurs. Arrangements

have been made to work the deposit and determine its dimensions.

Seven Troughs.

Unwatering of the Seven Troughs Coalition has been completed and repairs are being rushed. Work has been resumed at some points and within a few days the company expects to resume production of rich ore from the 1700 workings. The new pumping plant is expected to prevent future water troubles.

Winnemucca.

A 5-ft. vein of sulphide ore assaying \$40 gold, silver and copper has been opened at a depth of 130 ft. in the Wolverine mine. Shipments have started and sufficient ore is stated to be exposed to insure a steady yield. Arrangements have been made to install a Cameron pump and to send the shaft deeper. F. L. Andregg is superintendent.

Bullionville.

The new mill of the Prince Con. has been placed in commission on the old tailings in this district, and is reported to be making a satisfactory recovery. The amount available is figured at 120,000 tons. The company also operates the noted Prince Con. group at Pioche.

Kimberly.

The Con. Coppermines Co. has let a contract for \$100,000 with the General Engineering Co. of Salt Lake for the remodeling of the old Giroux Concentrator which was built in 1907 on the hillside above Riepetown and never used. The mill was recently inspected by J. M. Callow, the oil flotation expert, who advises installation of pneumatic flotation machines. It is expected to finish the new mill by the new year. The Morris No. 2 shaft is to be deepened 200 ft. to get under the Morris-Brooks-Bunker Hill ore body, in accordance with which plans, churn-drill prospecting from above has been discontinued.

Reno.

The stockholders of the Luning-Idaho Mining Co. held the annual meeting here. About three-quarters of the stock of the company was represented at the meeting. The articles of incorporation were amended, increasing the board of directors from three to five and changing the main office from Luning to Reno. The following directors were chosen: R. G. Withers, R. M. Todd, W. T. Erickson and R. B. Todd. The directors were requested to appoint the fifth director later. Reports of the financial condition of the company, the standing of the treasury stock account, etc., submitted by the secretary, were read and approved. The management reported the work accomplished at the mine since starting up in December and reported that shipments would be started at once, and that the first carload would leave Luning this week. Much delay in starting shipments has been made owing to the lack of teams for hauling, as well as shortage of cars for shipments. The future development of the mine was discussed and the company will undoubtedly sink a working shaft as soon as the connection with the contact is made, the Hahn tunnel now being extended as rapidly as possible in that direction. The management can thus better decide whether the working shaft be sunk on the hanging-wall vein, the foot-wall vein or the blind ledge or middle vein exposed in the Hahn tunnel.

NEW MEXICO.

Mogollon.

Cleanup by Mogollon Mines Co. for last half of August produced three-quarters of a ton of gold and silver bullion and 4.5 tons high-grade concentrates from treatment of approximately 2400 tons of ore during period. New shaft is now 880 ft. deep and has encountered andesite on both walls. Work on the company's flume to convey tailings to storage dams on Mineral creek, about 4 miles below, is being pushed and with prompt lumber deliveries will be completed this fall.

The Oaks Co. is continuing to find good mill ore from development work on both Clifton and Eberle mines, and is making regular shipments to local custom works.

The tailings disposal system adopted by Socorro Mining & Milling Co., consisting of an elevator by which the mill

discharge will be conveyed to an adjoining flat, has been delayed by the equipment having gone astray in railway transit.

The U. S. Geological Survey, through Henry G. Ferguson, is about to complete data for a geological folio of the district. A detail survey was made a few months ago and Ferguson is now working in the geology of the individual properties. When finally completed this data will be of inestimable value to the camp as a whole.

Pinos Altos.

The C. & O. Co. has taken over the Savanna properties under lease. It is the intention of the company to install the latest model flotation process for the treatment of the Pinos Altos ores, the success of which has been demonstrated by the operation of the present mill, in addition to the experiments of eastern specialists. J. W. Crowder, mining engineer, El Paso, visited the camp recently, when the plans for the improvements were decided upon. A force of men were put to work at the Gillette mine, where ore bodies that are already developed will be mined as one of the sources of supply for the enlarged mill.

Lordsburg.

It is believed that the 85 Mining Co. will soon erect a plant at its property. A test mill has been established by the company at the Texas School of Mines, Fort Bliss, Texas. J. W. Crowder is in charge of the plant and is making complete tests of flotation and wet method of treating the ores. Representatives of several of the largest flotation companies have visited the mine and have gone into the problem of concentrating the ore. A number of shipments have been made to various test plants, and it is believed that the correct method of treatment will soon be solved. The company is connecting the main shaft of the mine with the new 500 level. A raise is being made from the winze sunk some time ago. A sump has been excavated and everything is ready for work on the new level.

OREGON.

Cornucopia.

Queen of the West Mines Co. has contracted with the A. Leschen & Sons Rope Co., St. Louis, for a 2-bucket, 3200-ft. tramway. The line will have a fall in this distance of 1456 ft. The tram replaces a single line built several years ago.

Halfway.

The Queen of the West cyanide mill is rapidly nearing completion. The tanks are in place and the machinery is all on the ground, but not in place. It will be, however, in a few days. Carpenters are scarce, but a large force is now working and it will not be long until the plant is under cover. The tram is occupying a large force. Several new stations are being put in and a new tram station is being built at the mine. The work is being pushed as rapidly as conditions will allow. There are about 25 men at the mine and the same number at the mill.

Paker.

A 4-ft. vein of silver-gold ore has been opened at the D. M. Kelly mine on Roch creek.

SOUTH DAKOTA.

Custer City.

Under George Playford the Golden Crest mine is being reopened. He is engaged in retimbering an old shaft, sunk on the vein many years ago by Fritz Webber, the original owner of the ground. This shaft, which is free from water, has reached a depth of 215 ft., and at that level had struck the foot wall. From the foot wall a drift of 80 ft. has been run, all in ore, and the hanging wall of the vein has not been struck. The ore carries good commercial values, is easy to mine and mill, the present system of treatment in the Crest mill being particularly suited to it. After the work of retimbering the shaft and drift, the work of extending the drift

toward the hanging wall will be continued, and the ore body explored at the depth to which the shaft has been sunk. The work that is being undertaken in this old shaft is being done for the purpose of giving the ore body at depth a thorough development. This development could have been given the property from the main workings, but they are now flooded and continue to make about 150 gallons per minute, so it would be quite expensive.

In completing its plans for the receiving and handling of custom ores the Trojan Co. has started work on a raise from the Halford tunnel to surface, which will break through the ground near the Burlington and the Northwestern lines just west of Trojan.

UTAH.

Garfield.

By not later than Nov. 1 the sulphuric acid plant of the Garfield Chemical & Mfg. Co. will be completed. Work has been delayed on account of material not arriving. The chemically treated bricks with which to line the chambers are just beginning to arrive, although they were ordered months ago. These come from Akron, O., and on account of labor trouble they have not arrived, but are now beginning. The concentrating plant which is being built in connection with the acid plant is moving ahead and it is expected that the installation of machinery will start this week. The building is practically completed and nearly all the machinery is on the ground. It is expected that the acid plant will be running in advance of the leaching plant being built by Utah Copper, which will use most of the product. The acid plant when completed will cost about \$500,000. It will start out with a capacity of 100 tons of acid. The company contemplates increasing the capacity to 150 tons. The ultimate capacity can be 1000 tons. It will take a period of several years to work up to this and make a market for it.

Salt Lake.

Details are now being worked out and the design of a new sampling plant to be located here is nearly completed. The project has been financed by mining interests that at the present time control between 12,000 and 15,000 tons of ore per month, the greater portion of which heretofore has been going through the process of sampling before it was shipped to the smelters. Delays in getting the ore sampled, due to the rapidly increasing tonnage at the present plant, resulted in the plan to build another. Negotiations are under way for the purchase of the site of the new sampler. It will have an initial capacity of 750 tons per day and can be increased by adding additional units. It will be of the Vezin type, the same type that is used at present by smelting companies. Its cost is estimated at \$75,000.

Stockton.

With the filing of incorporation articles by the Keystone Development Co., the Galena King Mining Co., the Southport Mining Co. and the Merwin group, consisting of 37 patented claims, have been taken over. The property consists of claims along the strike of the lodes for 8000 ft. Over \$500,000 of lead-silver ore has been shipped from the properties. They are producing at present under leases. On the Galena King recently a rich strike was made by a leaser. On this ground there is a 1000-ft. shaft and numerous other workings. The Southport has a 1700-ft. drift from the Honerine tunnel, besides work done in other places. It is the intention to extend the tunnel on the Merwin group to the Galena King shaft, cutting it at a depth of 600 ft. The company is capitalized for \$100,000, consisting of 1,000,000 shares of a par value of 10 cts. In payment for 500,000 shares of the stock the company accepts the various properties, the remaining stock is held in the treasury. Officials are J. B. Overton, Madison, Wis., president; Duncan MacVichie, vice-president; W. C. Alexander, secretary and treasurer. These with the following compose the directorate: Charles Cochran, Williamsport, Pa.; David Keith, L. H. Farnsworth, Charles C. Dey, Joseph E. Galigher and D. L. Wertheimer.

Peterson.

At the Morgan-Argentine the vein is growing stronger with development in the upper level and a lower tunnel is

now being pushed to open the vein at depth. There are 2500 ft. of workings and at 176 ft. in the shaft high-grade galena was cut. General Manager Pembroke says "lead ore has been found on the surface in 12 places. To develop the principal fissure a shaft was sunk and at a depth of 176 ft. ore was struck. A drift was started and bunches of ore were encountered. When the main vein was struck, which is approximately 2½ ft. wide, high-grade galena was encountered. The main body is a carbonate and scattered through it are masses of galena assaying as high as 83% lead. The lower tunnel, some 300 ft. below the workings, will be continued to cut the downwards extension. The values in silver so far have been low, the highest assay showing 44 ozs. Numerous fissures traverse the property showing lead-silver ore and there is one fissure that shows copper values. The company is capitalized for 500,000 shares, par value 1 ct., and 149,072 shares have been issued, leaving 350,928 shares in the treasury.

Eureka.

The plant of the Tintic Milling Co., near Silver City, is treating about 85 tons per day. Within the next 2 months this will be raised to 300 tons. General Manager George H. Dern said in discussing the work now under way at the mill, that he had received word to the effect that six new Holt-Dern roasters had arrived. The two others that have been ordered are scheduled to arrive at the mill in a week. These, with those now in operation, will bring the capacity up to 300 tons. Metallurgists that have visited the plant and examined the process state that the problem of treating the low-grade siliceous silver-copper ores of the Tintic district has been solved.

The lower workings of the Tintic Standard are now being ventilated by a power fan. A car of ore a week is being shipped and a body of shipping ore of excellent grade has been developed in the lower levels, according to the management. As the ore is broken and without any preliminary sorting it runs better than 35% lead. As the work progresses the ore body on the 1600 level continues to grow larger. It has now been drifted on for more than 50 ft. and has been crosscut at right angles to the drift for a distance of 50 ft., with all faces in ore. General Manager Raddatz says that he had as yet been unable to determine just how large the ore body is, nor has he been able to determine its strike. A new shaft is being sunk, and the company has recently installed a new compressor. It will deliver power enough to put three shifts of miners, with drills, to sinking the new shaft, and also to put three shifts of miners at work on the ore in the lower levels.

At the Sioux Con. a winze is being sent down from the 600 level in an attempt to get Iron Blossom's vein extending into Sioux Con. ground. It is understood that Sioux Con. directors have authorized the sinking of the main working shaft and that a contract may be let for this work. Sioux's shaft is now down 600 ft. and if sinking is taken up the shaft will be deepened 500 or 600 ft.

Bingham.

Synopsis of report of superintendent New Utah Bingham Mining Co., for Sept. 1. Bonanza tunnel. Advanced 57 ft. Total 480 ft. This tunnel running to the south on the Giant Chief vein encountered a break in the formation throwing the vein 40 ft. to the west. Some isolated pieces of iron pyrite and galena have been found in the vein, but no continuous streak has yet been found. There are some smooth rounded boulders of ore lying in a fissure. These isolated bunches of ore are increasing as work progresses. Giant Chief Main Level No. 6 Raise Drift to Vein No. 7. Advanced 35 ft. Total 35 ft. This raise is going up on the foot wall on the ore previously opened up. Some small pockets of low-grade ore have been opened, but no continuous ore body has yet been cut. Giant Chief Main Level No. 7 Raise. Advanced 12 ft. Total 133 ft. At this point the work broke into the crosscut from No. 6 raise. Bunches of mineralized matter and ore have been encountered. More of these are found as work proceeds. The ground is opalized chert and looks favorable for an ore body.

It was announced Sept. 3, 1916, that not for six weeks would the Federal Court in Salt Lake City confirm the Ohio Copper Mining Co.'s sale, or order it vacated as a stay for that period had been granted by the Federal Court in New

York on petition of stockholders not satisfied with the bondholders' proposed plan of reorganization. The New York court ordered the Ohio trustees to give to stockholders' representatives a complete list of registered holders of both stock and bonds in order that their views on reorganization might be secured. Two stockholders' committees would likely come into the field. The stock could be assessed \$2 per share should it be found necessary to raise new working capital, but operations had been so profitable that trustees and receivers were reported as having about \$400,000 cash on hand, against about \$60,000 unsecured liabilities.

WASHINGTON.

Spokane.

August sales on the Spokane stock exchange aggregated 809,800 shares, valued at \$178,094, according to the official report for the month of Secretary Charles T. Underwood. This is the lightest monthly business of the exchange for the current year, the decrease in sales being due principally to the vacation season.

Success again was the leader in the trading for the month, but the price was materially less than in previous months, and Lucky Jim was second and Slocan Star third.

WISCONSIN-ILLINOIS.

Ore deliveries were reported by districts for August as follows:

	Zinc, lbs.	Lead, lbs.	Pyrites, lbs.
Benton	18,662,000	564,600	90,000
Galena	5,808,000	.....	.....
Millin	4,144,000	.....	.....
Cuba	3,928,000	60,000	2,160,600
Linden	3,504,000	77,970	160,000
Hazel Green	2,940,000	.....	.....
Shullsburg	2,352,000	30,000	.....
Platteville	2,216,000	.....	.....
Highland	850,000	.....	.....
Montfort	342,000	.....	.....
Mineral Point	238,000	.....	728,000
Potosi	70,000	.....	.....
Totals	45,054,000	732,570	3,138,600

The gross recovery of zinc concentrates totaled 35,298,000 lbs.; net refined ores from separating plants to smelter, 18,942,000 lbs. The Mineral Point Zinc Co. delivered 57 cars refinery product, all high grade, to smelter at DePue, 4,512,000 lbs. The Hard Fibre Co. of Delaware, and the Sandoval Zinc Co., new buying interests, were represented in the field. The Mineral Point Zinc Co., Wisconsin Zinc Co. and National Separating Works were the heaviest producers and refiners of crude ore.

Highland.

The introduction of two new mining and milling plants will assist in a better output, but prices are not satisfactory, for zinc concentrates and shipments are light. Saxe-Lampe, Red-Jacket and Eberle mines are all operating with full surface equipment.

Linden.

A large surplus of zinc ore held in bin, low prices for zinc ore the cause, and wages and mine supplies abnormally high, are factors regarded as most discouraging, and yet no signs of abatement are seen here. Two new power, mining and milling plants have been completed here, one for the Mineral Point Development Co. on the Wickes farm and the other for the Spring Hill Mining Co. Optimo Mining Co. No. 3 has liquidated all debts and is now on sound business basis. The Optimo is one of the new outfits to come in this year. Five drilling machines are engaged in proving the Gilman mine lease with excellent results. A big strike of zinc ore 8 ft. in thickness has been made with drill on the Vial land, known as the Glanville extension.

Platteville.

Eastern interests in combination with local corporations have perfected a working organization, the plan and purpose of which is to bring into combination enough zinc ore pro-

ducers in this field to insure an output of 200 tons of zinc concentrates daily, this to be diverted under exclusive arrangement to a smelter plant in the coal region of Illinois. Each corporation to share alike in the operation and results. For the present names are withheld, but a working capital has already been subscribed and experts are engaged in working out the problems.

Montfort.

The O. P. David mine, shipping zinc ore regularly, has been opening new deposits in untried ground and a heavier output is insured.

New Diggings.

The liveliest zinc mining camp in the entire field, all viewpoints considered, is found here. There are 1000 miners employed in the mines in this district. New mine development and the building of more new mining plants is being rushed on all sides. The Wisconsin Zinc Co. is now trying out a new 200-ton mill on the Chas. A. Thompson mine ready to go into commission. Another plant is nearing completion on the Longhorn, but production will scarcely be attempted before the latter part of October. On the C. A. Thompson, the new shaft went through 40 ft. of milling area, insuring a wonderful zinc ore producer. The shaft is complete at a depth of 160 ft. The new Champion mine is making 250 to 300 tons of zinc concentrates weekly averaging 36%. A recent innovation is the complete installation of a table house. Heretofore mining companies have been content to install one or two sludge tables, but the Champion's eight Wilfley tables are in operation. At the Skinner Separating plant, the property of the Wisconsin Zinc Co., 1000 tons of various grade zinc ore is handled weekly, the high-grade finished product being sold in open market to the highest bidder. In addition to the large working forces employed by this company at all plants going double shift daily, are 10 drilling squads working on several newly acquired leases in this district, with as many more at work in the Galena camp.

The Fields Mining & Milling Co., one of the large operating companies of this district, is shipping an average of 1 car of zinc concentrates daily from its two producers, the Crawhall and Thompson mines. The Crawhall, presumed sometime ago to have run its natural course, is now better than ever, much mineralized area having been developed under the old workings. Besides re-milling tailings on the Crawhall, accumulated during several years' high run and successful operation, the company is rebuilding the Empire magnet in Ore Separating plant purchased from the Wisconsin Co. at Platteville. This plan involves designs to provide smelter facilities under a new process in which costs are said to be far below any now obtaining.

The Vinegar Hill Zinc Co. has begun the construction of a new 200-ton modern mining and milling plant on the Edward Meloy 80, in the very heart of the zinc belt of this section. The ground has been explored and shows deposits, according to the drill log, in places 60 ft. in thickness. The introduction of the Whaley electric shovel at the Martin mine, one of the Vinegar Hill mines, is doing the work of 20 shovelers. More machines of this type are now being secured for early installation.

WYOMING.

Casper.

During the week ending Sept. 9 Elkhorn No. 1 well was brought in. In spouting it went as high as 130 ft. The casing has now been placed and the well will be ready for production as soon as tanks for storage are furnished. The company has made arrangements to drill several more wells on this lease and have contracted for tankage to be placed on the ground in time to care for the oil which now is almost a certainty in that section of the field.

The Standard Exploration Co., drilling for the Merritt Oil & Gas Co., has brought in two good wells during the week, No. 2 on Sec. 3 proving to be the biggest producer yet struck in the field. This well came in Sept. 8. It showed considerable gas pressure and continued to flow at intervals of about an hour all during the first day. The driller has

been unable to shut in the well. Teams were being used in the hurried building of sumps in which the oil was being caught. The first made sumps were overflowing, which continued to increase, one interval of spouting followed another. For over 15 minutes the well spouted a 3-in. stream of oil a distance of 20 ft. through an opening in the side of the rig housing, the stream being highly impregnated with gas. Estimates of the well range from 50 to several hundred barrels when it settles down. The drill had only entered the oil sand a few inches when the oil started to flow. The same company brought in another well, No. 1, Sec. 4, the same afternoon, but as soon as the sand was struck the well was shut down.

CANADA.

BRITISH COLUMBIA.

Greenwood.

Permanent development, following extensive diamond drill exploration, is verifying the predictions of the engineers regarding the extent and value of the deposits in the Copper mountain holdings of the British Columbia Copper Co., according to Oscar Lachmund, general manager, who personally is in charge of operations. "The new main tunnel, now in 1000 ft., has crosscut one end of the ore body, and a drift now is being run on it," said Lachmund. "The tunnel is being continued to reach other shoots, and is being advanced at the rate of about 20 ft. daily, except where we have to timber through soft ground. The bore is 9 by 10 ft. in the clear, and will open the property to what is known as the glory hole level. We now are installing a pumping plant to raise water from the Similkameen river to furnish power for the mine equipment and a 50-ton experimental mill. The pipe line is 6000 ft. long, and delivers the water at a distributing point 1700 ft. above the river level. The experimental mill is for the purpose of working out a treatment system for our ores, preparatory to the construction of a 2000-ton concentrator, to be erected at a site on the Similkameen river."

Vancouver.

The Granby Mining, Smelting & Power Co., with mines in different parts of Alaska and British Columbia, together with immense modern copper smelters at Anyox and Grand Forks, is producing an average of 4,000,000 lbs. of blister copper monthly, according to Frank M. Sylvester of Vancouver, general manager. He states that all difficulties of a mining and metallurgical nature that hampered operations at the Anyox smelter and Hidden creek mines during the first year or so that they were in production have been overcome, and conditions now are satisfactory in every way. "In pursuance of the company's policy of expansion, which contemplates the Anyox smelter and the Hidden Creek mines as the nucleus of an immense industry, we always are on the lookout for promising new properties, and in the last year we have had not less than 100 examined by our engineers," said Mr. Sylvester. "Of our newer properties two now are on a substantial producing basis. The Midas mine at Valdez, Alas., is shipping to the smelter at Anyox. The Maine mine on Prince of Wales island, also in Alaska, is shipping between 4000 and 5000 tons monthly. A number of others are producing on a smaller scale. We are able to get this tonnage moved because through a subsidiary company we own and operate our own fleet of steamers. The Grand Forks plant put its 7th furnace into operation on Sept. 7. As the Crow's Nest Pass Coal Co. now seems to have overcome its labor troubles and to be in a position to keep us supplied with coke, I anticipate that we shall soon have the 8th furnace blown in and be running at full capacity once more."

ONTARIO.

Cobalt.

On Sept. 5 the 600-ton flotation plant of the Buffalo Mines Co. was put in operation. Callow machines are used and the plant will treat tailings from the dump, as well as concentrates from the mine. The dump is the accumulation of tailings from the old mill for a period of over 7 years. The system of treatment previous to the introduction of

oil flotation in the camp did not make anything like so close a recovery of silver from ores treated as can be done by the oil flotation system and the re-treatment of the tailings can be done very profitably and at a very small cost. No information has been given out as to what the tailings at the Buffalo mill average, but the tailings in the dumps from some other mills in the camp will, it is estimated, average as high as 5 ozs.

Kerr Lake produced 1,260,000 ozs. of silver during the first 6 months of 1916 according to company reports. In June it established a new record of production with 237,942 ozs. This compares with 234,598 ozs. in May, 225,423 in April, 214,902 in March, 163,995 in February and 184,697 in January. Estimates of ore reserves Sept. 1, 1915, showed 4,172,000 ozs. of silver, indicating a diminution of 1,526,300 ozs., as against 2,036,962 produced during the year. In addition to its ore reserves, Kerr Lake has \$750,000 in cash and cash assets in the treasury, or about \$2,510,000 in all, equivalent to \$4.18 per share on the 600,000 shares outstanding, to which should be added the value of the company's holdings in the Caribou-Cobalt property.

Kirkland Lake.

A considerable tonnage has been blocked above the 300 level at the McCane mine. A strike of some importance was made in a crosscut when a vein carrying free gold was encountered on the latter level. The known width of the vein is at least 4 ft. This strike occurred in the crosscut driven from the south from the main workings on the 300 level. Seven ft. south of the shaft a 7-ft. vein was encountered. Across its entire face average assays ran \$16. The crosscut was continued further south, and after breaking down a distance of 7 ft., another vein came in.

Gowganda.

Sinking has been commenced on No. 44 vein at the Silverdale mine. The vein is 8 ins. wide and carries good silver values. The work will be done by hand steel but it is the intention of the company to install a compressor and hoist this winter, owing to the difficulty in getting in machinery in summer. Work was started on this property in early summer. Up to the present time it was confined to surface work. In the course of this work 8 veins were located, most of which carry values. The best of these is a 2-in. vein, called Vein No. 2. While sinking is under way now a force of men will be kept on surface trenching and stripping until winter. The property consists of 10 claims in Leith Township, surrounding the Hudson Bay claims.

Schumacher.

In a drift from the main shaft of the Schumacher mine a vein showing free gold has been encountered on the 100 level. The crosscut from the 200 level, from which the ore for the mill will be taken from, is being rapidly pushed forward to reach the vein on that level. Progress in sinking the new shaft is being made. It is to connect the two shafts, which are 1400 ft. apart, by drifting along the ore. It may require 6 months to do this if the indirect courses of the veins are followed. In the meantime a temporary arrangement will be installed, probably a light aerial tramway, to bring ore over to the mill from the new shaft. From the latter shaft crosscuts will be run to pick up two veins. The present mill is equipped for 125 tons but by forcing it the tonnage is brought up to 140 tons. An extra agitator may be put in and some increase to the tank capacity made in order to handle 160 tons.

HONDURAS.

It has just been reported that the Guggenheims have recently acquired an important interest in the New York, Honduras & Rosario Mining Co. This company has been operating continuously for over 36 years under more than a dozen presidents. The company is the largest single industry in the Republic of Honduras; a former president was the original owner of the mine. There are many outside mining propositions open to Rosario management and located in Honduras which are expected to be developed, with the affiliation of the Guggenheims. H. A. Guess, the Guggenheim representative, joins the Rosario board of directors.

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I. GEOLOGY

GEOLOGY AND MINERALOGY.

Geology

Bonillas, Y. S.; Tenney, J. B.; Feuchère, L.—*Geology of the Warren Mining District, Arizona*. [A complete review of the geology, mineralogy and nature of the ore deposits of the district].—Bull. A. I. M. E. Sept. 1916; p 1397; pp 69*; 35c.

DeLury, J. S.—*The Mineral Belt North of the Pas, Manitoba*. [Mostly on the geology and nature of the deposits and country formation].—Canadian Mg. Jnl. Sept. 1 1916; p 412; pp 4*; 35c.

Reger, David B.—*The Possibility of Deep Sand Oil and Gas in the Appalachian Geo-Syncline of West Virginia*.—Bull. A. I. M. E. Sept. 1916; p 1709; pp 16*; 35c.

Ore Genesis

Bonillas, Y. S.; Tenney, J. B.; Feuchère, L.—*Geology of the Warren Mining District, Arizona*. [A complete review of the geology, mineralogy and nature of the ore deposits of the district].—Bull. A. I. M. E. Sept. 1916; p 1397; pp 69*; 35c.

Van Tuyl, Francis M.—*New Points on the Origin of Dolomite*. [A historic review and field and experimental evidence on the new theory].—American Jnl. of Sci. Sept. 1916; p 249; pp 12; 60c.

Zies, E. G.; Allen, E. T.; Merwin, H. E.—*Some Reactions Involved in Secondary Copper Sulphide Enrichment*. [Full details regarding laboratory and field investigations].—Economic Geol. Aug. 1916; p 407; pp 97*; 60c.

Mineralogy and Petrography

Bonillas, Y. S.; Tenney, J. B.; Feuchère, L.—*Geology of the Warren Mining District, Arizona*. [A complete review of the geology, mineralogy and nature of the ore deposits of the district].—Bull. A. I. M. E. Sept. 1916; p 1397; pp 69*; 35c.

DeLury, J. S.—*The Mineral Belt North of the Pas, Manitoba*. [Mostly on the geology and nature of the deposits and country formation].—Canadian Mg. Jnl. Sept. 1 1916; p 412; pp 4*; 35c.

Gaby, W. E.—*Petrography of the Mount Morgan Mine, Queensland, Aus-*

tralia.—Bull. A. I. M. E. Sept. 1916; p 1725; pp 20*; 35c.

Phillips, A. H.—*New Zinc Phosphates from Salmo, British Columbia*. [Mineralogic treatise on the minerals].—American Jnl. of Sci. Sept. 1916; p 275; pp 4*; 60c.

Van Tuyl, Francis M.—*New Points on the Origin of Dolomite*. [A historic review and field and experimental evidence on the new theory].—American Jnl. of Sci. Sept. 1916; p 249; pp 12; 60c.

II. ORES AND METALS

(I) METALS AND ORES

Alloys

Arthur, W.—*Season Cracking and Self-Annealing of Brass*.—A. I. of Metals Adv. Paper No. 4; pp 7*; 35c.

Merica, Paul D.; Karr, C. P.—*The Initial Stress Produced by the Burning-In of Manganese Bronze*.—A. I. of Metals Adv. Paper No. 8; pp 8*; 35c.

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Aluminum

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McKinney, P. E.—*Aluminum Castings and Forgings*.—A. I. of Metals Adv. Paper No. 15; pp 8; 35c.

Phalen, W. C.—*Bauxite and Aluminum in 1915*. [On the production, uses and methods of refining].—Min. Res. of U. S. 1:7; pp 16*.

Copper

Addicks, Lawrence.—*Possibilities in the Wet Treatment of Copper Concentrates*. [The method tested and described con-

sists of roasting and then leaching].—Bull. A. I. M. E. Sept. 1916; p 1565; pp 9*; 35c.

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Silver

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(II) NON-METALS

(A) FUELS

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III. TECHNOLOGY

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Crushing, Grinding, Etc.

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METALLURGY**Electrometallurgy**

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Taggart, James M.—*Heat Distributions and Economies in a Steam Power Plant*.—Steam Sept. 1916; p 63; pp 4*; 35c.

IV. MISCELLANEOUS**Testing**

Addicks, Lawrence.—*Possibilities in the Wet Treatment of Copper Concentrates*. [The method tested and described here consists of roasting and then leaching].—Bull. A. I. M. E. Sept. 1916; p 1565; pp 9*; 35c.

Gahl, Rudolf.—*History of the Flotation Process at Inspiration, Arizona*. [Describes tests made and methods adopted

with the results obtained in each. The paper is complete and gives details].—Bull. A. I. M. E. Sept. 1916; p 1627; pp 54*; 35c.

Johnston, A. M.—*Testing of Conveyor Belts*. [Abst. from a paper read before the South African Inst. of Eng.].—Met. & Chem. Engg. Sept. 1 1916; p 262; pp 2¼*; 35c.

Legrand, Charles.—*Power Plant of the Burro Mountain Copper Co., New Mexico*. [Electric power generated by direct connection to Diesel engines is used].—Bull. A. I. M. E. Sept. 1916; p 1531; pp 8*; 35c.

Lehman, George R.—*Ore Drawing Tests and the Resulting Mining Method of the Inspiration Consolidated Copper Co., Arizona*. [Describes the caving system and the tests which led to its adoption].—Bull. A. I. M. E. Sept. 1916; p 1501; pp 14*; 35c.

Mann, Horace T.; Clayton, C. Y.—*Cupellation Losses in Assaying*. [Contains considerable tabulated data and curves].—Mo. School of Mines Bull. II:3; pp 60*.

Morse, H. W.; Tobelmann, H. A.—*Leaching Tests at New Cornelia, Arizona*. [Different methods and the results of tests are dealt with].—Bull. A. I. M. E. Sept. 1916; p 1593; pp 18*; 35c.

Taggart, Arthur F.—*The Reclamation of Brass Ashes*. [Methods of concentration are given in detail, with results of tests].—A. I. of Metals Adv. Paper No. 5; pp 12*; 35c.

—*Water Sampling in Creosote Oil: Relation of Amount of Preservation and Depth of Penetration to the Resistance of Materials Against Decay; Compilation of Service Test Records*.—American Rwy. Eng. Assn. Bull. 184; pp 36*; \$1.

Metallography

Bullens, Denison K.—*Steel and Its Heat Treatment*. [Omits intricate formulas and questionable theory].—Wiley & Sons; book; pp 431*; \$3.75.

Caesar, G. V.; Gerner, G. C.—*The Annealing Properties of Copper at Temperatures Below 500 Degrees with Particular Reference to the Effect of Oxygen and of Silver*.—A. I. of Metals Adv. Paper No. 6; pp 43*; 35c.

Mathewson, C. H.—*Co-operation with the Metal Industries in Metallographic Work at the Hammond Laboratory of the Sheffield Scientific School, Yale University*.—A. I. of Metals Adv. Paper No. 1; pp 20; 35c.

Merica, Paul D.; Karr, C. P.—*The Initial Stress Produced by the Burning-In of Manganese Bronze*.—A. I. of Metals Adv. Paper No. 8; pp 8*; 35c.

Rawdon, Henry S.—*Note on the Occurrence and Significance of Twinned Crystals in Electrolytic Copper*.—A. I. of Metals Adv. Paper No. 13; pp 12*; 35c.

Conservation

Smith, Lowry.—*Penetration of Preservatives*. [From "Railway Maintenance Engineer." A table is given of specific data].—Wood-Preserving Sept. 1916; p 66; pp 2¼; 35c.

—*Mixing Tar with Creosote*. [On opinions of the use of the mixture as a timber preservative].—Rwy. Rev. June 10 1916; pp 1¼; 20c.

—*Water Sampling in Creosote Oil: Relation of Amount of Preservation and Depth of Penetration to the Resistance of Materials Against Decay; Compilation of Service Test Records*.—American Rwy. Eng. Assn. Bull. 184; pp 36*; \$1.

Ore and Metal Markets; Prices-Current

New York, Sept. 14, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Sept. 13 were as follows:

	New York, Cents.	London, Pence.
Sept. 7.....	67 7/8	32 5/16
8.....	68 1/4	32 1/2
9.....	68 3/4	32 9/16
11.....	68	32 3/4
12.....	67 7/8	32 5/16
13.....	68	32 3/4

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London Standard Oz.	
	1916 High.	1916 Low.	1916 Avg.	1915 Avg.	1915 Avg.
January.....	57 1/2	55 1/2	56.775	48.890	26.875
February.....	57	56 1/2	56.755	48.477	27.000
March.....	60 3/4	56 3/4	57.935	49.926	27.080
April.....	73 1/2	60 3/4	64.415	60.034	31.375
May.....	77 1/4	68 3/4	74.27	49.915	34.182
June.....	68 3/4	62 3/4	65.02	49.072	31.038
July.....	65	60	62.94	47.619	29.870
August.....	67	25	64	47.178	31.25
September.....	.....	.....	.....	48.68	.....
October.....	.....	.....	.....	49.285	.....
November.....	.....	.....	.....	51.713	.....
December.....	.....	.....	.....	55.038	.....
Year.....	.....	.....	.....	49.690	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Very heavy buying of copper has continued. Foreign and domestic business has come before sellers in a never-ending stream. Dominant among the week's transactions is 5000 tons copper taken by the Russian Ministry of Munitions, which is now negotiating for a similar sized block of copper. Resellers who were doing business for this year at concessions advanced their prices following the sale to Russia and at this writing the market is very strong. As intimated in the last letter negotiations on the copper requirements of the entente allies would not long remain inactive. The large financial house handling this matter has resumed dealings with copper producers for 300,000,000 to 400,000,000 lbs. for delivery next year, starting from April. Producers instead of being asked to bid on a stated amount have been requested to tell how much copper they would care to sell for delivery from April to December at a price of 26 cts. In view of the fact that sales for the first half have been made at 27 3/4 cts. the price of 26 cts. offered by the allies may appear to be satisfactory, but producers would rather limit the tonnage sold at this price, as the situation is such that a better figure could be obtained early next year on ordinary transactions. It is likely, however, that the matter will now be closed, as producers concerned agree that the price meets with their approval. A Canadian inquiry for 1,000,000 lbs. copper for delivery 30 days after October 15 is now in the market, while active domestic inquiry calls for about 20,000,000 lbs. for delivery this year and over the first quarter of next year.

Now that the closing of the allied copper order is rendered certain copper factors are looking forward to further expansion in general buying. Regular consumers take war buying as their guiding point. When England buys copper for a year ahead, paying the high price, then regular consumers see their way clear to do the same thing. Thus the placing of a large war order for copper constitutes a sign for increased domestic buying. In the past week absorption of copper for the fourth quarter of this year has been so heavy that two of the large producers have been forced to withdraw from the market being sold up for this position. Spot and October electrolytic was offered by some dealers down to 27 1/2 cts., but at this writing they are holding firm for 28 3/4 cts. for these months. Important first hands continue to take orders for the fourth quarter at a flat price of 28 cts., but some producers are asking 28 3/4 cts. for what little copper they still have unsold. Despite the heavy buying of copper that has gone in the past five weeks, domestic consumers are

still seeking metal for delivery this year. This can only be regarded as a sign of improved domestic consumption, an indication which is borne out by the demand for finished copper goods. Spot casting copper has advanced to 25 3/4 @ 26 cts., while for the fourth quarter 25 1/2 @ 25 3/4 cts. is the prevailing price.

Estimates place the total copper production for the seven months up to Aug. 1 at 1,043,000,000 lbs. The entire refinery capacity of the country in 1915 was 1,634,000,000 lbs., so that there must be a substantial increase in refining capacity to take care of the ore and half refined copper. August statements of the copper companies show some good gains. Inspiration produced 11,450,000 lbs.; Anaconda, 28,800,000 lbs.; Kennecott, 10,200,000 lbs.; Braden, 2,616,000 lbs., and Shannon, 860,000 lbs. The latter two are the only ones showing declines.

A high copper authority asserts that considerable new refining capacity will come into play this month and increase the marketable copper in October. August refinery yield did not run above 160,000,000 lbs., but September may go close to 165,000,000 lbs., and October probably 175,000,000 lbs. Such increases would be valuable in meeting the insatiable demand. Producers now have orders on their books for shipment this year that make these increases in refinery yield necessary.

The market at London has held fairly steady. Last week standard copper receded slightly, but the closing price made up the loss. Electrolytic has advanced £2 to £132. Standard copper opened the current week £1 higher in spot and 1s up in futures.

Quotations for copper per pound at New York for the week ended Sept. 13 were as follows:

	(For Fourth Quarter Delivery.)		
	Lake.	Electrolytic.	Casting.
Sept. 7.....	28 @ 28 1/4	28 @ 28 1/4	25 @ 25 1/2
8.....	28 @ 28 1/4	28 @ 28 1/4	25 1/4 @ 25 1/2
9.....	28 @ 28 1/4	28 @ 28 1/4	25 1/4 @ 25 1/2
11.....	28 @ 28 1/4	28 @ 28 1/4	25 1/2 @ 25 3/4
12.....	28 @ 28 1/4	28 @ 28 1/4	25 1/2 @ 25 3/4
13.....	28 @ 28 1/4	28 @ 28 1/4	25 1/2 @ 25 3/4

Quotations for copper per ton at London for the week ended Sept. 13 were as follows:

	Standard		Electrolytic.
	Spot	Futures.	
Sept. 7.....	£109 10 0	£106 10 0	£131 0 0
8.....	110 0 0	107 10 0	131 0 0
9.....	110 0 0	107 10 0	131 0 0
11.....	111 0 0	108 0 0	131 0 0
12.....	111 0 0	108 0 0	132 0 0
13.....	114 0 0	110 10 0	132 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month	1916		Average.	1915. Average.
	High.	Low.		
January.....	25.50	23.00	24.101	13.891
February.....	28.50	26.25	27.437	14.72
March.....	28.25	27.25	27.641	15.11
April.....	30.00	28.50	29.40	17.398
May.....	29.75	28.25	29.05	18.812
June.....	29.25	27.25	27.90	19.92
July.....	27.20	26.10	26.745	19.423
August.....	28.00	25.00	26.320	17.472
September.....	.....	.....	.....	17.758
October.....	.....	.....	.....	17.926
November.....	.....	.....	.....	18.856
December.....	.....	.....	.....	20.375
Year.....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916		Average.	1915. Average.
	High.	Low.		
January.....	25.50	23.00	24.101	13.707
February.....	28.50	25.25	27.462	14.572
March.....	28.25	27.25	27.410	14.96
April.....	30.50	28.25	29.65	17.057
May.....	29.75	28.00	28.967	18.601
June.....	29.25	27.25	27.90	19.173
July.....	27.20	26.10	26.745	19.08
August.....	28.00	25.00	26.320	17.222
September.....	.....	.....	.....	17.705
October.....	.....	.....	.....	17.859
November.....	.....	.....	.....	18.826
December.....	.....	.....	.....	20.348
Year.....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	1916	1916	1915	1916	1915
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	25.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.451
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.33	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	.....	.....	.....	.....	68.560
October	.....	.....	.....	.....	72.577
November	.....	.....	.....	.....	77.400
December	.....	.....	.....	.....	80.400
Year	.....	.....	.....	.....	.....

Tin.—Weakness has become evident in tin. Continued absence of demand as well as conditions that would favor the metal have finally broken down the reserve of sellers at the Straits, who are now offering freely at concessions. Since our last report the market has been flat, with but minor changes in prices. At the opening of the current week a decided recession took place, being forced by a break at Singapore. Spot Straits tin was offered down to 37½ cts., while spot Banka could be had at 36½ cts. and spot No. 1 Chinese at 36 cts. Futures were also affected by the reaction. Consumers are well supplied up to November, but there remains some buying to be done for December. Sellers had hoped to force the issue, but consumers withheld and now conditions appear to be shaping so that they can not only cover December needs but buy well into next year at low prices. Straits tin for September and October delivery has been offered at 37½ cts., while for November and December delivery sellers asked 37½ cts. Limits from the Far East for January and February arrival held around 37½ cts. Last week Straits tin at London declined £1 to £170 and Singapore shipments £2 10s to £171. Singapore opened the current week £1 down at £170 10s, while Straits at London eased off only 5s to £169 15s. On the break at Singapore there were no sales, a development that seems to typify the final breaking of the control exerted by factors at the Straits. The total visible supply on Aug. 31 was 18,042 tons, representing a decrease of 362 tons from the month previous. The total stocks were 8892 tons, against 8887 tons. The total afloat the close of August was 9150 tons, against 9517 tons on July 31.

Arrivals of tin since the first of the month total 815 tons, while stocks afloat to this country total 3980 tons.

Quotations for tin per pound at New York and per ton at London for the week ended Sept. 13 were as follows:

Sept.	New York		Sept.	London		Sept.	Singapore	
	Spot.	38¾c		Straits, spot.	£170 17 6		Shipments.	£170 15 0
7.....	38.90c	38¾c	.....	170 0 0	171 10 0	.....	171 10 0	171 10 0
8.....	38¾c	38¾c	.....	169 15 0	170 10 0	.....	172 5 0	172 0 0
9.....	38¾c	38¾c	.....	169 17 6	172 0 0	.....	.....	.....
10.....	38¾c	38¾c	.....	.....	.....	.....	.....	.....
11.....	38¾c	38¾c	.....	.....	.....	.....	.....	.....
12.....	38¾c	38¾c	.....	.....	.....	.....	.....	.....
13.....	38¾c	38¾c	.....	.....	.....	.....	.....	.....

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.386
September	.....	.....	.....	33.13
October	.....	.....	.....	33.077
November	.....	.....	.....	39.376
December	.....	.....	.....	38.755
Year	.....	.....	.....	38.664

Lead.—Scarcity of spot lead and a very small supply for late September have served to strengthen the lead market considerably and while prices are repeated the trade is waiting for an advance by the American Smelting & Refining Co. Independents do not care to send their prices any higher, as there is now a difference of 20 to 25 points over the A. S. & R. Co. figures. If, however, the leading interest comes up to 6.75 cts. New York the independents will quickly go to 7 cts. Japan has been in the market for a fair amount, but domestic users appear to be well covered. The government has done some buying for the arsenals. Canadians have not

been in the market, but it learned that a contract for 160,000 cartridges is now being figured in this country and may soon be closed. This may be the forerunner of more cartridge contracts here, a development that would further strengthen the lead situation. Independents have quoted 6.70 @6.75 cts. New York and 6.50@6.55 cts. St. Louis, while the principal producers' quotations have been 6.50 cts. New York and 6.42½ cts. St. Louis. Independents reported that users were sounding the market for October metal and it is learned that some outside interests took business for that month at around 6.50 cts. New York.

Producers are all well sold up for this month and also have orders for October. There appears to be no lead on the market. Brokers report that what few inquiries they have had have been difficult to fill, as sellers were not in evidence. Lead at London has been declining. Last week spot dropped £1 to £30 5s and futures 15s to £29 5s, with further declines this week.

Quotations for lead per pound at New York and per ton at London for the week ended Sept. 13 were as follows:

Sept.	New York		Sept.	London	
	Indpts.	A. S. & R. Co.		Spot.	Futures.
7.....	6.70c	6.50c	.....	£30 5 0	£29 5 0
8.....	6.70c	6.50c	.....	30 5 0	29 5 0
9.....	6.70c	6.50c	.....	30 5 0	29 5 0
10.....	6.70c	6.50c	.....	30 0 0	28 15 0
11.....	6.75c	6.50c	.....	30 0 0	28 15 0
12.....	6.80c	6.50c	.....	30 0 0	28 15 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London		
	1916	1916	1915.	1916.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	22.010
April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	6.75	6.88	5.875	29.760	25.750
July	6.85	6.25	6.37	5.738	28.035	25.611
August	6.70	5.95	6.32	4.750	30.260	22.150
September	.....	.....	.....	4.627	.....	22.953
October	.....	.....	.....	4.612	.....	23.932
November	.....	.....	.....	5.152	.....	26.240
December	.....	.....	.....	5.346	.....	28.884
Year	.....	.....	.....	4.675	.....	23.099

Lead Ore.—Virtually no change was noted in the ore market of the Missouri-Kansas-Oklahoma district during the week ended Sept. 9 and though the bulk of the buying was at \$65 there were some few lots that went at as high as \$67. Production for the week was down over 600,000 lbs. and totaled 1,725,275 lbs. of concentrates bring the yearly production to 72,567,747 lbs. The values of these amounts were \$55,927 and \$3,057,981.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916				1915.
	High.	Low.	Average.	Average.	Average.
January	81.00	70.00	73.15	.....	47.00
February	90.00	83.00	86.45	.....	47.00
March	100.00	87.00	93.50	.....	48.70
April	118.00	94.40	106.20	.....	50.50
May	97.00	92.00	94.75	.....	50.50
June	82.50	75.00	76.35	.....	63.50
July	75.00	70.00	71.9375	.....	59.00
August	67.00	63.00	65.625	.....	47.50
September	.....	.....	.....	.....	48.25
October	.....	.....	.....	.....	51.80
November	.....	.....	.....	.....	63.00
December	.....	.....	.....	.....	71.375
Year	.....	.....	.....	.....	53.34

Zinc Ore.—In unison with its allied metals zinc ores remained the same as during the previous week in the Missouri-Kansas-Oklahoma district. Large sales of ore stocks was a common rumor during the first part of the week but this subsided when nothing for its substantiation could be brought out towards the end of the week. Prices ranged from \$45 to \$65 during the week ended Sept. 9, and the production was given at 6,477,070 lbs. for the week and 452,106,444 for the year. The week's production was valued at \$176,332 and the year's at \$20,082,841.

Calamine.—Nothing new has become evident in this market and the demand seems fair at the price of \$30 to \$40 which is entirely unsatisfactory to the producer. Production for the week of 140,000 lbs. was only about 30% of that of the previous week. The total for the year was 20,772,610 lbs. and valued at \$740,336, while the week's production was valued at \$2,800.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.60	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	68.75	60.25
September				76.76
October				82.40
November				92.50
December				87.00
Year				102.95

Spelter.—On persistent urgings by dealers a fair amount of buying of spelter for the fourth quarter was done by brass makers. The dealers pointed out that prices were reasonably low considering war times, and that the metal represented a safe purchase. The advent of business, of course, brought a minor advance in the price. The market appeared to be fairly steady, but it is apparent that consumers must be prodded. A few foreign inquiries have appeared, notably one for 500,000 lbs. for Canada and about 1000 tons for France. Spot moved up to 8% cts. New York and 8½ cts. St. Louis, while for the fourth quarter there were sales at an average price of 8.50 cts. For October alone sellers asked 8% cts., with November and December quoted at 8½ cts. Various reports designed to force consumers to cover were noted. Thus there were reports of a gas shortage hampering smelters, while some dealers who are holding good lines for the fourth quarter issued some very wild reports, but without success, as users of spelter are pretty well posted on the situation. At London the market moved up towards the close of the past week, going to £50 for spot and £44 for futures, making further gains this week.

Quotations for spelter per pound at New York and per ton at London for the week ended Sept. 13 were as follows:

	New York.	London	
	Spot.	Spot.	Futures.
Sept. 7.....	8½c	£48 10 0	£41 10 0
8.....	8½c	50 0 0	44 0 0
9.....	8½c	50 0 0	44 0 0
11.....	8½c	50 0 0	44 0 0
12.....	9¼c	52 0 0	45 0 0
13.....	9.45c	54 0 0	47 0 0

MONTHLY AVERAGE PRICES OF SVELTER.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	19.42½	17.30	18.801	8.519	8.840
February	21.17½	18.67½	20.094	8.866	9.7840
March	20.50	16.60	18.40	10.125	100.720
April	19.37½	17.75	18.76	11.48	98.103
May	17.50	13.75	15.98	15.825	89.507
June	13.62½	11.26	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August	9.75	8.37½	9.11½	16.110	56.00
September				14.493	
October				14.196	
November				16.375	
December				16.675	
Year				13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Poor demand for quicksilver has resulted in prices receding. Selling agents made three reductions last week, bringing the price down to \$75 per flask for spot virgin. Adequate supplies from Europe and Mexico are beginning to exert a repressive influence on the high prices.

Antimony.—There has been no improvement in the demand for antimony. As a result spot supplies are again beginning to accumulate on sellers' hands. Spot has been offered freely down to 11½ cts., while sales are known to have been made at 11 cts. Consumers are well supplied.

Aluminum.—Demand continues fair, with the market holding steady. Prices are repeated at 60@62 cts. per pound for spot virgin in ton lots.

Spiegeleisen.—While furnaces are asking \$55 per spot 20%, business can be done at \$45@50 without much trouble.

Pig Iron.—Business in pig iron continues brisk, with

more large tonnages purchased. The Brier Hill Steel Co. has taken 20,000 tons basic for the fourth quarter at a price equivalent to \$18 valley. A Pittsburgh dealer has taken 10,000 tons basic for the first half at \$18.50 valley, but this price is not yet generally established. Foreign demand for bessemer remains large. Foundry business continues good. The American Locomotive Co., Westinghouse Electric & Mfg. Co. and the Standard Sanitary Mfg. Co. are in the market for round tonnages, while a considerable miscellaneous business is being negotiated.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.07½	to	.08½
Nitric, 40 deg.....	.09	to	.09½
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured, 188 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.71
Alum.—Powdered, lb.....	.05	to	.07
Lump, lb.....	.04	to	.06
Ground, lbs.....	.041	to	.06½
Ammonia—			
Muriate, white grain, lb.....	.09½	to	.09½
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06	to	.06½
Red, lb.....	.60	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.14	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	2.75	to	2.80
Foundry.....	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese—Spot.....	175.00	to	.....
Last half.....	175.00	to	.....
Ferrosilicon, 60%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
White crystals.....	.15½	to	.15½
Broken, cakes.....	.14½	to	.15
Powdered.....	.17	to	.17½
Lead—Granulated, lb.....	.17	to	.17½
Brown sugar.....	.13½	to	.14½
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	50.00	to	55.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.39	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.45	to	.50
Prussiate, yellow.....	.65	to	.70
Prussiate, red.....	1.75	to	1.80
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.25½	to	.26
Soda—Ash, 48% (43% basis), bbl.....	2.75	to	3.00
Strontia Nitrate, casks, lb.....	.30	to	.31
Sulphur—			
Crude, ton.....	28.00	to	29.00
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.29½	to	.30
Oxide, lb.....	.43	to	.45
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest						Paid in 1916	Total to date	Latest	
						Date	Am't.							Date	Am't.
Acacia, g.....	Colo..	1,433,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.....	Colo..	480,915	\$1	\$.....	\$98,916	Sept. '01	\$0.01
Adams, s. l. c.....	Colo..	80,000	10	.....	778,000	Dec. 13, '09	.04	Golden Star, g.....	Ariz..	400,000	6	.....	120,000	Mar. 15, '10	.06
Adventure, c.....	Mich..	100,000	25	50,000	50,000	July 20, '16	.50	Gold Com. Fra., g.....	Nev..	922,000	1	.....	92,111	Oct. 15, '08	.10
Abmco, c.....	Mich..	200,000	25	1,200,000	5,250,000	July 10, '16	3.00	Goldfield Con., g.....	Nev..	3,559,148	10	.....	23,989,831	Oct. 31, '15	.10
Alaska Goldfields.....	Alaska	250,000	5	.....	403,250	Jan. 10, '15	.15	Good Hope, g. a.....	Colo..	500	100	.....	941,250	Jan. '08	.25
Alaska Mexican, g.....	Alaska	150,000	5	.....	3,507,381	Nov. 28, '15	.10	Good Sp. Anchor, z. s.	Nev..	550,000	1	33,000	119,755	June 15, '18	.01
Alaska Mines Sec.....	U. S.....	500,000	5	.....	90,000	Nov. 1, '06	.....	Grand Central, g.....	Utah..	600,000	1	.....	1,545,200	Dec. 23, '16	.02%
Alaska Treadwell, g.....	Alaska	200,000	25	250,000	15,780,000	May 29, '16	.60	Grand Gulch, c. s.....	Nev..	239,846	2.50	9,694	11,992	Jan. 1, '16	.03
Alaska United, g.....	Alaska	150,200	5	54,060	2,045,270	Feb. 28, '16	.30	Granite, g.....	Alaska	430,000	1	17,200	17,200	May 10, '16	.02
Allouez, c.....	Mich..	100,000	25	450,000	650,000	July 15, '16	2.00	Gwin, g.....	Cal..	100,000	10	.....	481,500	Feb. '08	.25
Amalgamated, c.....	Mont.	1,533,529	100	.....	103,444,983	Aug. 30, '15	3.77	Hazel, g.....	Cal..	900,000	1	.....	1,114,000	Jan. 5, '16	.01
Am. Sm. & R., com	U. S.....	600,000	100	1,500,000	30,833,333	June 1, '16	1.50	Hecia, a. l.....	Idaho	1,000,000	0.25	950,000	4,705,000	Aug. 20, '16	.15
Am. Sm. & R., pf.	U. S.....	600,000	100	1,750,000	56,546,386	June 1, '16	1.75	Hercules.....	Idaho	1,000,000	1	1,850,000	12,630,000	Aug. 15, '16	.20
Am. Sm. Sec. A. pf.	U. S.....	300,000	100	1,250,000	11,495,000	July 1, '16	1.50	Hidden Treasure, g.....	Cal..	30,000	10	.....	457,452	Sept. '00	.10
Am. Sm. Sec. B. pf.	U. S.....	300,000	100	1,250,000	16,335,000	Aug. 1, '16	1.25	Holy Terror, g.....	S. D.....	500,000	1	.....	172,000	Jan. '00	.01
Am. Zinc, l. & Sm	Mo..	183,120	25	2,756,180	3,906,000	Aug. 1, '16	1.50	Homestake, g.....	S. D.....	251,160	100	1,306,032	37,011,740	Aug. 25, '16	.65
Anasconda, c.....	Mont.	2,331,520	60	11,656,350	175,914,371	Aug. 28, '16	2.00	Hope Dev.....	Cal..	600,000	1	.....	1,500,000	Dec. 31, '16	.01
Annie Laurie, g.....	Utah..	25,000	100	.....	439,561	Apr. 22, '06	.50	Horn Silver, l. a. z.....	Utah..	400,000	1	40,000	5,182,000	June 30, '16	.05
Argonaut, g.....	Cal..	200,000	5	40,000	1,680,000	June 27, '16	.10	Imperial, c.....	Ariz..	500,000	10	.....	300,000	June 24, '07	.20
Arizona, c.....	Ariz..	.....	.....	621,164	30,212,164	Apr. 1, '16	.....	Inspiration Con.....	Ariz..	920,687	20	3,091,233	3,091,233	July 31, '16	2.00
Atlantic, c.....	Mich..	100,000	25	.....	990,000	Feb. 21, '05	.60	Inter'l Nickel, com.	U. S.....	1,673,334	25	6,433,498	30,941,338	Jan. 1, '16	2.00
Bagdad-Chase, g. pf.	Cal..	84,819	5	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, pf.	U. S.....	89,126	100	401,067	5,748,513	Aug. 1, '16	1.60
Bald Butte, g. s.....	Mont.	250,000	1	.....	1,354,648	Nov. 1, '07	.04	Inter'n Sm. & R.....	U. S.....	100,000	100	.....	4,000,000	May 2, '14	2.00
Baltic, c.....	Mich..	100,000	25	.....	7,950,000	Dec. 31, '13	2.00	Interstate-Calahan	Idaho	464,990	10	1,394,970	3,952,415	June 30, '16	1.60
Barnes-King, g.....	Mont.	40,000	5	60,000	60,000	June 1, '16	.07%	Iuwa, g. a. l.....	Colo..	1,666,667	1	.....	270,167	Dec. 31, '15	.00%
Beck Tunnel Con.....	Utah..	1,000,000	0.10	.....	940,000	Nov. 15, '07	.02	Iowa Tiger, g. a. l.....	Colo..	3,000	1	.....	25,179	Jan. 15, '16	.05
Big Four Expl.....	Utah..	400,000	1	80,000	90,000	Aug. 15, '16	.06	Iron Blossom, l. a. g.	Utah..	1,000,000	1	260,000	2,750,000	July 30, '16	.10
Board of Trade, z.....	Wia..	120,000	1	.....	78,000	Jan. 15, '11	.06	Iron Cap pf. d. c.....	Ariz..	33,481	10	6,422	29,803	July 1, '18	.35
Bonanza Dev.....	Colo..	300,000	1	.....	1,425,000	Oct. 23, '11	.20	Iron Clad, g.....	Colo..	1,000,000	1	.....	50,000	Nov. '06	.06
Booth (Reorganized)	Nev..	998,295	5	349,949	249,949	June 28, '16	.06	Iron Silver.....	Colo..	600,000	20	.....	5,600,000	Dec. 31, '16	.10
Boss, g.....	Nev..	408,500	1	.....	40,850	Dec. 10, '14	.10	Isabella, g.....	Colo..	2,250,000	1	.....	745,600	Mar. '01	.01
Boston & Colo. Sm.	Colo..	16,000	10	.....	402,350	Oct. '02	.75	Isle Royale, c.....	Mich..	160,000	25	160,000	500,000	July 31, '16	1.00
Bot. & Mont. Con.	Mont.	100,000	25	.....	63,225,000	May 16, '11	4.00	Jamison, g.....	Cal..	380,000	10	.....	376,300	Jan. '01	.02
Breco, l. z.....	Colo..	200,000	25	.....	220,000	Dec. 15, '13	.10	Jerry Johnson, g.....	Colo..	2,600,000	10	.....	187,500	Nov. 5, '14	.00%
Brunswick Con., g.....	Cal..	300,000	1	.....	208,315	Sept. 15, '15	.08	Jim Butler.....	Nev..	1,718,020	1	343,604	615,406	Aug. 1, '16	.10
Bullion B. & Champ	Utah..	100,000	10	.....	2,768,400	July 11, '08	.01	Joplin Ore & Spelter	Mo..	400,000	5	62,000	62,000	July 22, '16	.04%
Bullwhacker, c.....	Mont.	450,000	1	.....	10,000	July 1, '07	.01	Jumbo Ext., g.....	Nev..	1,550,000	1	194,000	684,998	June 30, '16	.05
Bunker Hill Con. g.	Cal..	200,000	1	40,000	861,000	Aug. 4, '16	.02%	Kendall, g.....	Mont.	600,000	5	60,000	1,555,000	Apr. 3, '16	.10
Bunker Hill & Bull	Idaho	327,000	10	1,154,500	17,917,500	Aug. 4, '16	.40	Keneck Zinc.....	Mo..	200,000	.....	60,000	60,000	June 30, '16	.10
Butte All. Scott.....	Mont.	75,000	10	844,502	1,054,119	Apr. 10, '16	10.50	Kennecott.....	Alas..	250,000	10	7,000,000	12,000,000	June 30, '16	1.60
Butte-Ballaklava, c.	Mont.	250,000	15	.....	4,700,000	Dec. 1, '11	.25	Kennedy, g.....	Cal..	100,000	100	.....	1,801,001	June '06	.06
Butte Coalition, c.....	Mont.	272,637	10	.....	11,883,017	June 30, '16	10.75	King of Arizona, g.....	Ariz..	200,000	1	.....	384,000	Oct. 2, '09	.12
Butte & Superior, z.	Idaho	2,606,000	1	625,200	1,507,931	Aug. 5, '18	.08	Klar Pluot, c.....	Wia..	20,000	1	.....	155,500	Dec. 16, '12	.25
Caledonia, l. z. c.....	Ariz..	641,923	10	2,565,678	25,714,001	June 20, '16	2.00	Knob Hill, g.....	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%
Calumet & Ariz. c.....	Mich..	100,000	25	3,000,000	132,250,000	June 23, '16	15.00	La Fortuna, g.....	Ariz..	250,000	1	.....	1,200,500	Oct. '02	.01%
Calumet & Hecla, c.	Colo..	1,750,000	25	113,684	10,243,964	Jan. 1, '16	.17%	Lake View.....	Utah..	500,000	.05	60,000	114,500	June 12, '16	.01
Camp Bird, g.....	Utah..	500,000	1	125,000	250,000	June 1, '16	.25	Last Dollar, g.....	Colo..	1,600,000	1	.....	180,000	Feb. 23, '03	.02
Cardiff, l.....	Utah..	600,000	1	.....	60,000	Dec. '08	.01	Liberty Bell, g.....	Colo..	133,661	5	.....	1,762,795	Jan. 31, '16	.06
Carima, g. s. c.....	Utah..	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Lightner, g.....	Cal..	102,255	1	.....	331,179	June '06	.06
Centennial Eureka, c.	Cal..	100,000	10	55,000	650,000	Aug. 1, '16	.15	Linden, z.....	Wis..	1,020	1	.....	11,200	Dec. 31, '16	3.00
Center Creek, l. z.....	Cal..	100,000	1	.....	799,189	Mar. 6, '06	.05	Little Bell, s. l.....	Utah..	300,000	1	15,000	76,000	Apr. 22, '16	.06
Central Eureka, g.....	Utah..	1,000,000	1	44,000	392,087	Feb. 15, '16	.06	Little Florence.....	Nev..	1,000,000	1	.....	430,000	Jan. '08	.03
Century, g. s. l.....	Mich..	100,000	25	5,000,000	15,000,000	Aug. 9, '16	6.40	Lost Packer.....	Idaho	150,000	1	.....	37,600	Oct. 23, '13	.25
Champion, c.....	Cal..	892,960	1	134,323	483,960	Aug. 2, '16	.06	Lower Mammoth.....	Utah..	1,000,000	1	.....	67,000	Dec. 16, '16	.01
Chiel Con.....	N. M.....	869,380	5	3,944,930	9,742,925	June 30, '16	2.25	Mammoth, g. s. c.....	Nev..	1,000,000	1	.....	46,800	Apr. 23, '06	12.00
Chino Copper c.....	Cal..	1,431,900	1	.....	171,828	Nov. '04	.01	Magma, c.....	Ariz..	240,000	5.00	240,000	450,000	June 30, '16	.60
C. K. & N. g.....	Alaska	100,000	1	.....	115,000	Feb. 5, '14	.06	Mammoth, g. s. c.....	Utah..	400,000	10	90,000	238,000	June 30, '16	.06
Cliff, s. l.....	Utah..	300,000	10	.....	90,000	Jan. 1, '13	.10	Manhattan-Big 4, g.	Nev..	762,400	1	.....	30,248	Aug. 15, '11	.02
Clinton, g. s.....	Colo..	1,000	100	.....	60,000	Dec. '08	.30	Mary McKinney, g.	Colo..	1,309,262	1	.....	1,169,306	July 28, '14	.02
Colo. O. Dredging.....	Colo..	200,000	10	100,000	425,000	Feb. 23, '16	.10	Mary Murphy, g. s. l.	Mich..	370,000	5	25,067	93,106	May 1, '16	.07
Colorado, a. l.....	Utah..	1,000,000	0.20	.....	2,600,000										

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid In 1916	Total to Date	Latest						Paid In 1916	Total to Date	Latest	
						Date	Am.							Date	Am.
Petro, g. s.	Utah	600,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success	Ida.	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03
Pharmacist, g.	Colo.	1,600,000	1	.....	91,600	Feb. 1, '10	.00%	Superior & Pitts. c	Ariz.	1,499,792	10	.....	10,318,568	Dec. 21, '15	.35
Phelps, Dodge & Co	U. S.	450,000	100	6,400,000	53,771,627	June 30, '18	6.00	Tamarack, c.	Mich.	60,000	25	.....	9,420,000	July 23, '07	4.00
Pittsberg, g. s.	Alaska	6,000,000	1	.....	2,041,626	Oct. 7, '11	.03	Tamarack-Custer	Idaho	2,000,000	1	106,575	106,575	Aug. 30, '16	.02
Pittsburg-Idaho, I.	Ida.	1,000,000	1	.....	249,104	July 16, '07	.02	Tennessee, c.	Tenn.	200,000	25	300,000	6,266,250	Apr. 15, '16	.76
Pitta Silver Peak	Nev.	2,790,000	1	.....	840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100	74,400	160,000	Jan. 3, '14	.....
Platteville, I. z.	Wis.	600	60	.....	179,500	June 16, '07	0.00	Tomboy, g. s.	Cal.	310,000	6	.....	3,661,655	June 30, '16	.....
Plumas Eureka, g.	Cal.	150,625	10	.....	2,831,294	Apr. 8, '01	.06	Tom Reed, g.	Ariz.	909,555	1	.....	2,555,934	Sept. 5, '15	.01
Plymouth Con.	Cal.	240,000	6	116,500	289,300	Aug. 10, '16	.24	Ton-Beimont, g.	Nev.	1,600,000	1	562,600	8,205,627	July 1, '16	.12%
Portland, g.	Colo.	3,000,000	1	270,000	10,447,080	July 20, '16	.03	Ton-Extension, g. s.	Nev.	1,272,301	1	413,660	1,400,856	July 1, '16	.16
Prince Con., s. l.	Nev.	1,000,000	2	125,000	250,000	July 1, '16	.06	Tonopah, g. s.	Nev.	1,000,000	1	450,000	13,450,000	July 21, '16	.15
Quartette, g. s.	Nev.	100,000	10	.....	376,000	July 31, '07	.20	Tonnaph Midway, g.	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.06%
Quicksilver, pf.	Cal.	43,000	100	.....	1,931,411	Apr. 8, '03	.50	Tremmisi	Cal.	200,000	2.50	.....	234,000	Apr. 28, '15	.02
Quip, g.	Wash.	1,600,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,100,000	Oct. 30, '12	.30
Quincy, c.	Mich.	110,000	25	770,000	22,647,500	June 30, '16	4.00	Tuolumne, c.	Mont.	800,000	1	.....	496,625	Apr. 15, '13	.02
Ray Con., c.	Ariz.	1,671,279	10	1,671,279	6,144,406	June 30, '16	.50	Uncle Sam Con, s.	Utah	500,000	1	.....	470,000	Sept. 20, '11	.06
Red Metal, c.	Mont.	1,000,000	10	.....	1,200,000	Apr. 1, '07	4.00	Union, g.	Colo.	1,250,000	1	.....	444,244	Jan. 27, '03	.02
Red Top, g.	Nev.	1,000,000	1	.....	128,176	Nov. 24, '07	.10	Union Basin, z.	Ariz.	835,350	1	.....	167,070	Nov. 16, '10	.02
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. pf.	Mont.	60,000	100	.....	1,500,000	Apr. 16, '07	3.00
Richmond, g. s. l.	Nev.	64,000	1	.....	4,453,797	Dec. 23, '00	.01	United, c. pf.	Mo.	19,656	25	.....	6,125,000	Aug. 6, '07	1.75
Rocco-Home, I. s.	Nev.	300,000	1	.....	162,600	Dec. 22, '06	.02	United, z. l. pf.	Mo.	19,656	25	.....	211,627	Oct. 15, '07	.20
Rochester Ld. & L.	Mo.	4,900	100	.....	190,846	July 1, '12	.50	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Round Mountain, g.	Nev.	889,018	1	.....	363,964	Aug. 25, '13	.04	United (Crip. Ck)	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Sacramento, g.	Utah	1,000,000	6	.....	308,000	Oct. 22, '06	.00%	United Globe, c.	Ariz.	23,000	100	759,000	3,335,000	June 30, '16	18.00
St. Joseph, I.	Mo.	1,464,798	10	704,733	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	50,000	100	.....	11,000,000	Sept. 23, '10	6.00
St. Mary's M. L.	Mich.	160,000	26	2,083,000	10,972,631	June 30, '16	.25	United Verde, c.	Ariz.	300,000	10	1,845,000	38,272,000	Aug. 9, '16	.75
Schoenh'r-Wal'n, z. l.	Mo.	10,000	10	.....	6,890,000	Aug. 28, '16	2.00	United Verde Ext.	Ariz.	1,000,000	50	600,000	600,000	Aug. 1, '16	.60
Scratch Gravel	Cal.	1,000,000	1	20,000	90,000	Sept. 20, '11	.20	U. S. Red & R. com.	Colo.	59,188	100	.....	414,078	Oct. 9, '03	1.60
Seven Tro. Cn., g. s.	Nev.	1,443,077	1	36,076	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,468	100	.....	1,776,936	Oct. 1, '07	1.60
Shannon, c.	Ariz.	300,000	10	.....	252,632	Apr. 1, '16	.02%	U. S. R. & M. com	Utah	351,116	80	985,666	7,590,745	July 15, '16	1.00
Shattuck-Ariz., c.	Ariz.	350,000	10	1,226,500	760,000	Jan. 30, '13	.50	U. S. R. & M. pf.	USMx	495,350	50	1,288,668	18,084,360	July 15, '16	.87%
Silver Hill, g. s.	Nev.	108,000	1	.....	4,200,000	July 2, '16	1.26	Utah, c.	Utah	1,624,490	10	8,234,686	41,656,692	June 30, '16	3.00
*Silver King Coal'n	Utah	1,250,000	6	662,600	88,200	June 24, '07	.06	Utah Apex, s. l.	Utah	625,200	6	274,100	330,125	July 1, '16	.25
Silver King Con.	Utah	637,682	1	127,516	14,147,485	July 1, '16	.16	Utah Apex, s. l.	Utah	300,000	6	460,000	9,600,000	June 26, '16	.75
Silver Mines Expl.	N. Y.	10,000	100	.....	942,373	July 22, '16	.10	Utah Con., c.	Utah	760,000	1	325,000	1,285,482	Aug. 15, '16	.60
Sinix Cons., I. s. c.	Utah	745,399	1	.....	250,000	June 16, '10	2.00	Utah M. & T. i.	Utah	760,000	1	325,000	1,285,482	Aug. 15, '16	.60
Skidoo, g.	Cal.	1,000,000	6	.....	872,106	July 20, '11	.04	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00
Smugler, s. l. z.	Colo.	.....	1	.....	365,000	Oct. 2, '14	.01	Victoria, g. s. l.	Utah	250,000	1	.....	207,500	Apr. 23, '10	.04
Snwstorm, c.	Idaho	1,600,000	1	.....	2,235,000	Nov. 22, '06	.03	Victindicator Con., g.	Colo.	1,600,000	1	135,000	3,397,500	July 25, '16	.03
Socorro	N. M.	377,342	6	68,599	1,199,610	Oct. 10, '13	.01%	Wasp No. 2, g.	S. D.	600,000	1	100,000	649,466	May 15, '16	.02%
South Eureka, g.	Cal.	299,981	1	167,920	196,070	Aug. 1, '16	.05	Wellington, I. z.	Colo.	10,000,000	1	400,000	1,050,000	July 1, '16	.02
South Hecla	Ida.	600,000	1	39,450	196,070	Aug. 1, '16	.05	West End Cn.	Nev.	1,788,486	1	.....	636,645	Jan. 15, '16	.05
Sn. Swansea, g. s. l.	Utah	.....	1	.....	1,409,754	Aug. 15, '16	.07	West Hill	Wis.	20,000	1	8,000	40,000	June 29, '16	.20
Spearfish, g.	S. D.	1,600,000	1	.....	39,450	Aug. 10, '16	.16	White Knob, g. pf.	Cal.	200,000	10	60,000	190,000	Aug. 25, '16	.10
Standard Con., g. s.	Cal.	178,394	10	.....	287,500	Apr. 3, '04	.01%	Wilbert	Ida.	1,000,000	1	30,000	40,000	Aug. 15, '16	.01
Standard, c.	Ariz.	426,000	1	.....	165,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	360,600	8,760,000	Apr. 1, '16	6.00
Stewart, I. z.	Idaho	1,238,362	1	.....	5,274,408	Nov. 17, '13	.03	Wolverine & Ariz. c	Ariz.	118,674	16	.....	53,403	Apr. 31, '12	.25
Stratton's Crisp. Ck.	Colo.	2,000,000	1	.....	69,600	Sept. 3, '05	.50%	Work, g.	Colo.	1,600,000	1	.....	1,697,685	Apr. 31, '12	.02
Stratton's Ind.	Colo.	1,000,000	6	.....	2,043,297	Dec. 31, '15	.05	Yak, g.	Colo.	1,000,000	1	120,000	2,227,685	June 30, '16	.07
Str'n's Ind. (new) g.	Colo.	1,000,000	30	160,000	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	.....	167,650	Feb. 1, '13	.01
Stro	Colo.	1,000,000	1	.....	6,028,568	Dec. 23, '06	0.12	Yellow Aster, g.	Cal.	100,000	10	17,000	1,189,759	Aug. 1, '16	.02
	Colo.	1,000,000	30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine	Cal.	1,000,000	1	750,000	1,643,008	Aug. 15, '16	.15
	Colo.	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	.....	102,583	July 15, '14	.10

Corrected to September 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization						NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					
				Paid in 1916	Total to Date	Latest		Paid in 1916	Total to Date					Latest					
						Date	Am.							Date	Am.	Date	Am.		
Ajuchitlan	Mex...	50,000	\$ 6	\$.....	\$237,600	July 1, '13	\$0.25	Las Caballitas	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00				
Amistad y Concordia g. s.	Mex...	9,600	60	.....	429,358	July 16, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25	.....	1,827,320	Dec. 16, '15	\$0.24		
Amparo, s. g.	Mex...	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.06	Lucky Tiger	Mex...	715,337	10	321,902	3,585,263	Aug. 20, '16	.03				
Bartolo de Medina Mill	Mex...	2,000	25	.....	103,591	Aug. 1, '07	.60	McKinley-Darragh-Sav.	Ont...	2,247,692	1	202,298	4,510,061	July 1, '16	.03			
Batopilas, s.	Mex...	446,268	20	.....	55,870	Dec. 31, '07	.12%	Mexican, I. pf.	Mex...	12,500	100	.....	1,018,750	May 1, '12	3.60		
Beaver Con., s.	Ont...	2,000,000	1	80,000	710,000	Apr. 23, '16	.03	Mexico Con.	Mex...	240,000	10	.....	660,000	Mar. 10, '08	.25			
Boleo, g.	Mex...	120,000	20	.....	721,871	May 8, '11	6.00	Mines of El Oro	Mex...	180,000	6	.....	4,478,500	June 26, '14	.96		
British Columbia, c.	B. C.	691,709	6	.....	615,399	Jan. 6, '13	.15	Minas Pedrazzini	Mex...	1,000,000	1	.....	4,987,500	Jan. 23, '17	.06%		
Buena Tierra	Mex...	330,000	6	.....	160,380	Jan. 30, '15	.24	Minas Co. of Am.	Mex...	900,000	10	.....	4,988,600	July 25, '13	.12%		
Buffalo, Ont.	Ont...	1,000,000	10	.....	2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can...	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%			
Canadian Goldfields	Can...	600,000	0.10	.....	237,099	July 15, '14	.01%	Monteruma, I. pf.	Mex...	6,000	100	.....	402,500	Nov. 15, '12	3.60		
Cananea Central, c.	Mex...	600,000	10	.....	360,000	Mar. 1, '12	.60	Monteruma M. & Sm.	Mex...	500,000	1	.....	100,000	July 20, '09	.04		
Cariboo-Cobalt	Ont...	1,000,000	1	.....	295,000	Sept. 1, '15	.09	Muther Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11			
Cariboo-McKinney, g.	B. C.	1,250,000	1	.....	66,250	Dec. 1, '09	.00%	Naica, s. l.	Mex...	100,000	300	.....	3,190,000	Oct. 11, '09	\$283		
City of Cobalt	Ont...	600,000	1	.....	138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	220,000	3,970,000	July 25, '16	.60			
Cobalt Central, s.	Ont...	4,761,500	1	.....	192,845	Aug. 24, '09	.01	Nipissing, s.	Ont...	1,200,000	6	900,000	14,340,000	July 20, '16	.25			
Cobalt Lake, s.	Ont...	3,000,000	1	.....	465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	.....	533,000	Feb. 1, '10	.02		
Cobalt Silver Queen	Ont...	1,000,000	1	.....	115,000	Dec. 1, '05	.03	Palmes Co. of Can.	Mex...	90,000	.....	.....	600,000	Jan. 1, '16	.60	
Cobalt Townsite, s.	Ont...	199,282	6	.....	1,042,258	Aug. 10, '14	.24	Panuco	Mex...	10,000	.....	.....	7,465,000	Nov. 4, '09	6.00	
Conlagas, s.	Ont...	800,000	6	400,000	8,240,000	Aug. 5, '16	.25	Penoles, s. g.	Mex...	120,000	20	.....	6,451,867	Sept. 30, '13	1.25			
Con. Mg. & Sm., g. s. c.	B. C.	58,560	100	420,617	2,740,654	July 1, '16	2.50	Persegrina, pf.	Mex...	10,000	100	.....	328,656	Sept. 1, 10	3.50			
Crown Reserve, s.	Ont...	1,999,957	1	.....	6,162,408	July 15, '15	.03	Peterson Lake	Ont...	2,401,320	1	84,064	340,287	July 1, '16	.01%			
Dolores	Mex...	400,000	6	.....	1,374,865	July 24, '11	.22	Pinguico, pf.	Mex...	20,000	100	.....	790,000	Apr. 16, '13	3.00		
Dome Mines, s.	Ont...	400,000	10	400,000	800,000	June 1, '16	.50	Porcupine Crown	Ont...	2,000,000	1	190,000	600,000	July 2, '16	.03				
Dos Estrellas, (El Oro)	Mex...	300,000	0.60	.....	15,406,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex...	6,000	15	.....	963,360	Apr. 1, '08	1.00		
El Rayo, g.	Mex...	3,500,000	1	.....	210,000	Apr. 30, '11	.01	Rambler-Cariboo	B. C.	17,500	100	70,000	490,000	Aug. 15, '11	.01			
El Oro, g.	Mex...	1,475,500	1	.....	9,136,442	Jan. 1, '13	.24	Rea Miner, Leasing	Ont...	20,000	.....	.....	24,000	Feb. 2, '16	.06%	
El Rayo, g. s.	Mex...	260,020	2	.....	140,410	Apr. 24, '11	.16	Right of Way	Ont...	1,685,500	1	16,855	560,614	June 15, '16	.03			
El Triunfo, c.	Mex...	2,000,000	1	.....	20,000	Aug. 23, '11	.01	Rio Plata	Mex...	374,518	6	.....	345,744	Feb. 1, '13	.05		
Esperanza, s. g.	Mex...	450,000	6	.....	12,521,200	Dec. 31, '15	.10	San Francisco Mill	Mex...	6,000	25	.....	445,086	Oct. 15, '08	1.00		
Granby Con., c. g. s.	B. C.	149,985	100	749,798	6,350,311	Aug. 1, '15	2.00	San Rafael	Mex...	2,400	25	.....	6,798,260	Jan. 11, '12	2.00			
Greene-Cananea, c.	Mex...	478,100	100	2,431,045	6,696,816	Aug. 23, '16	2.00	San Toy, s. l.	Mex...	6,000,000	1.00	.....	540,000	July 24, '13	.01			
Greene Con., c.	Mex...	1,000,000	10	2,500,000	12,544,000	July 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex...	1,500,000	6	364,500	2,819,772	June 16, '16	.04				
Greene Gold-Silver, pf.	Mex...	300,000	10	.....	194,871	Mar. 28, '07	.40	Sta. Maria del Guadalupe, g. s.	Mex...	60,000	.....	.....	3,960,000	Mar. 27, '09	1.00	
Guanaquato Con.	Mex...	640,000	5	.....	600,000	Jan. 1, '16	.80	Sta. Maria del Par.	Mex...	9,600	12%	.....	5,606,000	Jan. 2, '13	2.50		
Guanaquato Dev. pf.	Mex...	10,000	10	.....	247,356	Jan. 1, '11	.00	Super-Superior	Ont...	478,841	.....	672,549	1,547,761	Aug. 15, '16	.30		
Guggenheim Explorat.	Mex...	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.85	Soledad, s. l.	Mex...	960	20	.....	4,439,540	Oct. 17, '11	8.00			
Halleybury, s.	Ont...	50,000	1	.....	60,000	Apr. 6, '11	.50	Sorpresa, s. l.	Mex...	19,200	20	.....	3,979,240	Jan. 6, '11	34.00		
Hedley	B. C.	120,000	10	120,000	1,943,620	June 30, '16	.50	Standard, g. s.	B. C.	2,000,000	1	400,000	2,200,000	Aug. 10, '16	.02%				
Hinds Con., g. s. l.	Ont...	6,000,000	1	.....	88,000	Feb. 27, '03	.62	Temiscaming & Hud. Bay	Ont...	7,761	1	.....	1,940,250	Nov. 12, '14	3.00		
Hollinger	Ont...	240,000	100	1,160,000	6,370,000	Aug. 14, '16	.05	Temiskaming, s.	Ont...	2,500,000	1	75,000	1,534,156	July 22, '16	.03				
Hualco, c.	Mex...	10,000	100	.....	976,000	Feb. 27, '11	.10	Textilan, c.	Mex...	8,000	100	.....	1,865,000	Jan. 1, '09	1.50		
Kerr Lake	Ont...	600,000	10	300,000	8,420,000	June 1, '16	.24	Tough-Oakes	Ont...	531,500	6	199,311	12,750,000	Jan. 2, '17	.05				
La Blanca	Mex...	140,000	20	.....	2,775,700	Mar. 31, '13	.90	Trailway	Ont...	1,000,000	.....	.....	1,061,988	July 1, '15	.05	
La Republica, s.	Mex...	400,000	6	.....	110,000	Aug. 15, '11	.05	Wetlaufer-Lorrain, s.	Ont...	1,416,590	1	.....	656,386	Oct. 20, '13	.05		
La Rose Con., s.	Ont...	1,498,627	6	224,793	6,811,913	July 20, '16	.06	Yukon, C.	Y. T.	3,500,000	5	525,000	8,108,110	June 30, '16	.07%				

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PENROSE SHAFT, PRINCIPAL PUMPING CENTER. DOWN TOWN MINES, LEADVILLE, COLO.

Leadville Pumping and Drainage Projects

W. A. SCOTT.

The purpose of this article is to present some of the main facts relating to the pumping and drainage systems of Leadville, Colo., whereby the deeper levels of the mines of Carbonate, Fryer and Breese hills, and contiguous territory, have been dewatered. This has been accomplished by establishing pumping centers on several groups of mines, and by connecting the Yak tunnel with the workings of mines in the territory tributary thereto. Three pumping projects, of great importance to the district, deal with the three drainage basins of Carbonate and Fryer hills. One of these is at Penrose shaft, on lower Carbonate hill, which is the center of a group of 15 mines controlled by the Down Town Mines Co. Another is at the Harvard shaft, through which the mines of Leadville Unit on Fryer hill have been unwatered. The third is at Wolfstone shaft, on upper Carbonate hill, the water basins of which is cut off from that of the Down Town Mines. Other pumping plants contributing to the drainage of Wolfstone basin are on the Greenback and Mikado. The Wolfstone pumps have been in operation many years; those at Penrose and Harvard shafts are recent installations.

Down Town Mines.

The Down Town group, controlled and operated by Down Town Mines Co., under 20-year leases, comprises the Penrose, as the center of pumping and mining, the Coronado, Midas, Niles-Augusta, Grey Eagle and Pocahontas, Star, Weldon, Bon Air, Bohn, P. O. S., Midland, Alice, Otosito, Hibschiele, Bison, and oth-

ers. The Penrose belongs to ex-Governor Jesse F. McDonald, the others are under various ownerships in Colorado and other states. The conditions of the leases permit the entire group to be operated as one property, and the drainage system is in control of the Down Town Mines Co., the lessee.

The area of ground thus consolidated amounts to 400 acres, and extends under a part of the city of Leadville. It contains a number of shafts, other than the Penrose, and most of the old workings are connected. All these properties were closed down in 1907 by reason of inability of all interests to unite on a central pumping project. They remained closed until this company took possession as lessee and installed power and pumping equipment in 1915. The Penrose has a depth of 900 ft., and when the work of unwatering was begun on May 8, 1915, the water level was at 238 ft. below the collar of shaft. The unwatering to the bottom of shaft was completed on June 13, 1916, and at this writing the company is preparing for actual mining operations.

The task of effecting this consolidation, the formation of the operating company, the installation of equipment and the dewatering of the group, has been put through under the direction of Jesse F. McDonald, general manager, who is one of the individual owners as well as a member of the lessee company.

Penrose Pumping Plant.

Penrose shaft contains five electric-driven, centrifugal pumps. The bottom station, at close to 900 ft.

depth, has two 2-stage, 8-in. centrifugal pumps, each driven by a 300-hp. General Electric motor, and having the capacity of 1500 gals. per minute for a 450-ft. lift. At the 450-ft. level is a relay station, containing two other pumps of type and capacity similar to the two at the bottom station. The pumps at lower station discharge into those at the relay station; that is, the discharge of lower station pumps becomes the suction of the relays, the latter discharging through a tunnel outlet about 60 ft. below the collar of the shaft. During the unwatering period the two lower station pumps were used as sinking pumps, having been suspended by $\frac{7}{8}$ -in. red-strand Leschen cables.

At the completion of the shaft dewatering, they were set in position on bed plates, as station pumps, above referred to, at bottom of shaft. These two and the two relay pumps were manufactured by Providence Engineering Works, Providence, R. I.

The fifth pump, lately installed at the lower station, is a 4-stage, vertical, centrifugal pump, operated by a 650-hp. General Electric motor, having capacity of 2000 gals. per minute, for a lift to the surface or 900 ft. This was made by Harris Engineering Works, Providence, R. I. It has a guaranteed efficiency of 70%. The guaranteed efficiency of the 650-hp. motor, which drives the 2000-gal. pump, is 93.3% at full load, and 93.6% at less than full load. This large pump, with motor, stands 18 ft. high, and in lateral dimensions takes up but little station room.

The two smaller pumps at lower station, and the two relays at 450-ft. level, are auxiliary to the 2000-gal. pump.

The volume of water being handled at this time is 2600 to 2700 gals. per minute, although it is thought the normal flow from the basin will be considerably less. During the dewatering period of 9 months, when all the work was performed with the two sinkers and their relays, their rated capacity was greatly exceeded, as 4200 to 4400 gals. per minute were raised to the surface. In like manner, the four 300-hp. motors were actually operated at 375 to 400-hp., and it is said they stood the crowding well. While the two sinkers were being operated electric light wires, suspended from a twin cable reel at surface, were attached to the pumps to afford light, and these wires unwound as the pumps were lowered. Current for hoist, compressor and pumps at Penrose shaft is furnished by Colorado Power Co., being received from the latter's plants at 6600 volts, and transformed down to 550.

In order to provide for reserve power, three 6600-volt lines connect the transfer here with the power company's nearest substation. This mine has three 300-kva. transformers in service, and one extra in reserve.

Current for the 2000-gal. station pump is transmitted through a 900-ft. cable, suspended from a cable head at collar of shaft. This large cable is rubber insulated, 3-conductor, lead sheathed and wire armored, and was furnished by General Electric Co. The other four electric cables, attaching to the four smaller pump motors, are each 3-conductor, rubber insulated, submarine type, jute filled, double-wire armored. The cables which served the sinking pumps were handled by hand winches during that phase of pumping.

The starting and stopping of the sinking pumps were controlled at the surface by signals from the pumpmen; the main station pump operations are controlled directly at the stations.

The Hendrie & Bolthoff double-drum hoist, originally steam operated, has been converted into an electric hoist. Hoist is controlled through magnetic con-

tactors, enabling the operator to handle a heavy current by means of an easily operated master controller.

The pump installations and operations have been under direct supervision of William Angus, master mechanic, while C. D. Criley, electrician, has supervised the installation of all electrical equipment and connections.

Early operations in the Penrose and other mines of the Down Town group were mostly in the lead carbonate ores of the upper contact, which ran high in



PROVIDENCE 2-STAGE SINKING PUMP.

silver; but the Penrose shaft cuts through the second and into the third contact, where there are sulphide ores, consisting of lead, zinc and iron, with silver and gold. There is, however, much carbonate ore in the second and third contacts; but the two lower deposits, which are below the natural water level, are not extensively developed. With the ample facilities now provided for keeping workings clear of water down to the 900-ft. level, the lower contacts will be explored, developed and mined. It is estimated that 500 tons of ore per day will soon be produced through

Penrose shaft, and other shafts of group may be put in order for hoisting ore.

Leadville Unit.

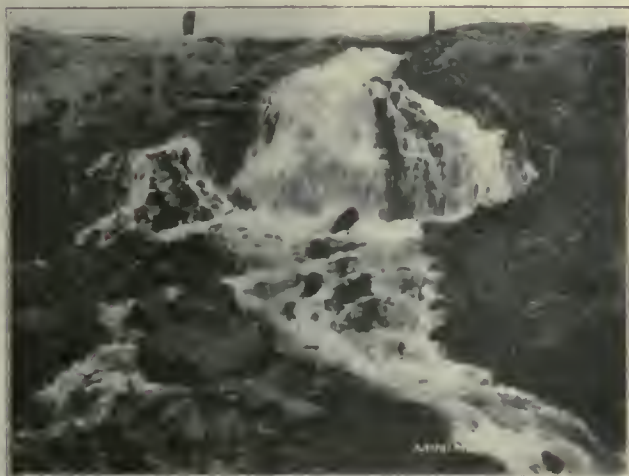
A group of mines on Fryer hill, under long-term lease to the U. S. Smelting, Refining, Mining & Exploration Co., is locally known as the Leadville Unit, of which H. S. Lee is resident manager, with E. A. Hamilton as superintendent. In this consolidation for operating purposes are such claims as El Paso, Little Miami, Tip Top, Harvard, Jamie Lee, Olive Branch, Forepaugh, Fitzhugh, Corabelle-Bankok, Little Sliver, Joe Davis, Shannus O'Brien, Lee Basin and Virginius.

The Harvard shaft, which is the main pumping center for the group, is on the south side of Big Evans gulch, and was sunk 10 years ago to a depth of 407 ft. There are 11 other shafts on the group, among them the Tip Top, which is being operated. Since this company took possession last January, the Harvard has been provided with buildings, and new equipment for hoisting, pumping and air compression, and they re-

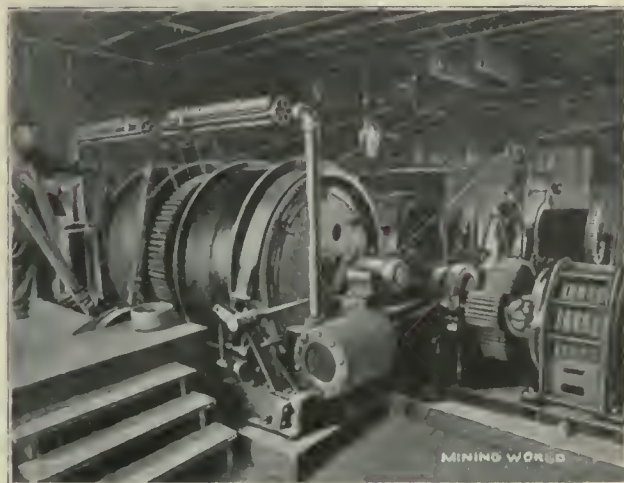
tom of Harvard shaft for station pumps and for air-operated winches to be used in handling a sinker pump as work in the shaft proceeds. The Ingersoll-Rand air-compressor at Harvard shaft, of capacity of 1080 cu. ft. free air per minute, is operated by a 150-hp. General Electric motor, for which a Lenox type of short belt drive is used; in addition to this, a Laidlaw-Dunn-Gordon compressor, 1200-cu. ft. capacity, has been ordered. The two will supply compressed air for drills, winches and sinking pump. The hoist in use is a Denver Engineering Works geared type, has double drum, is driven by a 182-hp. General Electric motor, is capable of operating to a depth of 1000 ft., with a rope speed of 450 ft. per minute, carrying a 4500-lb. load. Other equipment includes an 80-hp. boiler for heating the buildings. A force of 40 to 50 men are on the payroll.

The ore in lower workings is mostly a sulphide of iron, carrying silver and zinc. The lower contact has been prospected only by diamond drill holes.

The Fryer hill water basin is segregated from other similar basins of the district, and this company's pump-



WATER FLOW, PENROSE SHAFT, DURING UNWATERING.



PENROSE ELECTRIC HOIST FROM CONTROL SIDE.

cently completed dewatering the shaft, which contained 160 ft. of water.

At the old pump station, 220 ft. below the surface, two Krogh 4-stage, 600-gal. centrifugal pumps were installed, each one being operated by a 150-hp. motor. Then, a Byron Jackson, 8-stage, 1000-gal. deep-well pump, with a 75-hp. motor, was installed at same station, and operated as a sinking pump, while the shaft was being unwatered. The deep-well pump discharged into the centrifugals which lifted the water to the surface, all operating as one unit. Now that the shaft is clear of water the two Krogh pumps are being lowered to the 407-ft. station, for use while sinking 300 ft. deeper into the lower contact.

In the meantime, all the shafts and old workings of the group have been drained; and the normal flow of water, after the accumulated volume had been drawn out, is found to be about 600 gals. per minute at existing depth of workings.

The plan of deeper sinking is to cut through the parting quartzite into the lower deposit which is in white limestone, the upper contact deposit being in blue lime. All parts of the old workings, tributary to the several shafts, are being sampled and inspected, and a geological study made of same by C. A. Allen, chief engineer, and 30 assistants.

A station has been cut out and timbered at the bot-

tom of Harvard shaft for station pumps and for air-operated winches to be used in handling a sinker pump as work in the shaft proceeds.

The Wolfstone.

The Wolfstone shaft is the pumping center of the Western Mining Co.'s operations on upper Carbonate hill. Its properties include Adams, Maid, Wolfstone and Mehala, and they are situated in the same drainage basin as that of Mikado, Greenback, Small Hopes and others. The Western Mining is controlled by S. D. Nicholson and associates.

The principal pump station in Wolfstone shaft is at the 1000-ft. level, where there are two steam pumps—a Knowles triplex, of 1200-gals. capacity per minute, and a Jeanesville compound, of 1000-gals. capacity, for a lift of 1000 ft. A Layne & Bowler deep-well extension pump, formerly at the 800-ft. station, has been moved to the 1000-ft. extension, the extension column from which reaches to the 1150-ft. level. The Lane & Bowler is a centrifugal, electric driven pump, which raises 2000 gals. per minute from 1150-ft. level to a tank at 1000-ft. station. The two big steam pumps, which are throwing 1500 gals. per minute from the 1000-ft. station to the surface, take their suction from the tank referred to.

The 1150 level has been under water 10 years. As soon as the water is pumped out to that depth a station

pump may be installed at that point, preparatory to sinking 250 ft. deeper. Other steam pumps situated at 800-ft. station are not now in use.

The Adams, Maid, Wolftone and Mehala mines are all operated through Wolftone shaft, and about 200 tons of zinc carbonate ore per day are being hoisted and marketed. On this property Arthur Dalrymple is superintendent and J. R. Dewar is master mechanic.

The Greenback, owned by P. Mulrooney, is doing a share in keeping down the water in the same basin. It has a 1500-ft. steam pump at the 900-ft. level, which discharges at the surface. A Layne & Bowler electric driven centrifugal pump has been set at 900-ft. station, the extension column to reach 250 ft., however, and raise water to a bulkhead drift at 900, from which the steam pump takes its suction. The Layne & Bowler pump has capacity of 1000 gals. for the lift required.

It is understood the Empire Zinc Co., operating the Small Hopes and other mines in that basin, is co-operating in the matter of unwatering the lower levels of the Greenback.

The Iron-Silver Mining Co., which is retimbering the Mikado shaft, is preparing to install pumps there, to draw on the same drainage basin as that of Wolftone.

Yak Tunnel.

The 4-mile drainage and transportation tunnel of Yak Mining, Milling & Tunnel Co., which drains a large territory, underlying Iron and Breese hills, and extends beyond these through grounds of the Resurrection mine, has a flow of approximately 1200 gals. of water per minute into California gulch. The Yak is operating extensively along the course of this tunnel, and in the several places where the workings extend below it the water is pumped up to and discharged into that channel. The White Cap mine, on Iron hill, having a depth of 800 ft. below Yak tunnel, raises 150 to 200 gals. per minute. Other Iron Hill mines are drained through this tunnel.

The Resurrection mine, across Evans gulch from Breese hill, is tapped at its 900-ft. level by this tunnel. Operations below that level are carried on by means of a 200-ft. winze, through which 400 to 600 gals. of water per minute are pumped up to Yak tunnel. The Resurrection is being operated by the Yak Co. under a lease.

The most important drainage through this tunnel, aside from that of the Yak Co.'s operations, is the drainage of the Ibex mines on Breese hill, which have five shafts as follows: No. 1, 450 ft. deep; No. 2, 750 ft.; No. 3, 1000 ft.; No. 4, 1300 ft.; No. 5, 1000 ft. A level running from the bottom of the 1300-ft. shaft drains directly into Yak tunnel. Drill holes from the bottom of No. 3 shaft connect with a lateral leading into the same drainage.

Ibex operations are conducted mostly by lessees, one of the most important being the C. & G. lease, on the south end of the group, which is in the hands of T. D. Kyle, Hahnawald Bros. and Cortellini. This lease has been in force several years, and at this time 200 tons of ore per day, running \$20 in gold, is being shipped. This ore is being taken from all levels from 100 to 700, inclusive, and most of it is hoisted through the Garbutt shaft, outside of Ibex group. The ore occurs in shoots in a vein or fissure, between porphyry walls. The foot wall is well defined, and the 20 to 25 ft. of ore next to it is of smelting grade. About 75-ft. width of milling ore extends from that point and shades out into the rather indistinct hanging wall. The

gold is apparently free, is associated with iron sulphide in a silicious gangue. Mill tests show that a high saving can be made on amalgamating plates and concentrating tables. A big tonnage of milling ore, running \$8, is being accumulated. The building of a mill is a possibility.

Colorado Power Co., whose substations here are connected to its hydro-electric plants at Boulder and Shoshone, is furnishing about 4000-hph. to the mining properties of the district, for hoisting, pumping and air compressors.

Japan Now a Producer of Zinc.

A noteworthy feature in Japan's mining industry is the recent growth of zinc refining. Prior to the war there was practically no refining of zinc. All zinc ore produced in Japan was sent to Germany, but the rise in the price of zinc has made it pay to refine it in Japan. Along with the growth of refining the demand for zinc ores has increased. The largest zinc mine, according to the *Far Eastern Review*, is that in Miyagi Prefecture, owned by Messrs. Takata & Co. Last year the monthly output ranged between 300 and 500 tons, and the total was 4000 tons for the year. It is estimated that 2400 tons will be mined in the first six months and 6000 tons in the second half of this year. By January next year the monthly output is expected to be 1500 tons, or 18,000 tons a year. The Hiroo mine in Hokkaido, owned by the same firm, is expected to produce 300 tons a month, but the plants are being increased for an annual output of 5000 tons. The Yawata mine in Gumma Prefecture, also owned by the same firm, has an output of 200 tons a month. Messrs. Kuhara Mining Co. recently bought a zinc mine which produces 300 tons a month. This company, a prominent copper mining concern, has for some time been refining zinc. The Kamioka mine in Hida Province, owned by the Mitsui Mining Co., is the largest zinc mine in Japan. Its output even prior to the war was 20,000 tons per year, or over half of all the Japanese output. As improvements have been made, it is estimated that the present production soon will be increased by about 30%. The Yasuda mine, in Nagasaki Prefecture, which was producing 3000 tons a year prior to the war, is now producing 6000 tons. Thus the output prior to the war was scarcely 40,000 tons a year, but is increasing so that next year it may be over 60,000 tons.

Gold Output on the Rand.

Rand gold output in August was 781,000 fine ounces, comparing as follows:

	1916.	1915.	1914.	1913.
January	787,000	714,984	651,000	789,390
February	753,000	476,000	626,000	734,122
March	796,000	753,000	686,000	790,000
April	754,000	744,000	684,000	784,000
May	777,000	763,000	720,000	794,000
June	761,000	755,000	717,000	547,000
July	761,000	770,000	732,000	655,000
August	781,000	778,000	711,000	728,000
September .....	.....	776,000	702,000	706,000
October .....	.....	797,000	733,000	718,000
November .....	.....	781,000	715,000	673,000
December .....	.....	781,000	672,000	776,400
Total .....	.....	8,888,984	8,590,512	9,124,296

Copper exports from Atlantic ports for the week ended Sept. 14 were 5446 tons; since Sept. 1, 10,584 tons; a year ago, 5427 tons.

Ore Sampling Conditions in the West

T. R. WOODBRIDGE.*

Continued from page 280.

Theoretically, the sampling of a lot of ore is a continuous process from beginning to end. It seems advisable to discuss sampling under two headings, the "outside work," or all the operations up to the point where the sample is to be dried, and the "final work," which includes the drying, grinding, and all bucking-room operations.

The sampling resulting from the outside work usually weighs from 25 to 250 lbs. and may be obtained by any one of a number of methods. These methods may be divided into so-called hand methods, involving the use of nothing more elaborate than a shovel and wheelbarrow, and mechanical, sometimes called automatic, methods, involving the use of more or less complicated machinery.

Hand Methods of Sampling.

The simplest form of hand sampling is "grab sampling." From the pile or carload of ore to be sampled small quantities are taken at random by hand, or with a small scoop or a shovel, and are thrown into a container or into a pile and held for further treatment.

This is the most rapid method of sampling a lot of ore, and, with ore of uniform grade, careful workmen obtain fairly accurate results. It is most valuable when a quick but rough check is desired on the regular sample, as, for instance, to check a possible gross error or to detect quickly whether the regular sample has been salted. The difficulty in getting the proper proportion from a small pocket of ore, and the equal difficulty of knowing how much to take from the large lumps, places the whole process at the mercy of the operator's judgment, and his knowledge of the distribution of the values may unduly influence him in selecting the material for the sample.

Pipe Sampling.

Pipe sampling can be used for fine material only, and is therefore usually confined to mill products. The simplest form of pipe sampler is a section of 1-in. pipe which is driven or pushed into the material to be sampled, then withdrawn and the contents removed by pounding the pipe. This operation is repeated a number of times until a sample of the desired size results. Another more elaborate form consists of two pipes, one fitting within the other and both having a longitudinal slot and being so arranged that after the pipes have been driven into the ore one can be turned to close the slots before being removed from the ore.

The grab and pipe methods of sampling were not found to be in general use and are so rarely suitable for ores that a more extended discussion of them seems unnecessary.

Coning and Quartering.

Coning and quartering is the oldest and best known method of sampling, and its introduction probably marks the beginning of scientific sampling. Its simplest application consists of shoveling the ore into a conical pile, flattening the cone thus formed into a circular cake of larger diameter than the base of the

cone by dragging the ore radially or spirally with a shovel, and dividing the cake into four equal sections, called "quarters," by two lines at right angles to each other and passing through the center of the cake. Either two of the opposite quarters, called the reject, are removed by shoveling and taken to the bedding floor or to storage bins. The two remaining quarters are shoveled into a cone, which is flattened and subdivided as before. This process is repeated until a sample of approximately the desired weight remains. The portion retained throughout the operation at the various stages is called the "sample." Coning and quartering is in use exclusively in two of the plants and in combination with other sampling methods in 26 of the plants visited.

The advantages claimed for the coning and quartering method are as follows: An expensive plant or complicated machinery is not required; it is applicable to all kinds and conditions of ore; it may be used for a small lot of high-grade ore without the loss that might result from putting the ore through a large mechanical sampler, and it often pleases the seller because his ore is in plain sight during the whole operation.

The disadvantages, however, are so numerous that it is difficult to understand why it so persistently survives. It is expensive, for the ore has to be moved many times by shovel and wheelbarrow, much time is lost in the necessarily frequent sweeping of the floor; it offers ideal conditions for salting by the seller, and the slightest carelessness may cause a serious error.

Whenever a lot of ore containing particles of varying size is piled in the form of a cone with a shovel or by falling from a vertical or an inclined chute, a rough separation of the fine and coarse particles is begun and is continued to the end of the operation. This is true even when the ore is finely crushed, although the separation becomes more noticeable as the differences of the sizes increase. There is no possibility of uniformly mixing the ore by this method, no matter how conscientiously the method may be carried out. The most that can be claimed for it is that the different sizes are more or less evenly distributed around the vertical axis of the cone. The separation of the particles begins with the first shovelful, and after the cone is a foot or more in height the coarser particles run down the sides, the larger ones continuing to the floor. The finer particles remain at or near the apex, while the intermediate sizes lodge on the sloping surfaces and are forced nearer to the floor with each added shovelful. If the ore be coned from a chute or spout, this condition is exaggerated, because the ore flows in a continuous small stream instead of in intermittent and heavier shovelfuls.

Bench or Cobb System.

A method known as the "bench" or "cobb" system, by which a considerable part of this segregation is overcome, is in use at two plants. It was first applied to certain high-grade ores and has given such satisfaction that it has been continued in use for over a decade. Instead of first piling all of the ore in a cone, a certain part, sometimes as little as 15 lbs., is coned. This small cone is then dragged out into a layer 1 in. or more in thickness and a similar quantity is coned on top of this layer and dragged out. This is contin-

*U. S. Bureau of Mines; excerpts from advance proofs, Technical Paper 86.

ued until all the ore is in the cake, ready for quartering. This method gives a cake with a surprisingly small amount of segregation and, as there is no large accumulation of fine particles at the center, the effects of accidental error in dragging out the ore are not so serious as in the original method of flattening from a single large cone.

Use of Wooden or Steel Cross.

The cross, which was used in the early days of mining in Colorado, is still in use at seven of the plants investigated. The arms, placed at right angles, are of steel or wood, any desired length or width, but the arms of each cross are of uniform size. Crosses of different sizes are used, depending on the quantity of ore to be sampled.

The cross is placed on the floor where the cone is to be formed and the ore is then shoveled onto it, the intent being to throw each shovelful directly over the intersection of the arms. After all the ore is placed on the cone it is flattened by the usual method into a cake as thick as the cross. The cross may also be used for quartering after the cake has been formed. This is accomplished by placing a steel cross on the cake in such a manner that its intersection comes at the center of the original cone, and then driving it down to the floor, the rejected quarters are then shoveled from between the arms. The special advantage of this device is apparent from the following description of the quartering.

The flattened cake, if the cross is not employed, is usually marked with a straightedge, or, if the cake is small, with the handle of a shovel. In order that every quarter may contain its proper proportion of fine and coarse particles it is obviously necessary that these lines should intersect at the center of the original cone. Sufficient care is not always given this important step, and it is not unusual for these lines to be marked two or more inches to one side of the center. In this way it is possible to take advantage of any known shifting of the apex of the cone. The reject quarters are now shoveled from the cake into wheelbarrows and taken to the bin. After the bulk of the reject is removed as closely as possible to the marked lines on the cake, the shovel is either driven down vertically from these lines to the floor or drawn from the top to the bottom at an angle approximating the angle of rest, the ore thus removed being added to the reject. Segregation of the particles will be most apparent at this point, and the thicker the cake the greater will be the difference between the sizes of the particles at the top and at the bottom. The workmen can not prevent the face of a cut seeking its angle of rest, and the result is that the finer particles at the top usually fall or are dragged into the reject space and are consequently swept up and carried away, a corresponding amount of coarser material being left in their place. Although this amount is not large, it may, with high-grade ore, cause a serious error.

With the open system, the workman can never be sure that he is taking from these division edges more or less than he should. He also has to exercise his judgment as to whether he should take all the fine particles that fall to the floor, or whether he should dip into the layer of coarse material that lies close to the floor. This error may be minimized by the use of the steel cross, as previously described. Whether the cross is used at the time of coning or for the quartering only, it is an improvement over the open system, and its general adoption is a matter worthy of consideration.

Throughout the whole operation, from the time that the ore is first dumped on the floor to the time that the reject quarters are removed, the tendency is to reject an excessive proportion of fine particles, thus leaving for each succeeding sampling a constantly increasing proportion of coarse material. This tendency can in a measure be overcome by alternately taking for the sample the ore in the usual reject quarters. Inasmuch as the first cone is the largest, its proportionate error, due to segregation, is probably greater than that of the succeeding cones. Therefore, whether the reject or the sample contains the greater proportion of fine particles depends on which one is removed in the first quartering. All operators do not recognize the importance of this segregation, and occasionally a plant permits the seller of a lot of ore to specify, during the sampling, which quarters are to be taken for the sample. Where this is done, an intelligent and attentive watcher may be of considerable value to his employer.

The custom noted in a few plants of removing additional slices from the sample quarters left on the floor, when these quarters are found to contain more ore than is desired for the final sample, and yet is too small to be again quartered, is of doubtful accuracy. If this slice is taken radially, there is less objection to it, but it is usually taken on a line parallel to the already marked radial edge, so that the proportion of fine material to coarse material is increased beyond the correct ratio.

Fractional Shoveling.

None of the plants examined used the fractional shoveling method of sampling exclusively, but all the plants using the coning and quartering method, and six plants in which mechanical methods were used in combination with hand methods use fractional shoveling at some point in their operations. It is more commonly used during the unloading of the ore in order to save the expense of passing an entire lot through the mill, or, if the ore is to be smelted, in order to put it on the beds in as coarse a condition as possible. Unquestionably it is a very convenient method, especially in unloading a lot of ore that has been previously crushed, or has been sampled at a custom sampling plant before its arrival at the reduction works.

Fractional shoveling has many advocates who claim for it greater accuracy than is possible with the coning and quartering system and offer figures to show close checking on samples and resamples. If, however, the ore has been coned or placed in a regular pile before shoveling, the same evident sizing exists and opportunities for careless or objectionable shoveling seem as great and, in certain instances noted hereafter, greater than in the coning method. Therefore, except for the convenience and possibly greater economy in handling, it offers little or no improvement over coning and quartering.

(To be continued.)

Large Sulphuric Acid Exports.—Sulphuric acid exports in June were 9,421,735 lbs., which is next to the largest month's total this year, the March exports having been 12,979,267 lbs. This brings the total for the half year to 43,739,427 lbs. or 7,289,903 lbs. per month. For the fiscal year ended June 30, 1916, the total exports were 82,020,246 lbs. against 46,771,510 lbs. and 12,131,750 lbs. for the fiscal years 1915 and 1914 respectively. The June exports were nearly equal to the total for 1913, of 9,689,005 lbs., while the March exports were very little short of the 13,176,175 lbs. exported in 1914.

Nineteenth Annual Meeting of the American Mining Congress

The 19th annual session of the American Mining Congress, which will be held at Hotel LaSalle, Chicago, during the week of Nov. 13, will eclipse in attendance and in interest all previous meetings, and represents a climax of the great work of co-operative purpose and endeavor of nearly two decades.

And that it will be an unparalleled success is due in a great measure to the unstinted efforts, both as to time and means, of the Chicago committee.

The entire 17th floor of Hotel LaSalle has been set apart for exhibits, and enough space has already been taken to assure a thoroughly representative display of all the interests associated with the Mining Congress.

The General Electric Co. promises an unusual display—the best it has ever made. Among others who have contracted for space on the floor are the following: The Link Belt Co., Goodman Mfg. Co., Stromberg-Carlson Co., John A. Roebbing & Sons, Justrite Mfg. Co., G. L. Simonds Co., Tool, Steel Gear & Pinion Co. of Cincinnati.

The entire 19th floor of the hotel has been set apart for meeting rooms. In addition to this there will be several meeting rooms on the 18th floor and two on the 17th.

On Monday night Edward L. Doheny, of Los Angeles, will show the moving picture of the great Mexican oil gusher, Cerro Azul, and Dr. Henry Mace Payne will have an illustrated lecture on Mining Frozen Gravels of Alaska and Siberia. The slides will portray features of mining in the far north which have never before been shown.

H. L. Ameling, of St. Louis, will deliver a lecture illustrated by moving pictures on the use of the core drill. This will be delivered at one of the general meetings or at an evening session. It will show the drill at work, give pictures of the cores, explain in detail how underground areas are exploited for mining prospects, and will be a pictorial presentation of the revolution that this drill has worked in the labors of the investigating mining engineer.

On Tuesday evening there will be the general meeting for the election of officers and for the presentation of the regular reports.

On Wednesday evening there is to be a smoker, and on Thursday the annual banquet will be held in the banquet hall of the hotel.

The programs for the general meetings in the mornings and for the section meetings in the afternoons are nearly completed, with a sufficient number of acceptances to bear out the prediction that it will be a great convention. Nothing quite so far-reaching and so extensive in its scope has been attempted at previous conventions, and no coal mining, metal mining or oil man can afford to miss it.

It means that those who come will get into touch with those interested in their own branch of the mining or oil business, and with new and carefully tried out economies and means of greater productiveness.

The addresses of welcome from Governor Edward F. Dunne of Illinois, Mayor William Hale Thompson of Chicago, and President J. W. O'Leary of the Chicago Association of Commerce will be responded to by representatives of every oil and mining state in the union. These responses will, however, not be the

ordinary impromptu kind, but in every instance a carefully prepared 3-minute resolution embracing the state's most important mining issue. With such a consensus of opinion before it, the Resolutions Committee will be able to frame legislative demands which will synthesize the needs of the mining sections of the country.

At the general meeting Tuesday, the 14th, the subject will be "Safety." Van H. Manning, director of the U. S. Bureau of Mines, will have an address on "The Past and the Future of Mine Safety Work." J. F. Welborn, president of the Colorado Fuel & Iron Co., has promised to be present and will take part in the discussion. Others of great prominence will participate.

At the general meeting Wednesday the topic will be "Efficiency in Mining Operation." This promises to be an exceptionally interesting and instructive program. Colonel George Pope of Hartford, Conn., president of the National Manufacturers' Association, has consented to speak on the general topic: "Organized Capital and Organized Labor and Their Relation to Efficiency, Conservatism, Better Wages, Better Living Conditions, Lawlessness, Strike Disorders, and Industrial Freedom."

Secretary of Labor W. H. Wilson will be present to reply to Col. Pope if it can possibly be arranged. It is also the intention to urge Henry Ford of Detroit to be present and speak on the subject.

At this meeting Hon. E. N. Herley, chairman of the Federal Trade Commission, will speak on the subject of "The Federal Trade Commission and the Mining Industry." It was this commission which, through Mr. Herley, established a uniform system of cost accounting for the coal industry, and he will present for consideration his ideas of needed legislation as developed in the course of the commission's investigation.

Charles M. Moderwell, of Chicago, will present the report of the Committee on Relations with the Federal Trade Commission.

On Thursday the subject will be "Conservation," and among those who are to have papers is Senator Phelan of California. Hennen Jennings of Washington, D. C., will deliver an address on "The Accomplishment of Invention and Its Relation to Labor and Capital." Among the other topics of the day by experts will be: "Waste in the Mining Industry—in Mining, in Distribution, and in Use," the "Relation of Waste—to the Operator, the Consumer, the Public."

Friday the local reception committee will probably arrange an excursion to Gary where inspection will be made under the guidance of the steel company's experts.

The sections promise to be of unusual interest. The zinc and lead section opens in its own meeting room at 2 p. m. Tuesday, under the chairmanship of S. D. Nicholson of Denver. The principal address of this day will be by Otto Ruhl of Joplin, on the subject "A Tariff for Revenue as Related to a Compensating Duty on Lead and Zinc Ores." The discussion will be participated in by the leading men in this section.

On Wednesday in the zinc and lead section the report of the committee on Mineral Statistics will be

made. The topic for the day will be "Co-operation in the Zinc Industry." Addresses will be delivered on "The Marketing of Zinc Ores" by W. B. Shackelford, "The Importance of Zinc in Preparedness," by J. H. Troutman of Denver, and "Smelter Contracts and Market Quotations," by R. M. Henderson of Breckenridge, Colo.

On Thursday the Zinc and Lead section will hear the following addresses: "Lead and Zinc Resources of the United States," by C. E. Siebenthal, of the U. S. Geological Survey; "The New Things in Science," by F. G. Cottrell, of the U. S. Bureau of Mines. In addition to these there will be papers on "Conservation in the Zinc and Lead Industry of Present Day Importance," and a talk on "Flotation Processes" by Edward H. Nutter of San Francisco.

An interesting discussion will be led by H. C. George, manager of the Wisconsin Zinc Co., on the "Need of a Satisfactory Tariff on Ores."

The Precious Metals section will begin its discussions in its own assembly rooms Tuesday, the 14th, at 2 p. m., Irving T. Snyder of Cripple Creek, presiding. On the opening day of this important session Senator John F. Shafroth of Colorado is to talk on "The Future of Silver," Dr. Waldemar Lindgren of Boston is to speak on "The World's Gold Supply and Its Sufficiency for Business Needs."

On Wednesday in the Precious Metals section the addresses and discussions will be on these topics: "The Best Industry of the Rocky Mountain West," by T. B. Stearns, president of the Denver Civic Association; "How to Protect the Small Investors in Metalliferous Mines," by W. R. Allen of Butte, Mont.; "Does the Smelting Business Partake of the Nature of a Public Utility?" "Should Independent Ore Producers Co-operate in Providing Treatment and Marketing Facilities?"

On Thursday, with D. W. Brunton of Denver presiding, the committee on Revision of Mineral Land Laws is to report to its chairman, E. B. Kirby. At this meeting will be an address on the "Foster Bill" by Congressman M. D. Foster of Illinois, chairman of the House Committee on Mines and Mining. Horace V. Winchell of Minneapolis is also to speak on this topic. The discussion promises to be warm and interesting.

The Oil section in its own assembly rooms opens for business at 2 p. m. Tuesday, Ralph Arnold of New York presiding. Three addresses, which will all be open for discussion, are as follows: "The Oil Resources of the United States," by W. A. Williams of the U. S. Bureau of Mines; "The Authority of States to Tax Production from Indian Lands," by Judge J. G. Gamble of Des Moines, Ia., and "The Public Interest in Gas and Oil."

On Wednesday in the Oil section E. L. Doheny of Los Angeles presiding, the opening address will be by Ralph Arnold of New York on the subject "The World's Oil Supply." Dr. Rittman is to speak on "Chemistry in Its Relation to the Oil Industry," and J. C. McDowell of Pittsburgh will have an address on "Geology in Its Relation to the Oil Business."

On Thursday with S. Y. Ramage of Oil City, Pa., presiding, the addresses are to be on "The California Plan of Marketing Oils," by George Lane of Los Angeles, and "A Federal Petroleum Bureau," by H. G. James of Kansas City, secretary of the Independent Oil Refiners' Association.

The Coal section opens in its own assembly rooms Tuesday, the 14th, at 2 p. m., Chas. M. Moderwell of Chicago presiding. S. A. Taylor will present a

report of the committee on "Uniform Accounting Cost System," and Dr. F. C. Honnold of Chicago will lead the discussion. S. H. Robbins, president of the Pittsburgh Vein Coal Operatives, Hugh Shirkie of Terre Haute, and T. L. Lewis of West Virginia, are all to have something to say on this subject. Promptly at 3:30 p. m. the report of the committee on "Workmen's Compensation" will be presented by T. L. Lewis, and this will be followed by an address on "The Distribution of Coal in Cities."

On Wednesday, with Dr. I. C. White of Morgantown, W. Va., presiding, there will be an address on "The Colorado Industrial Commission," by Wayne Williams of Denver. An effort is now being made to induce John D. Rockefeller, Jr., to be present and to address the convention on "The Rockefeller Plan" or on a kindred topic. Dr. S. D. Warriner of Philadelphia is to have an address on this day on "The Closed Shop and the Check-off as Related to Efficiency in Mining Operations."

On Thursday in the Coal Section, with J. C. Kolssen of Terre Haute presiding, the principal address is to be on "Co-operation—the Great Necessity in Bettering Coal Mining Conditions, and the Means of Its Accomplishment," by President Carl Scholz. A discussion of "Ways and Means" is to follow this address.

James F. Callbreath, Secretary of the Congress, is now on a trip to Colorado and Utah, where big meetings are to be held and interest aroused in this epoch-making 19th annual convention of the American Mining Congress.

Among those whose addresses will be notable either in the sections or in the general meetings, are the following, to which titles have not yet been received, but definite assurances of attendance and participation are at hand. These are in addition to the names already mentioned in connection with the meeting: Judge George H. Patrick of Washington, D. C.; Dr. A. H. Perdue, State Geologist, Nashville, Tenn.; Dr. David T. Day, Geologist, Washington, D. C.; W. R. Allen of Montana, Mine Operator and former Lieutenant-Governor; Walter Harvey Weed of New York; Theodore F. Van Wagenan of Denver, Colo.; W. A. Lyon of Salt Lake City, Oil Flotation Expert of the Bureau of Mines; C. A. Tupper of Illinois, of the Mining and Engineering World; R. B. Moore of Denver, rare metal expert, Bureau of Mines; Fred Laist of Montana, Chemical Expert, Anaconda Copper Co., and Otto Kahn of Kuhn, Loeb & Co., who will probably deliver a special address on the "Conservation of Capital."

Silician Sulphur Production.—The latest official statistics of the production of sulphur is given by the Sicilian Sulfur Consortium for February, 1916. Production shows a marked decline, while sales, on the other hand, exceed those of February, 1915. The production for February was 16,865 metric tons as against 24,799 for the corresponding month of 1915, while shipments for the month were 53,023 tons as against 35,121 in 1915. There were marked increases in the exports this year to the following countries: France, Great Britain, Greece, Turkey, Spain, Portugal and South America. Stocks in hand at the end of February were 258,766 tons as against 365,330 tons last year, being the lowest for sulphur stocks in Sicily since the consortium took over the industry.

The most refractory clays are those containing an excess of alumina.

Conditions Governing Mining in South America

BENJAMIN LE ROY MILLER and JOSEPH T. SINGEWALD, JR.*

Having just returned from a 23,000 mile trip through South and Central America, where most of the important mining districts of Brazil, Chile, Bolivia, Peru, Costa Rica and Cuba were visited, the writers feel that certain impressions gained on the trip may be of some interest to members of the mining profession, and so yield to the request for a brief discussion of the mining conditions in the southern continent. In addition to the countries mentioned, Uruguay, Argentina, Ecuador, Panama and the islands of Barbadoes and Jamaica were visited, but these countries are mainly agricultural, and their less extensive mineral deposits are as yet poorly developed.

The most prominent feature which attracts attention in visiting the mining districts of Latin-America is the extensive investment of foreign capital. It is only a slight exaggeration to say that, at the present time, all the largest mining enterprises have been developed by foreigners. This condition which is not at all peculiar to South America, but has been seen in the development of the resources of other new countries, is at the same time a blessing and a curse to the countries concerned. In comparison with the nations of Europe and the United States, the South and Central American republics are poor and incapable of developing their own resources without the assistance of the wealth of the other countries.

The two great gold mines of Brazil, the largest copper mines and most of the nitrate oficinas of Chile, the principal tin, silver, bismuth and copper mines of Bolivia, the copper, coal and vanadium mines of Peru, the gold mines of Costa Rica and the iron and copper mines of Cuba, all owe their development to the introduction of foreign capital. Without such assistance most of these mines would at present be idle, or worked only in a very small way. The regions where these mines are located have been improved by the building of wagon roads and railroads, by the betterment of the conditions of living and by the higher remuneration for the native laborers.

In every country of South America one finds a large class of people who welcome the introduction of outside capital in the development of their mineral resources and also an equally large class who are antagonistic.

Some of the foreign companies attempted to evade the legitimate taxation for the support of the government which they by right owed, while government officials have at times attempted to force the foreign companies to pay for more than their just proportion of the country's revenues. Difficulties of this kind have by no means ended, for increased export taxes on ore and metals are being advocated in several of the Latin-American countries. Yet, on the whole, there are favorable indications that satisfactory and equitable adjustments will be arranged in the future. Without exception the leading men in the various countries seem inclined to welcome foreign capital, realizing its benefits in the development of their countries, and thus do not favor excessive taxation. Reasonable or even large profits of foreign companies are not necessarily looked upon by the government officials with disfavor, provided the companies do not

try to evade the payment of their proportionate share of the expenses of the government.

In comparing the mines owned by foreign capital in the Latin-American countries with those owned by the people of those countries, one notes great differences. Although there are a few exceptions, in general the equipment of the foreign owned mines is infinitely superior to that of the mines owned by local capital. The equipment of the latter class may be valued at hundreds of dollars, while that of the former at tens or even hundreds of thousands of dollars. The investment by some foreign companies of millions of dollars in the development of certain mines before a pound of ore has been shipped has been a most beneficial object lesson to the people of several regions.

The wisdom of the expenditure of large sums of money for the gain of much larger amounts is gradually being recognized, and the extension of such a policy cannot fail to materially increase the development of the mineral resources.

In the past, mining in South and Central America was mainly confined to the development of small mines containing high-grade ores. If bonanza ore bodies were encountered, the profits were invested in other mines or other industries; and, when the rich ores were exhausted, the mines were abandoned. Chile, particularly, contains hundreds of examples of this type of mining. The foreign companies have, however, indicated the better system with the result that ore deposits of much lower grade are now being worked and the mining profits are both greater and much more regular. If foreign companies had done nothing more for the countries where they operate than to point out better methods of conducting mining operations, they should still be regarded as of supreme importance to the Latin-American countries.

The problems which confront a mining company in South America are many and great, whether the mine be located in the tropical region of Brazil or in the high Andes. The greatest of these is the labor question, for it can be said of very many of the mining districts that the native laborers are poor, and tact and patience without limit are requisite qualifications for the successful mine managers. The drink and holiday habits are almost universal. Other companies might well follow the example of the Braden Copper Co. in the construction of a liquor fence, as the elimination of about nine-tenths of the holidays would materially increase the efficiency.

There is scarcely a mining region in South America where the supply of satisfactory laborers is not deficient, except when financial depressions occur and other industrial operations cease. The attempts to obtain laborers from other sections have not met with much success. Two instances may be cited to illustrate some of the difficulties encountered.

A few years ago the St. John del Rey Mining Co., which operates the Morro Velho mine in Brazil—the mine which at present holds the world's record for depth, the lowest working being 5824 ft. below the surface—imported 100 Japanese laborers at great expense. Within a few months every one had deserted, in spite of the fact that unusual care had been taken for their comfort. A mining company operating in Potosi mountain, Bolivia, had similar experiences in

*In Tentative Topics.

their attempt to bring Indian workmen from lower countries. The altitude of the mines, about 15,000 ft above sea level, affected the workmen, unaccustomed to these elevations, to such an extent that the men soon returned to their homes. In the sulphur mines of northern Chile, Bolivian Indians can be obtained for short periods, but as soon as they obtain enough money to purchase a good supply of coco leaves and some necessary provisions, they return to their home on the "altiplanicie." In general the importation of laborers from other countries has met with failure, and each section must furnish its own supply, which means that at times many of the companies must be short of labor.

In comparison with those of the United States, the mines of South America present a striking contrast in their equipment. Remote from the sources of supply, each mine must carry large quantities of necessary articles and must also depend mainly upon its own resources.

In the well-managed machine shops, which are so essential to the success of any company, many most ingenious devices have been invented as "necessity" continues to be "the mother of invention." Few, if any, mining districts in the United States have to their credit as many new and useful inventions and appliances as have been developed in the mining section of South America. When 4 to 6 months are required to get new supplies from the factories in the United States or Europe, the ingenuity of the men in charge is frequently taxed to the utmost, and illustrations of this condition were found in almost every mining camp.

In adjusting mining methods to environment, some unusual materials must be employed. These are to a North American most unique in the character of the fuel used in some of the mining camps of Bolivia and the elevated regions of northern Chile. In many mining sections the only fuel obtainable is taquia, and this is used for all purposes as a substitute for the more common kinds of fuel. It is perhaps natural that one should at first feel some disgust in having his food cooked with such fuel, but this seems less incongruous than the use of the material for the production of steam, for drying ore concentrates, for roasting ores, as well as for a great variety of other purposes. With a fuel value equal to about one-third that of ordinary bituminous coal, it makes a fair substitute, and is so much in demand that not only is it collected from the corrals where the llamas are herded at night, but Indian women can frequently be seen gathering it along the roads and trails used by the llama trains. One mining company in Bolivia uses 10,000 tons of taquia yearly and would like to be able to purchase more.

In other sections, a plant, called *yareta*, which resembles a huge lichen or fungus, grows on rocky slopes at elevations of 13,000 to 16,000 ft. above sea level. Because of the great amount of resinous matter contained in its woody tissues, this makes an excellent fuel. It grows upon rocks and conforms to their surface, resembling in shape heads of coral growth. Some of the masses are as much as 4 ft. in diameter and are 1½ ft. in thickness, and, when pried off the rocks and allowed to dry in the sun, burn readily and furnish a large amount of heat. A number of mining districts use no other fuel, and it is verily a Godsend, as the high cost of imported fuel at such elevations would practically render its used prohibitive. There is no doubt but that a number of mines in the high Andean plateaus could not be operated were it not possible to obtain supplies of these two unique and interesting types of fuel.

Loading a Pig Iron Freighter with Lifting Magnet.

The accompanying illustration shows the new magnet application made at Ashland, Wis., on the freighter *Cicoa*, which made the first loading of pig iron by means of these lifting magnets, designed at Milwaukee, Wis. This is said to be the first lake freighter to carry its own electric lifting magnets for loading pig iron, and although electro-magnets have been in use at ore docks a number of years for unloading pig iron, the loading has always been accomplished by longshoremen.

The successful and economical performance of magnets when unloading convinced the Charcoal Iron Co. of America that a similar means of loading would be of equal advantage, so that after buying the lake freighter, the *John Sharples* and renaming it the *Cicoa*, it was fitted up with circular magnets of 36 in. size, and they were first used for taking on the cargo at



LOADING PIG IRON AT ASHLAND, WIS.

the Ashland dock. The powerful magnets swing out over the dock from the crane and as they near the pile of pig iron the pigs fairly jump toward the magnet and are carried away to be dropped when the operator throws off the switch. The boat's crew store the iron in the hold.

Capt. James H. Gallagher said that the entire cost of taking on the cargo of 4,000,000 lbs. (2000 tons) was only \$100. The cost of loading with longshoremen would have been \$500 to \$600.

With all three magnets working the net weight of pig iron lifted from the dock is 4500 lbs. The *Cicoa* is utilized exclusively in carrying pig iron from the docks at Ashland, Manistique, Boyne City and Newberry, Mich., to Buffalo.

The railroads of the United States used 128,200,000 net tons of coal in 1915, or 24% of the total output. The bituminous mines furnished 122,000,000 tons, or 28% of their production, and the Pennsylvania anthracite region 6,200,000 tons, or 7 per cent its production. The roads in the eastern district, north of Potomac and Ohio rivers and east of Chicago, Peoria, and St. Louis, used 56,500,000 tons of bituminous coal and 6,200,000 tons of anthracite, a total of 62,700,000 tons. The roads of the southern district, south Potomac and Ohio rivers, and east of the Mississippi, used 22,000,000 tons of bituminous coal, and the western roads consumed 43,500,000 tons.

The Canadian Nickel Problem.*

The following article was published as an editorial in the Montreal Gazette, of Aug. 23. Of late so much that is imbecile has been printed in Canadian newspapers on the "nickel question" that a sensible presentation of facts, although they should be obvious enough to any one who has given any thought to the subject, comes as a welcome relief. As the Gazette remarks there is no "nickel problem." The desirability of providing for the refining of nickel in Canada has been realized. Arrangements have been made to that end. Effective measures, satisfactory to the British War Office, have been taken to prevent Canadian nickel reaching the enemy. This is all that need or can be done until, at least, the Commission appointed by the Ontario Government has submitted its report. On this report no doubt such matters as the most suitable location for a refinery and other details will be determined. The article referred to reads:

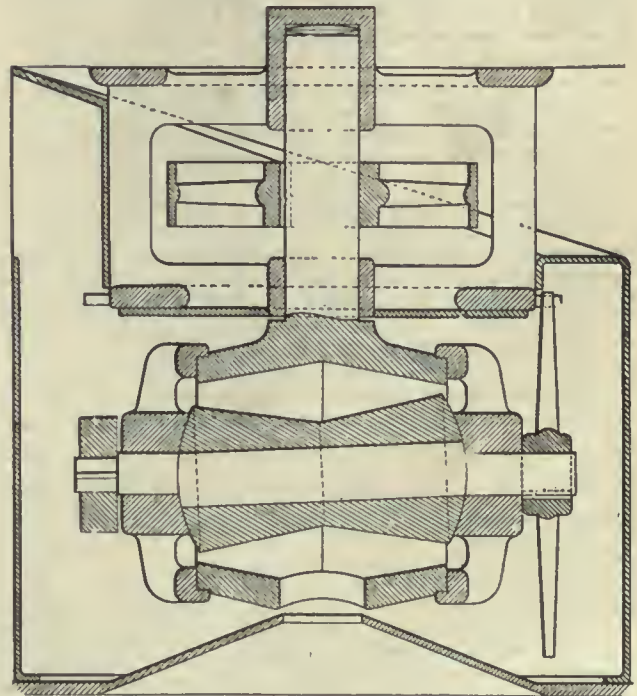
"The nickel problem has been the subject of much discussion of late, and in the recent Toronto by-election it was frequently thrust to the fore. No one who deals with it seems to have a clear idea of what the problem is. This fact may account for some of the extraordinary suggestions advanced, action on which would result in the stopping of the mining and smelting industry in Canada. Nickel is not a new metal. For over a century it has figured in the arts, the Germans, after the Chinese, being leaders in separating it and turning it to account. Canada has no monopoly of it. New Caledonia produces it in large quantities. It is found also in South Africa, Norway, Sweden and Finland, Greece, Cuba, and in Pennsylvania and Missouri in the United States. The Canadian and New Caledonia deposits are so great in extent and so superior in other ways that they have become the source of supply of the world. The story of the Canadian industry is simple. As long ago as 1856 men in the service of the Canadian Geological Survey noted the presence in the Sudbury district of a mass of rock which caused a disturbance of the magnetic needle. Dr. Sterry Hunt, one of the leading authorities of his day, on examining a sample found that it contained nickel and copper. Engineers in the construction service of the Canadian Pacific railway noted the peculiarities of the materials with which they had to deal. One of the cuttings disclosed what later became the property of the Murray mine. Many other deposits were noted, and a number were taken up as copper propositions. Some thousands of tons of ore were shipped from Copper Cliff before the value of the nickel contents was known. In the course of events, growing out of experiment, failure and success, a number of companies became prominent. Chief of these was the Canadian Copper Co., which was incorporated into the scheme of the International Nickel Co., described as a consolidation of mines and smelters in the United States, Canada, Great Britain and New Caledonia. The result of the introduction of new capital and more efficient methods was a large development that added to the business of the region concerned. Other companies were formed and operated. They took out the ore, smelted it so as to produce a matte containing copper and nickel. This was refined, some in New Jersey and some near Swansea in Wales. These facts are summarized from a report on the industry made for the Department of Mines of Canada. They show that the industry had an ordinary experience. The properties bearing ore were acquired under the law. There were failures. Some who had means and perseverance mastered the secret of separating the nickel and the copper, which involves a lengthy and complicated chemical process. Then it was discovered that nickel could be used to harden and strengthen steel. It was sought for armament work, by automobile makers, for ornamental work, and for casing bullets for use in military rifles. The product of the mines and smelters after being refined in New Jersey and Wales, went upon the world's markets. If it had not gone on the world's markets the quantity produced would have been of small account.

Canada's use alone would not keep a smelter going. The metal was like any other merchandise, like copper, or iron ore, or wheat, or cotton, or any of a hundred articles that are used for military services, but that find their great usefulness in the arts and purposes of peace. With some at least the problem seems to be to prevent the restoration of this simple and natural order after the war. There is no practicable or desirable way of gaining such an end. If there was such a way it would be doubtful if any one would seek to use it. When these bald facts are seen and recognized the nickel problem disappears. There appear to be some, however, who do not want the facts realized. Their zeal seems to have some connection with a scheme for getting taxpayers' money to enable them to make a profit in a business that others pursue without such unwholesome aid. This, however, is not a problem so much as it is a treasury raid."

Concentric Ore Crusher.

An ore breaker of high capacity and one in which, incidentally, the breaking elements are so opposed as to prevent reaction of the breaking pressure across the bearing surface, is embodied in an invention of Thomas W. Capen of Milwaukee, Wis., which has been assigned by mesne assignments to the Allis-Chalmers Co. of the same city.

The vertical, central section shown herewith gives a clear idea of the arrangement of the parts and their operation. The lower part consists of the frame proper, containing the step and ring bearing for the vertical shaft of the machine. The upper end of this shaft carries the crushed roll element. This roll is



A NEW CONCENTRIC ORE CRUSHER.

shaped like two diametrically opposed segments of a sphere, and is mounted concentrically on a horizontal shaft as shown. This horizontal shaft is turned by the star wheel at the left, the arms of which engage pins set all the way around the circumference of the frame. Ore is fed into this roll through a hopper shown at the top.

As the vertical shaft is revolved, the ore in the crusher roll is thrown outward by centrifugal force. At the same time, the star wheel is constantly revolving the roll, which, being set concentrically within the annular casing, crushes the ore against the latter.

*Canadian Mining Institute Bulletin.

Month's Record of a Dreadnaught Rock Drill.

LETSON BALLIET.

Owing to the fact that the Buckeye Belmont Mines Co., Nevada, was repairing chutes it was possible to work only one crosscut during August, which allowed but one drill to be in operation during the month. This gave them an excellent opportunity to prepare some drilling data on the operations of the drill:

Conditions.

Elevation above sea level 6200 ft. at surface.
Depth of shaft 1200 ft.
Four-inch air line down the shaft.
Drill worked 1250 ft. from the station.
Level piped with 1¼-in. pipe line.
Guage pressure 100 lbs. maintained at surface.
Compressor is motor-driven through belt transmission.
Compressor—Sullivan angle-compound, equipped with unloaders.
Efficiency of compressor 5 cu. ft. per horsepower.
Drill operated 31 shifts during the month.
Average atmospheric temperature 78°F. on surface at 2 p. m.
Relative humidity average 20% on surface at 2 p. m.
Natural rock heat in working face 104°F.
Formation trachyte.
Number holes to break a round, 11. Average depth 5 ft.
Total feet of holes per day 55, and 1705 ft. during month.
Drill Dreadnaught water feed, hammer drill.
Total number cubic feet of free air compressed, 705,900.
Average number of cubic feet per day, 22,771.
Average number cubic feet per minute, 130.
Compressor was started, after drill was set up.
Compressor was stopped while the bar was being lowered.
Compressor was started again when lifters were ready to drill.
Compressor was stopped when drilling was finished.
Compressor motor was driving compressor 90½ hours during month.
Average daily time compressor was running 2 hours 55 minutes.
Shortest time compressor run any one day 1 hour 45 minutes.
Longest time compressor run any one day 3 hours 45 minutes.
While compressor was running 18 hours in the aggregate was lost-time, changing steel, shifting machines, getting water and oiling, shown on recording guages.
Compressor motor used 1820 kwh. on the meter, during the 90½ hours (5430 minutes) it was in motion.
Drill sharpener and forge included in compressor operations.

set up on a tunnel bar over the muck and mucker helped with the set up, then mucked out behind and under him. By the time the bar was ready to lower, mucker had cleaned out and was ready for him. If not ready the driller helped muck back.

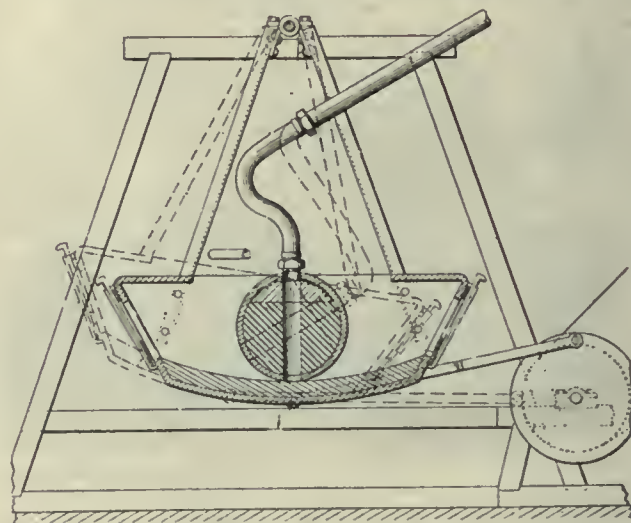
Average time that the driller and muckers were under ground (from collar until they were hoisted over the collar) was 7¼ hours per shift.

The result of these figures shows that a foot of drill hole was made every 3 minutes, or 4 ins. every minute that the compressor was in motion.

Inexpensive Ore Mill for Light Work.

This ore mill is simple in construction and inexpensive to build and install. It is designed on the principle of a swinging mortar, and will do the work satisfactorily where the requirements do not call for an elaborate equipment.

A pan or mortar is suspended by rods so as to swing back and forth like a hammock. In the pan is



AN INEXPENSIVE ROCK CRUSHER.

a roller or crusher consisting of a hard steel shell mounted on a cylindrical core, which rolls in the pan as the latter is swung by a crank.

The shell of the roller has one side cut down flat

COSTS OF 1820 KWH. USED BY THE COMPRESSOR DURING THE MONTH.

	1c kwh.	1½c kwh.	2c kwh.	2½c kwh.	3c kwh.	3½c kwh.
Electric power at.....	1c kwh.					
Month's power bill.....	\$18.20	\$27.30	\$36.40	\$45.50	\$54.60	\$63.70
Cost per drill shift.....	.5875	.88	1.175	1.4675	1.7625	2.055
Compressor hour.....	.20	.30	.40	.50	.60	.70
Foot drill hole.....	.01	.016	.022	.027	.032	.0375
Foot crosscut.....	.14	.21	.28	.35	.42	.49
Cubic foot of air.....	.0000258	.0000386	.0000515	.0000644	.0000773	.0000902
Drill repairs and upkeep—Nothing.						

Blacksmith shop did no work except to sharpen steel for this drill that was running. Drill sharpener and forge fire were operated by compressed air. Steel was sharpened when drill was calling for air in the mine, thus compressor was not run for any purpose except while drilling was being done. The blacksmith shop was charged to the drill, and it must be remembered that all mechanical friction of the compressor and motor loss is charged to this drill. If other drills had been working the motor loss, friction and shop air would have been averaged between them, making the cost per drill somewhat less.

The drill was worked as "a one man drill." It was

as shown, so that the roller as a whole is heavier on one side, causing it to come back readily to the center of the pan, when the latter is at the lowest part of its swing. This construction of the roller really facilitates the swinging of the pan.

In the bottom of the pan is an adjustable screen by means of which the depth of the ore pulp is governed, and the latter is fed in automatically through the bent pipe which appears in the illustration. Jacob Lampert of Rapid City, S. D., is the inventor.

Don't kid about "Safety First"—you may be the goat.

What the Mining Companies are Doing

Jumbo Extension Co., Nevada.

Details of production and costs are given in the report of the Jumbo Extension Mining Co. for the year ended June 30, 1916, as follows:

Production, smelter recovery.....	\$970,784.55
Dump (mill) ore.....	882.35
Total recovery	\$971,666.90
Expenses—	
Mining	\$103,480.28
Development	88,445.32
Freight, treatment, sampling on ore shipped.....	329,145.63
General expenses	21,596.65
Marketing ore	1,650.00
Taxes	12,066.45
Total operating expenses	\$556,384.33
Construction, equipment	6,041.61
Net operating costs, including construction, freight, treatment and sampling on ore shipped.....	\$562,425.94
Net realization	409,240.96

REPORT OF SECRETARY.

Cash balance, June 30, 1915.....	\$120,533.13
Receipts—	
Received from ore sales.....	685,874.47
Interest	400.00
Jumbo Reduction Co., on account.....	1,811.62
	\$808,629.23
Expenditures to June 30.....	\$233,280.31
Dividends	465,100.00
Cash balance June 30, 1916.....	103,274.38
Addition to stores	6,974.53
	\$808,629.22
Net value of ore in transit and unsettled for June 30, 1916	\$ 28,728.30

Shannon Copper.

By Jan. 1 Shannon Copper Co. should be in position to resume dividends, which were discontinued with the payment Jan. 30, 1913, of 50 cts. per share, as the company is now earning between \$2 and \$3 per annum. At the present time net current assets amount to over \$1,000,000, but there is about \$240,000 to be deducted from this, \$183,000 to retire outstanding bonds of Shannon-Arizona Railway and the balance to meet payment on a property purchased many months ago. By Jan. 1, however, net quick assets should again have crossed \$1,000,000, which would be more than ample for all purposes.

Directors are very desirous of retiring the \$183,000 Shannon-Arizona Railway bonds which can be called on any interest date at par and interest. The Shannon Copper Co., which guarantees them is, however, prepared to purchase them now on the same basis at which they are callable.

The company reports for 6 months ended June 30 a production of 4,376,199 lbs. of copper, cost of 17.2 cts. per pound with net earnings for 5 months—property being closed in January—amounting to \$448,396. Deducting January expenses of \$14,175 net from 5 months' operation was \$434,220. Company received 27.363 cts. per pound for its copper.

Phelps, Dodge & Co.

New high record earnings and production have been established this year by the operating subsidiaries of Phelps, Dodge & Co., which have resulted in greater dividends than ever before on this stock. With the payment this month of \$8 per share there will have been distributed in the first three quarters of the year a total of \$20 per share requiring the disbursement of \$9,000,000. Owing to the well sold-up condition of the company at high prices it appears likely that the December distribution will at least equal, if not exceed, the September payment of \$8 a share.

It is estimated that Phelps, Dodge & Co. produced during the first 8 months of this year approximately 115,000,000 lbs. of copper, a big increase over last year's total for the same period. In addition, the sales department had the marketing of Calumet & Arizona production of close to 45,000,000 lbs. for the eight months.

It would not be surprising if the Phelps-Dodge produc-

tion reached 175,000,000 lbs. for the entire year against 140,000,000 lbs. in 1915. Assuming a 10-ct. cost and 25-ct. copper, profits should reach \$26,250,000, equal to \$58 per share on 450,000 shares of Phelps-Dodge stock.

Miami Copper, Arizona.

Miami, with a half-yearly production of approximately 28,000,000 lbs. of copper and a cost of about 9 cts., will show earnings around \$4,700,000, or better than \$6 a share. With a continuation of present attainments Miami stands to earn in 1916 between \$10 and \$11 per share, and as it has to date paid out but \$4.25 in dividends there is reason to hope that the dividend due in the middle of November may be increased. With no large construction expenses ahead and net working capital of over \$5,000,000, practically every cent of earnings is applicable to dividends.

The Miami mill now handles 4500 tons of ore daily, or upwards of 1,350,000 tons per annum. Present development warrants the statement that in high-grade ore alone the company has 12 years' life, while considering its complete reported tonnage of ore reserves of 35,000,000 tons of 1.82% material and 6,000,000 tons of 2% mixed ores Miami has more than 20 years' life in ore blocked out, the time beyond 20 years being indefinite as it will depend very largely on the treatment of the very lowest grade of ore, the method of which is yet to be determined.

The management is good, J. Parke Channing being consulting engineer. Greater efficiency is being secured from the mill than formerly through internal readjustments, and this has resulted, without increasing tonnage handled, in increased production. When it is decided how to treat the low-grade ores production is expected to get up to 60,000,000 lbs. of copper a year.

Based on its earning capacity Miami is selling too cheap, as the company is paying dividends at the rate of \$6 per annum and selling at \$37, which yields an income of 16%.

The company has an authorized capital of \$4,000,000, consisting of 800,000 shares of \$5 par value of which 747,114 shares have been issued. Miami was developed, financed and brought out by the General Development Co., Adolph Lewishohn being president of both companies. General Development is furthermore the largest individual stockholder with 25,000 shares in its name.

Federal Mining & Smelting.

The Federal Mining & Smelting Co. reports for the quarter ended July 31 as follows:

	1916.	1915.	Dec.
Total profit	\$332,294	\$356,126	\$23,832
Depreciation	64,007	65,235	1,228
Net profit	268,287	290,891	22,604

Tennessee Copper.

The Tennessee Copper Co. has entered appearance through Vogel & Vogel, of 15 Broad street, to four suits commenced against the company by W. H. Stiner & Son. These suits are for claims aggregating \$980,853 for breach of contracts entered into with Tennessee Copper Co. for delivery to Stiner & Son of 1000 tons carbolic acid crystals, 3500 tons sulphuric acid, 850 tons carbolic acid crystals, and 5000 tons of sulphuric acid, respectively. In the complaints Stiner & Son say that deliveries have not been made according to contract and that they have sustained damage by reason of the non-delivery to the extent claimed.

Attachments against the property of Tennessee Copper Co. in New York were issued, but these attachments were afterward vacated upon bonds being furnished by National Surety Co., in satisfaction of the attachment.

Several other suits against Tennessee Copper Co., alleging breach of contract, have been commenced and are pending in the Supreme Court of New York state. Armstrong & Keith of 4 Wall street have a claim of \$100,000 against the

Tennessee Copper Co., on behalf of the Nitrogenous Chemical Co., of Philadelphia and New York, claimed as damages for alleged breach of contract. Joline, Larkin & Rathbone have filed suit on behalf of Howard F. Bertine against the Tennessee Copper Co. for \$45,669 for alleged breach of contract entered into on Dec. 13, 1915, with the Diamond Alkali Co. for 625 tons of solid caustic soda.

United Verde Extension.

The United Verde Extension Co. is slated to produce this year better than 25,000,000 lbs. of copper, at a cost of between 7 and 8 cts. a pound. Assuming that it receives 25 cts. a pound for its product profits should approximate \$4,250,000, or \$4 a share on its 1,050,000 outstanding shares.

It is understood that recent development work at the property has added greatly to reserves estimated last July at 600,000 tons of 16% ore. At the 1400-ft. level, where the work centers, the ore body is 350 feet long and 250 feet wide, ore averaging 15% copper.

From this level a raise for more than 100 ft. has been in 15% ore all the way, while a winze from that level has been sunk more than 90 ft. in the same grade of material.

It is believed that the company will erect its own smelter so that it will not be forced to pay tolls to custom plants. Such a plant will also permit increased shipments as warranted by the further opening of the mine.

August Copper Figures.

During August American copper producers generally increased production over the previous month. Production figures of some of the companies are given as follows:

	August.	July.
Miami	4,698,795	4,310,000
East Butte	1,849,120	1,893,120
Anaconda	28,800,000	28,200,000
Inspiration	11,450,000	11,300,000
Kennecott	10,200,000	10,750,000
Old Dominion	3,600,000	3,852,000
Greene-Cananea	5,000,000	4,600,000
Arizona Copper	4,800,000	4,400,000
Chile	3,020,000	3,574,000
Shattuck-Arizona	1,699,575	1,397,445
Utah	20,000,000	20,300,000

United States Smelting.

It is expected that the final quarter of the year will see operations back to normal for the United States Smelting & Refining Co. With silver selling around 68 cts. per ounce, and copper, zinc and lead stronger, it is difficult to see how the company can fail to earn \$24 a share on its common for the full year.

There is nothing new in the company's affairs. The big silver sensation that started the stock on its rise from \$50 has proved to be all that has been said of it and when conditions across the border right themselves the new vein can be counted upon for 10,000 tons of ore a month. On the present 68-ct. silver market this would represent silver earnings of about \$3,400,000 in excess of normal, or pretty close to \$10 a share for the common.

The operations, however, in the bonanza Real del Monte and in the Pachuca districts as well must have been hindered in recent weeks by the difficulty in getting cyanide across the border. As approximately 90% of the company's silver values and 96% of the gold are extracted by the cyanide process and by concentration, the lack of cyanide is obviously bound to slow up output.

For this reason mainly, and as silver has averaged a full two cents lower thus far this half-year than for the second quarter of the year, earnings will probably show some falling off during the current three months. The first quarter showed over \$2,600,000, the second rising \$3,000,000 and the third will probably not show over \$2,000,000.

For the nine months the company should show a balance for the common of between \$18 and \$20 as against \$2.75 thus far distributed in dividends. Directors would therefore be amply justified in paying a liberal extra or in placing the stock upon a \$5 basis, which a certain section of the board favors, but until the Mexican situation is definitely straight-

ened out and normal transportation facilities furnished, no change will probably be made in the current rate.

Miscellaneous Company Notes.

The Anaconda Co. has taken up its option on the Douglas group of zinc mines in Coeur d'Alene district. A big deposit of high-grade zinc ore has been developed on the property. Anaconda has also acquired the Silver Cable, another zinc property in that district.

Reports from Alaska Gold show marked improvement, for during the first 10 days of September the average headings of the ore was \$1.51 per ton. The preceding high average for a month's run was \$1.42—in January last. Furthermore, the tonnage treatment is being expanded, as during this 10-day period 50,510 tons were milled, an average of over 5000 tons per day.

Braden's production in the first 7 months of 1916 showed a substantial increase over that of 1915, registering an output of 25,970,000 lbs., as compared with 18,128,000 lbs. during the same period in 1915. The official explanation of July's low production is: "Mill started July 10, having been down since June 14 for repairs to tailings dam, which went out the latter date. As weather was cold and dry, the water was low and damage slight. Repairs completed and property now operating."

The American Smelting & Refining Co. has made an appropriation for the enlargement of its lead stacks at Murray, and copper furnaces at Garfield, Utah. The entire appropriation for this improvement is said to have been between \$2,000,000 and \$3,000,000. Utah Copper Co. has notified the Garfield Smelting Co. that it will be prepared to make larger shipments as quickly as the smelting plant can be enlarged. In the meantime the Utah Copper Co. will arrange to store some of its concentrates.

Owing to necessary repairs to the shaft during the month of August, operations at the Butte & Superior were interrupted and production fell from 16,000,000 lbs. of zinc in concentrates, which it had been running, to 10,000,000 lbs. The milling performance, however, was quite up to that of the previous month, with a recovery of over 94% and the product running 52.4% zinc. Very good progress is being made in the new shafts, and with these completed in a few months more similar interruptions in the future should not again take place.

It now appears that larger dividend disbursements are in sight for Nipissing stockholders. Directors next meet Sept. 25. The company now has \$2,000,000 cash assets. The company has been paying regular dividends of \$1 per annum, or 20% on a par of \$5, and has to date paid the stockholders nearly three times the capital stock of \$6,000,000. This year Nipissing should earn close to \$2,000,000. Production has not been increased, the gain coming almost entirely from the higher silver market. Operations last month resulted in estimated profits of \$218,759.

Another of Calumet & Hecla's subsidiaries has entered the dividend-paying list, with a \$1 declaration payable Sept. 21. The company is producing at the rate of about 3,500,000 lbs. of copper per annum at a cost of less than 13 cts. per pound, so with the red metal at its present price, earnings are over \$400,000 per annum, or better than \$4 per share on the 100,000 shares outstanding. We figure that earnings for the first 8 months of the current year were \$220,000. As the company had "balance of quick assets" on Dec. 31 last amounting to \$216,000, this item probably stood at better than \$400,000 on Sept. 1.

It is estimated that the Arizona Commercial Copper Co. is now able to earn \$50,000 per month with copper above 25 cts. a pound. This is based on the record of the past 7 months, in which was produced over \$350,000 net, or an average of \$50,000 a month. The date of the company's dividend payment has not yet been determined. Assuming that \$2 per share per annum were paid, it would not be necessary to draw upon the company's present working capital which now stands at better than \$600,000, which total has been reached after paying over \$100,000 for the power plant and the installation of pumping equipment on the fourteenth level.



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*Illustrated.

Permissible Explosives and Electric Firing.

During the summer months, mine operators are interested and have more time to consider the introduction of new methods and improvements in their mines toward a betterment of working conditions.

What better improvement could be made than to install and adopt the electric method of firing explosives instead of the old method of fuse and blasting cap? It is true that in most of the modern and up-to-date mines electric firing and the use of permissible explosives have been adopted. There are a few, however, still lagging behind. Very few mines exist in which conditions could not be made more safe and the protection of the property enhanced by the use of permissible explosives and electric firing.

According to statistics compiled by the Bureau of Mines there were slightly more than 288,000 lbs. of permissible explosives used in American mines in the year 1903, and the fatalities during that year directly traceable to explosives, were 0.339 per 1000 men employed.

In 1914 over 15,000,000 lbs. of permissible explosives were used and the fatality rate dropped to 0.096 per 1000 men employed. A reduction of 72%! Again in 1870 there were 13.47 fatal accidents for every 1,000,000 tons of coal mined in this country and in 1914 only 4.78 for every 1,000,000 tons mined.

This great reduction was accomplished in spite of the fact that the production of coal has increased by several hundred per cent during that interim and many thousands more men employed in the industry. Also the coal mines have been developed to a greater extent and are deeper and more dangerous than in 1870. Much of the credit for this remarkable improvement is due to the use of permissible explosives and electric firing. Figures do not lie, and there is still room for an even better showing than the above, because compared to European statistics we are still behind in the matter of safety and protection in coal mining.

Statistics also show that of all the accidents due to explosives in coal mines 25% are caused by premature blasts caused by miners using short fuses or defective squibs. Why miners and mine operators will still persist in this antiquated method of firing explosives is hard to see.

When explosives are detonated electrically, the maximum execution is always assured. The blast cannot occur until the miner desires it and when everyone is in a safe place. As many holes can be fired at one time as desired so that it is possible to use less explosives per ton than when fired by fuse and blasting caps.

We have seen mines in which permissible explosives were used and still the old practice of fuse and blasting caps in use. How inconsistent that is! Surely if a mine requires the use of permissible ex-

plosives—and there are very few in which conditions could not be improved by their adoption—in order to harmonize, these explosives should only be detonated with electric blasting caps.

The cost of installation is very low. A blasting machine suitable for use in mines costs about \$10 and will last for years if properly cared for. Electric blasting caps cost little if any more than fuse and blasting caps, and the cost of leading wire is small. The advantages and benefits gained greatly outweigh the small first cost of installation.

In order to make the working conditions of the miner, which at best are bad enough, better, safer and more pleasant, not to mention the added protection to the mine property, you should, Mr. Operator, adopt the use of permissible explosives and electric firing.

Copper's Envable Position.

That present inquiries from foreign and domestic consumers call for all available copper to be produced up to next July is voiced by all the leading producers and sellers. November-December copper is fast going out of the market, and most of the current business is for first quarter 1917 delivery. Contracts are also being placed for second quarter copper for account of individual British, French and Italian consumers. This business is in no way connected with negotiations for the sale of a huge amount of next year's copper to the allies.

The volume of copper sales during last week was close to 75,000,000 lbs. according to estimates of producers figuring largely in the business done. Bookings were made through next July although the bulk was for the first quarter of next year.

Domestic demand was from brass and wire mills. The brass plants laid in their requirements against record-breaking tonnages of finished goods sold to the banking agents of foreign governments. Wire mills bought copper against a renewal of demand for their products from domestic users.

There were some good sized individual orders for copper placed by domestic manufacturers. The largest of these was for 20,000,000 lbs. taken by a brass mill to be delivered during the first half of next year. It is understood that prices on this business range up to 26¾ cts. a pound.

Negotiations for what will prove the largest individual block of copper ever figuring in one transaction are expected to be closed up during the coming week.

December sales have been made at 27½ cts. but the price has now moved up to 27¾. First quarter copper commands 27 cts.

Will there be an Iron-Ore Shortage?

Will the steel mills of the country, depending on Lake ore shipments, have sufficient stocks on hand to see them through until shipping opens up

next spring, is a question that is receiving consideration these days. The coming winter has everything to do with the situation for on its duration depends the tonnage to be shipped. If the season is of normal length, about 5 months, a supply of 28,000,000 tons would enable the furnaces to operate at capacity until shipments resume. Any prolongation of cold weather, however, would force a curtailed production.

It is estimated these mills are now consuming approximately 5,500,000 tons of ore monthly, estimated consumption for the year being about 65,000,000 tons. It is calculated total ore shipments will hardly exceed 63,000,000 tons, and are likely to be under 61,000,000 tons, so that there would appear to be a shortage of from 2,000,000 to 5,000,000 tons. If shipping can be continued beyond the 15th of September, however, this difference may be made up.

Little assistance can be expected from sending ore by rail, as it is pointed out that the cost of rail transportation would add several dollars a ton to the cost of iron and steel and that even if ore were thus sent it would freeze in transit and be very difficult to unload and handle. Further, it is questioned whether the roads tapping the Lake ore regions have sufficient capacity to make up any important shortage.

Spelter prices have strengthened as a result of the large purchases that have been made by domestic manufacturers who sought to cover their requirements against big brass orders placed in this country for foreign account since the first of September. This demand has not been confined entirely to the wants of American consumers as foreign inquiries have been for large quantities. Canada's needs are extensive and France has been taking no small lot. Other European countries are also taking sufficient to supply their needs.

Report comes from Mexico that special mine taxes decreed throughout Mexico by governors and military commanders have been revoked by Gen. Carranza. This is considered especially favorable to mining interests, which are largely American. Decree has created favorable sentiment towards de facto government and it is reported that mining men are already talking about reopening plants in northern part of republic.

A perusal of the recently passed revenue bill reveals the fact that the protests of the Western senators were heeded to the extent that the copper tax was dropped entirely. As the proposed tax, with copper at 25 cts. a pound, would have placed an added burden of \$10,000,000 annually on producers, there is cause for much rejoicing on the part of the operators.

The discovery of a new diamond field is reported in the Transvaal, about 6 miles distant from the famous Premier diamond mine and 18 miles from Pretoria. It is stated that the initial finds were exceptionally good, and there has been a rush of diggers to the new ground.

PERSONAL.

C. D. Rookledge is now superintending operations at the Cyclopic mine, Gold Basin, Ariz.

A. W. Liliendahl, consulting mining engineer, Saltillo, Mexico, has been in Cripple Creek, Colo.

Francis Church Lincoln, Mackay School of Mines, Reno, Nev., has returned from a trip to Bolivia.

Horace V. Winchell, consulting mining geologist, Minneapolis, Minn., has been in Lovelock, Nev.

P. Burns, Calgary, Alberta, owner of the First Thought mine, Orient, Wash., is now in Spokane, Wash.

E. Horst, mining engineer, Webb City, Mo., has returned from a trip to Chicago and northern Michigan.

Charles F. Williams, mining engineer with the Cananea Con. Copper Co., Chivatero, Mexico, is in Reno, Nev.

Oscar H. Hershey, geologist with the Bunker Hill & Sullivan Co., Kellogg, Idaho, has been at Spokane, Wash.

Dorchester Mapes, Chicago, is now in Laramie, Wyo., and will act as manager of the Rambler mine near that city.

James Callahan, Wallace, Idaho, has returned from a trip to Phoenix, Ariz., and New York and is now in Slocan, B. C.

E. C. Taylor, real estate agent for the Miami Copper Co. at Miami, Ariz., is revisiting his old home at Houghton, Mich.

H. H. Nicholson, consulting engineer for the Plinco Copper Co., Plumas county, California, is now in Salt Lake City, Utah.

Harold K. Boysen, mining engineer with the Tough-Oakes Mines Co., Swastika, Ont., has recently been in Chicago.

R. B. King has been appointed manager for the Highland Valley Mining & Development Co. at Ashcroft, British Columbia.

Van Evera, consulting mining engineer, has recently returned from a trip to Chicago, from his headquarters at Virginia, Minn.

George B. Holderer, recent manager of the Furlough Development Co., Arizona, is now with the General Chemical Co., New York.

Nelson Dickerman, mining engineer, San Francisco, has left to do professional work in Bolivia and Chile. He will return about Dec. 1.

H. S. Emlaw, mining engineer of late with H. S. Crawford & Co., New York, is in Spokane, Wash., from his present location at Grand Haven, Mich.

Wm. Wearne of Laurium, Mich., has resigned the head captaincy of the South Lake, North Lake, Indiana, and Algoma mines, in the Lake Copper Country.

Clyde A. Heller, president of the Belmont Development Co., and the Jim Butler Mining Co., Tonopah, Nev., has returned from a trip to Prince Rupert, B. C.

H. M. Whitman, of Boston, head of the statistical department of Hornblower & Weeks, is making a 3 weeks' stay at Houghton, Mich., visiting the mines in the Copper Country.

J. B. Umpleby, geologist with the U. S. Geological Survey, has been investigating fields in Idaho and will shortly leave for Washington, D. C. At present he is in Chelan, Wash.

W. A. Carlyle, formerly general manager of the Rio Tinto mines, Spain, and at present consulting engineer for the International Nickel Co., New York, as well as representative of the British government in the construction of the \$2,000,000 smelter to be built at Sudbury, Ont., is now in Butte, Mont.

Frank M. Estes, Spokane, Wash., representative of the American Smelting and Refining Co., has left for New York and from there will go to Chile in the interests of the company.

Edwin S. Berry, who has just joined Pope Yeatman as a partner, with offices at 111 Broadway, New York, sailed for Peru September 16 in connection with mine examination work in that country.

J. B. Cunningham, now second instructor in the metallurgical department of the Michigan College of Mines, has been appointed to the first instructorship, made vacant by the resignation of Assistant Professor Chapman.

R. R. Wiggins, mining engineer, has recently returned from Prinzapolca, Nicaragua, and in company with G. F. Schreiber, of late with the Alaska-Gastineau Co., Thane, Alaska, will examine properties near Lead, S. D., Boise, Idaho, and Grant's Pass, Ore.

OBITUARY.

William H. James died recently in Iron Mountain, Mich. He was born in Staffordshire, England, in 1833. He first went to Illinois on coming to this country and in 1879 came to Iron Mountain. In 1884 he took up a homestead at Iron River near Iron Mountain and on this land the James mine was later located. After it was developed and operations were commenced by the Mineral Mining Co., the property was known as the Osana mine.

Frank MacMillan Stanton died September 12 at White-stone, Long Island. He had been suffering for the past few months from intestinal trouble, and about a month ago was operated upon. The deceased was a son of the late John Stanton, one of the pioneers in the Lake Superior copper mining region, and was himself a mining engineer. He was treasurer of Wolverine, Mohawk, Michigan and White Pine copper companies at Lake Superior, of which his brother, John R. Stanton, is president. He was also a director in many more corporations. He had just passed his fifty-first birthday.

John V. Beekman, for many years connected with the Lidgerwood Manufacturing Co., passed away at his home in Plainfield, N. J., September 11. Mr. Beekman was born in 1842 at Somerville, N. J. About 1870 he engaged in the manufacture of rotary engines, pumps, etc., being a member of the firm of John A. Lighthall-Beekman & Co., with works on Imlay street, Brooklyn, N. Y. This company was absorbed by the Lidgerwood Manufacturing Co. in 1873, Mr. Beekman assuming charge of the works of that company, and was the inventor of many improvements in hoisting engine design. Mr. Beekman gradually withdrew from active participation in business about 10 years ago, devoting his later years to outdoor pleasures, becoming an enthusiastic motorist and golfer, being a member of several golf clubs, and a familiar figure on the golf course at Pinchurst, N. C., where he spent his winters. For many years he had been a member of the American Society of Mechanical Engineers. His death is keenly felt by his surviving family, and by many of the men with whom he was formerly associated.

NEW PUBLICATIONS.

The Atlantic Gold District and the North Laramie Mountains in Fremont, Converse and Albany Counties, Wyoming. By Arthur C. Spencer. Washington, D. C., U. S. Geological Survey. Bulletin 626; pp. 85; illustrated.

In view of the fact that considerable has already been written in reports regarding the district and its ores this bulletin has been directed to making a more detailed geological map of the district. A general review of the area and its history is first made. Economic geology and the geology of

the formation is then considered. In taking up the North Laramie mountains brief but separate descriptions are given of the mines, prospects and other small areas and this is again classified into three districts.

Ozokerite in Central Utah. By Heath M. Robinson. Washington, D. C., U. S. Geological Survey. Bulletin 641-A; pp. 16; illustrated.

This mineral, commonly known as "mineral wax," has heretofore been largely imported. The purpose of this report has been to aid in opening the domestic fields. Tests for the mineral, its genesis and other geological information regarding it are given, with accounts of the mines in the area covered by this report.

Cement in 1915. By Ernest F. Burchard. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. II:16; pp. 24.

Portland, natural and puzzolan cement are considered under separate headings where production, prices and other items of interest are given. Under Portland cement the production and shipments are taken up in general for the country, by states and commercial districts. Information is also given on the manufacture of Portland cement.

Principles of Oil and Gas Production. By Roswell H. Johnson and L. G. Huntley. John Wiley & Sons, Inc., New York. Book; pp. 371; illustrated. For sale by Mining World Co., \$3.75.

In the writing of this book the authors have well fulfilled their attempt of contributing a well balanced and up to date book. Undue subjects, though considered in some cases briefly, are not overdwelled on, and so much theory and practice is taken up as is of direct value to those interested in the oil and gas industry in the field. Necessarily the subject of geology must be given considerable preference over other subjects of interest to the oil producer and in the preface the authors state that they consider the time past when the sole requirement of an oil geologist is to recognize and map folds. The genesis, geology, nature and methods of locating wells are dealt with in separate chapters in the initial pages of the book. Leasing is also considered and followed by chapters on drilling and methods of bringing in a well. Chapters on management and methods of extracting are considered of less importance as also are chapters on methods of valuation and reporting on oil and gas prospects or properties. A fair account is given of the location of oil and gas areas in North America and the few concluding pages of the text are on the oil market and future supply followed by an appendix.

TRADE PUBLICATIONS.

The Pulsometer Steam Pump. Pulsometer Steam Pump Co., New York. Booklet; pp. 48; illustrated.

The first part of the booklet is confined to discussing the operation and construction of the pump, and besides views showing the construction of the pump many showing its practical application are shown. The latter type of views make up the greater part of the views shown. These views show that all that is necessary for installation of the pump is a beam or the like to which a "block and tackle" may be fastened. The pump in most instances is then fastened to the block and tackle. This arrangement gives general satisfaction in sinking operations. The latter part of the booklet reviews the various uses of this type of pump. Tables of costs, repair parts, etc., are also given.

Grinding Machinery. Colorado Iron Works Co., Denver, Colo. Pamphlet No. 31; pp 31; illustrated.

A series of separate articles are here included, each article taking up the correct uses, principles of operation, design and descriptions of operations in the field. Drawings of systems for installation are reproduced and tables of specific data are given in nearly all instances. Ball mills are first considered and followed by talks on grinding pans and tube mills. Tables showing standard sizes for each class of equipment are shown. Drawings are then reproduced with the dimen-

sion lines lettered. A table accompanies each of these drawings with each dimension letter on the drawing arranged so that these dimensions for different sized machines can readily be noted. "Slime Density Relations," abstracted from Metallurgical & Chemical Engineering, is given and includes a 2-page table showing slime density relations.

Hydro Turbine Air Compressors and Vacuum Pumps of Single Stage Types. Nash Engineering Co., South Norwalk, Conn. Bulletin No. 5; pp 4; illustrated.

The bulletin takes up a general description of the machine and points out the advantageous places in which it may be used. The machine consists of a casing with an internal revolving member having blades, the entire machine being something similar to a water turbine. The casing is elliptical in shape. Water is inside the casing and due to centrifugal force follows the casing. It recedes and re-enters the rotor twice during a revolution and thus acting as a piston compresses the air. Among some of the advantages the company claims for this machine is that there is no pulsation because at least six of the blades on the rotor are delivering at the same time. Large clearance and the lack of complicated parts are among other features which it is endeavored to bring out.

INDUSTRIAL AND TRADE NOTES.

M. W. Hull has been appointed manager of the Pueblo Foundry & Machine Co., Pueblo, Colo. He formerly operated a machine shop in Los Angeles.

Sarco Company, Inc., in view of the increase of business, has opened a new office at 963 Drexel building, Philadelphia, Pa., under the management of F. C. Perkins.

The Anaconda Copper Co., Butte, Mont., has recently purchased from the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., a 1215-hp. synchronous motor which is to be used for compressor service in the Leonard mine.

The Flint mill near Rollinsville, Colo., erected 2 years ago, operating 3 weeks as a cyanide plant, has been purchased by the Morse Bros. Machinery & Supply Co., and is being shipped to Denver for resale. The equipment consisted of crushers, Chilean mills, Pachuca tanks, Dorr thickeners, etc.

The Imperial Brass Mfg. Co., 1200 West Harrison street, Chicago, will shortly begin the construction of a new addition to its plant. Floor space is to be increased from 75,000 sq. ft. to 150,000 sq. ft. Orders have already been placed for the new factory equipment. The company's plant has been running night and day for many months without any war business, and there is every expectation that the new plant will be taxed to its utmost.

The Virginia Smelting Co., West Norfolk, Va., has purchased two blast roasters of the Holt-Dern type, for roasting pyrite cinder resulting from the manufacture of sulphuric acid. The pyritic cinder is chloridized in these roasters and then leached to recover copper. This roaster is manufactured by T. P. Holt and Geo. H. Dern, Salt Lake City, Utah. Mr. Holt went to West Norfolk to supervise the installation and starting of the roasters.

What is believed to be the largest natural draft cooling tower so far built has recently been completed at the Anderson, Ind., plant of the American Steel & Wire Co. This tower is of the Wheeler-Balcke type, built by the Wheeler Condenser & Engineering Co. of Carteret, N. J. The tower is approximately 150 ft. long, 50 ft. wide and 75 ft. high, and has a yellow pine frame with cypress sheathing and filling. The tower has two chimneys which rise above the cooling stacks and create the air circulation by natural draft. The capacity of the tower is 7300 gals. a minute, cooled from 115 to 85°.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Juneau.

In reviewing the Alaska Gold Mines Co.'s property President Hayden just recently returning to New York from a trip of inspection says: "There has been but one disappointment, both to the stockholders and the officials of the property, and that is that the assay value of the ore has not been as high as that shown in development of the property before its purchase and which was actually being obtained at that time. When the property was purchased the mine had been opened by what was the most natural method of development, viz.: the driving of a crosscut tunnel from the Silver Bow basin where water power was available and where there was a natural mill and townsite, to that point in the middle of the mountain where such a tunnel driven perfectly straight would cut and cross the vein. Immediately on passing into the vein the property was opened up along it both to the east and west for a distance of some 2000 ft. and stoping operations were begun. From 1907, in a small mill which could only run during the summer months on account of inability to get power, nearly 400,000 tons of ore were treated, which had an average grade of \$1.80, corresponding to a recovery under our present methods of milling of better than \$1.55 per ton. From the best engineering and geological advice which we can possibly get there is absolutely nothing to indicate that the ore body where struck by this tunnel should be any better or any worse than it should be either above or below this level or in other parts of the ore zone longitudinally. We furthermore know that in crosscutting through the vein to the shaft from the new Sheep Creek tunnel, known as the 13th level, 300 ft. below original openings, we encountered in large bodies as high grade ore as has been found anywhere in the mine. We furthermore know that the Treadwell mine operating across the channel has found lean places on certain of its levels and has at much greater depths than we have now reached again come into good values. We also know that the Alaska-Juneau property immediately adjoining ours on the west end and in the same lode system has cut these ore zones at some 300 ft. lower than our deepest level. The continuation of development work which has been done since the purchase of the property indicates that the ore exists in a number of separated shoots, some of which are materially higher in grade than others. The proper opening of the property for most economical mining requires that the upper levels be prepared first, and the developments in these upper levels of the west portion of the mine have been disappointing as to assay values. This has been due largely to the necessity of opening stopes before time could be taken for elaborate development, and of including in them greater widths of ore zone than would have been done had we understood the character of the ore bodies as well then as we do now. This early preparation of stopes has resulted in an accumulation in them of some 3,000,000 tons of broken ore and it is impossible now to go into the tops of these stopes and narrow them down for the purpose of improving the grade. As new stopes are opened on the levels below, this can and will be done, but it cannot be done until the comparatively low grade ore now broken has been drawn away; and as the average of all of this broken ore is such as to return a profit when run through the mill the only logical and natural thing to do is to so mill it. In the meantime other areas of better grade ore have been and are being developed to the extent that we now are deriving some benefit from those easterly sections, but due to structural conditions of the ore bodies there we have not been able to produce from them as rapidly as we hoped, and without sacrificing large and valuable ore bodies, cannot very greatly increase the

grade of ore now going through the mill until the large amount of low grade ore already broken in the westerly sections has been disposed of. Summing the whole situation up, it is fair to say that the results up to date have been somewhat disappointing, but viewing it in the light of the more perfect information we now have, the financing, development and equipment of the property on its present showing and to the present extent is fully justified from every viewpoint, and the same people who have been responsible for these things would do the same thing if they saw the property as they see it today instead of as they saw it in the beginning."

Cordova.

The McKinley Lake and Lucky Strike properties near Mile 22 on the Copper River & Northwestern railway, have been bonded to Col. B. F. Millard of Valdez. Twenty claims are included in the two groups, which are located on the north and northeast slopes of McKinley mountain and extend to the shores of McKinley lake. A recent examination of the properties, during which 88 samples were taken from the workings, shows that development to date has exposed three large veins, the widest of which has a width of 65 ft. Values in gold averaging from \$3 to \$5 were found to persist through long distances. According to the report very few blanks were found in the samples, and on the other hand several places yielded returns of \$20 to \$40. The assessment work to be done this fall will be planned with a view to increasing the information obtained by the sampling.

Col. Millard is of the opinion that the properties can be worked on a large scale with good profit. Barges can be taken from Cordova harbor up Alonganic river and Lake McKinley, directly to the Lake group. Excellent saw timber is plentiful on the claims. Salmon river and its tributaries provide a nearby source of power which is considered abundant for all mining and milling purposes. The terms of the bond are favorable and show the confidence of the present owners in their ground. A year hence, on Sept. 1, 1917, a small payment will be required, followed by an increased amount a year later.

ARIZONA.

Oatman.

Oatman is still growing, new building being continuous and showing that the people have a deep and abiding faith in the district. Quite a number of mining properties have become inoperative. In the main, these are properties of companies which started operations on a "shoestring" and which were not able to continue operations when the summer slump in the market for speculative stocks rendered it impossible to place their securities fast enough to supply working capital. Some of these undoubtedly started operations with the idea of selling out before much work had been done. Where such properties are well located and give much promise from the standpoint of the mining engineer, refinancing negotiations are already under way, and in a number of cases will be successful. Inoperation of the others is really a benefit, rather than a drawback.

The companies which are now working—and there are more than 30—are seemingly well financed, are in many instances being financed by eastern capital, which up to 2 or 3 months ago had not become interested in the district, and are determined to thoroughly explore their properties at depth and make mines if mines may be made. In other words, they are mining in the manner which is required to develop paying mines—are legitimate in every sense of the word. A number of other concerns which had shut down, both because of the

hot weather and slow movement of treasury securities at low prices, are now finding it possible to market their stocks at fair prices, and as soon as proper cash reserves for long development campaigns have accumulated, will resume operations. Several large deals are pending, whereby eastern capital will control attractive properties.

Another thing which points to the fact that Oatman has passed through its leanest period is that influential brokerage houses in the east and middle west are pointing to the district as one of great promise and advising clients to buy. The market for these securities is thus rapidly broadening, whereas up to the first of July it was practically confined to the southwestern states.

The new 200-ton mill of the United Eastern is now more than 50% completed. The major part of the heavy machinery has been placed. When this mill starts operation during the latter part of the year a new and heavy producer will have been added to the camp. The new working shaft at the mill site is now almost completed to 600, and then will be driven to greater depths and new levels opened. At the same time exploration work is in progress to determine how high the ore shoot—which has been opened for more than 900 ft. in length—extends above the top, or 350-ft. level.

The Gold Dust Co. has a considerable tonnage of ore in sight, and when the old Orien mill, on this property, is remodeled, will commence ore treatment. Experiments are being conducted in a Los Angeles laboratory with a new amalgamation process which embodies fine crushing and rotary agitation of pulp and amalgam. The gold in the Oatman ores is too fine to be saved by stamp and pan amalgamation.

The Tom Reed is steadily operating its 20 stamps at full capacity, and in addition to the usual work in its main line is sinking four new shafts at various points on its large estate.

The Gold Ore Co., with a large tonnage of ore averaging better than \$20 in sight, is planning a 30-ton mill. At the same time, it is learned that negotiations for the purchase of the property are being made by an eastern concern, and it is hinted that the possible purchaser may be the U. S. Smelting & Refining Co., which owns the Gold Road mine, adjoining the Gold Ore.

The Carter is steadily developing ore, and control may soon pass to eastern interests.

Fessenden will resume soon, and at this time a Pittsburgh concern is negotiating for control, with the time limit soon to expire.

Lucky Boy and Lucky Sam promise to resume soon, as do the Lazy Boy and Nellie, the two latter having been held up because of water.

Ivanhoe, at a depth of 500 ft., encountered a flow of 900 gals. of water. This was encountered in the face of a drift on a promising vein. The characteristics of the rock had radically changed at this point, mineralization and oxidization being more intense, the showing being better than anything in the history of the property. As soon as pumping machinery can be installed operations will resume.

Black Range, Sun Dial, Oatman Amalgamated, Boundary Cone, Adams, United Western, San Francisco, Mohawk Central, Jerome Oatman, North Star, United Northern and Pittsburgh are others which are steadily developing.

Arizona Central is making a fine showing in its shaft, and seems to have neared its vein, on account of the stringers carrying high values which have been encountered. Lexington has found milling ore at a depth of 110 ft., and Oatman Gold Mining & Milling at a depth of 500 ft. has drifted some 30 ft. in a vein which is showing about 2 ft. of pay ore, and which gives promise of being the end of an important ore shoot.

On the Big Jim property during the past 7 months discoveries of ore have been reported, and in the meantime work of developing these ore bodies has been in progress. Conditions are such that the engineer may now enter the Big Jim property and form a satisfactory conclusion as to the merits of the property. It is the opinion that Big Jim is developing into one of the important gold mines of the southwest, and that it will eventually become a large producer of gold. The property has as yet been developed on but two levels. One of these is at a depth of 400 ft., the other at a depth of 485. The

shaft is about midway between the main mine of the Tom Reed and its Black Eagle mine, and on the same lode system. On the opposite side of the Tom Reed main workings from the Big Jim is the United Eastern, also on the same lode system. There is a heavy seepage of water on the 485-ft. level of the Big Jim, which constantly washes off the walls and faces of the drifts, and renders an examination very easy. The drifts to the east and west of the point where the crosscut from the shaft entered the vein total more than 350 ft. At intervals the vein has been crosscut, and is about 30 ft. from wall to wall. The main drift is run along the hanging wall of the vein. The shaft is on the foot wall side of the vein. On the 400 level the east and west drifts total about 350 ft. in length, and the vein is of the same width as below. The average values appear to be some higher than on the 485 level. Bulkheads are now being put in on this level so that upraises may be driven to ascertain the height of the ore shoot.

In the main workings of the Tom Reed, immediately adjoining, on the strike of the same lode, the highest values were found between the 250 and 300 levels. Values then decreased until a central zone of about 500 ft. was reached, and then slowly increased until the 750 point was reached, where they were higher than any previously encountered. From this point down to 1100 ft. depth values appeared to hold very constant. What purported to be official assay maps of the Big Jim and of corresponding levels in the Tom Reed show that values and conditions in the two properties, level for level, appear to be identical. Formation and ore, according to all visible conditions, appear to be so similar that it is the belief that the Big Jim will show pay ore to as great a depth as has been shown in the Tom Reed to date. The exposed ore shoot in the Big Jim is now more than 450 ft. in length, and averages better than 25 ft. in width, and it is the opinion that it will mill to an average much in excess of \$20 per ton. The property has a fine machinery and surface equipment.

It is interesting to note that Oatman is a "dry" camp, and is the first prominent new mining camp in the nation's history in which the sale of liquor and gambling is prohibited, and which mining, rather than gambling, is the principal industry.

CALIFORNIA.

Goldstone.

New York capital has become heavily interested in the Goldstone Mining Co. and arrangements are being completed to sink to a depth of 500 ft. Orders have been placed for a hoist, compressor, machine drills and other equipment. The Cooper lease has opened rich ore at a depth of 50 ft., and several other leases are shipping ore of remarkable richness.

The United Goldstone Mining Co. is preparing for work. The company owns 23 claims in the eastern end of the district, where rich ore has been disclosed. A number of other companies are active and numerous shipments are being sent out. Machinery for the first unit of the custom mill is on the ground and the plant is scheduled to go into commission about Oct. 1.

Oroville.

The Oro Electric Co. has arranged to operate its mining properties under the name of the American Gold Dredging Co. Arrangements have been made to install a new dredge at Thermalito, and for completing a boat in the Mokelumne field. Preparations are being made for exploration of promising territory along the Sacramento river, in the vicinity of Redding. Two dredges are operated near Oroville.

Nevada City.

Operations are soon to be resumed at the Phoenix mine, 2 miles north of Nevada City, with Andrew Goering in charge. The mine has produced some good quartz, but recent work indicates the near proximity of a gravel deposit and the main 980-ft. tunnel will be extended to tap the channel. No. 2 level will also be driven further.

Groveland.

Production has been resumed at the Cosmopolite mine and the improved mill is running on ore of fair grade. The property was acquired Aug. 19 and considerable underground

work has been already started. The mine contains large deposits of low-grade material and the new owners plan to install additional reduction machinery and to operate along broad lines. Tonopah capitalists are interested.

Woody.

The Weringer Mines Co. has ordered a Hardinge mill, Dorr classifier, Oliver filter and several flotation machines for its 100-ton plant. A 150-hp. gasoline engine has been installed and preparations made to operate at greater depth. Massachusetts people are interested.

Happy Camp.

The Gray Eagle copper mine has been purchased by W. B. Thompson and associates of New York, and it is reported a reduction plant will probably be erected early in 1917. The mine is the largest developed property north of the Shasta field and contains fully 500,000 tons of ore. The ore is chalcopyrite, averaging 5% copper. The mine lies 7 miles from Happy Camp, and for years has been developed by the Dakin-Farish syndicate. It is considered the most important copper development in California since the Mammoth mine at Kennett started production.

Angels Camp.

The Angels Deep Mining Co., numbering 50 Angels Camp business men among its stockholders, has started work at the Pioneer mine. This property is on the same lode as the Gold Cliff, the premier producer of the district, and adjoins the Lindsay, recently purchased by the Utica Mining Co. Although opened only to a depth of 200 ft., the Pioneer has produced some rich ore and is highly regarded by local mining engineers. John C. Benson is superintendent.

Forbestown.

After a series of experiments extending over 18 months the Forbestown Con. Co. has demonstrated the efficiency of the flotation process. It is stated an extraction up to 98% has been secured. It is probable arrangements will be made at once for installation of a large plant, as the mines contain extensive reserves of good grade ore. The group comprises the Gold Bank, Shakespeare, Gold Queen and other noted gold yielders. M. J. Cooney is manager.

Redding.

The Mammoth Copper Co. has started work on its electrolytic zinc plant, which is to cost in the neighborhood of \$350,000. R. M. Hanley, former superintendent of the Bully Hill plant at Delamar, will have charge of the new smelter, which will embody a process developed by the Bully Hill engineers. The plant will enable the Mammoth Co. to advantageously treat its zinc ore besides turning to profitable account the solids deposited in the baghouse by furnace fumes.

Sonora.

The Pittsburg-Silver Peak Co. has unwatered the Rawhide mine to a point below the 1200 level, and is busily engaged in clearing the deepest workings. As soon as possible sinking of the shaft will be resumed. In the old levels some good ore has been intersected and good tonnage is indicated. The company plans extensive work in new territory in hopes of intersecting extensions of rich veins formerly worked.

The Excelsior mine near Sugar Pine was examined last week and will probably be reopened. The mine produced \$400,000 in pioneer days, although never operated to a greater depth than 225 ft. Some good ore is exposed.

Jamestown.

The North vein has been intersected in the Nyman Con. at a point 30 ft. from the 800 level of the Knox & Boyle shaft. Several feet of good quartz are exposed, of which 2 ft. assays \$50. From the main workings a good tonnage is being mined. The 10-stamp mill is crushing 30 tons of \$35 ore daily. Within a short time the shaft will be carried deeper and extensive lateral work prosecuted in new ground.

ment shaft on the Happy Year claim. It has entered the Happy Year basalt dike and while low values obtain at this point the dike will be crosscut before drifting is commenced. The Happy Year dike is 20 to 25 ft. wide and the management is confident that with development ore shoots along its course will be entered within the boundary lines of the War Eagle. The Happy Year shaft has attained a depth of 175 ft. and the work of sinking is planned to continue to the 500 level. On the War Eagle the company is prospecting the Amanda-Bogart dike by drift carried northwest from the 3rd level of the Darnell shaft. Pay values are reported and the prospects for a permanent shoot are encouraging.

At the Cresson Con. reserves have been increased 500,000 tons as noted in the report of Engineer L. S. Noble. The ore on hand on July 1, 1916, amounted to 189,282 tons, with an average gross value of \$31.84. Since that date development has added 17,170 tons to these reserves, with an average gross value of \$82.66. The reserves in the mine on Aug. 1, 1916, totaled 291,388 tons, with an average gross value of \$31.10. The net profit per ton on these reserves will be \$20.51, equivalent to \$4,130,318. Shipments from the Cresson mine during August, up to and including the 24th, were at the rate of 6300 tons a month. The proportion of ore from 1203 stope was 34.3%. The average grade of ore broken in the 1203 stope was \$33.33. Since the report of June 24, 12 new ore bodies have been opened by development. During July 809 tons of ore of an average value of \$24.85 were produced from development drifts. The principal addition to the ore reserves were from localities where at the time of Noble's previous report the development was not sufficient to permit of complete calculations and where subsequent work has increased former estimates and added important extensions to known bodies.

Telluride.

Good silver-lead-copper ore has been encountered on the Moody property by leasers. They sunk a shaft in a tunnel which had been run in 550. After getting down 6 ft. from the bottom of the tunnel near the breast they opened a big vein of shipping ore worth from \$35 to \$50. At the point opened the vein is said to be a fissure 12 ft. wide, with a big pay streak. The property is $4\frac{1}{2}$ miles from Vanadium on the wagon road, so that shipping will be an easy matter and not expensive.

The Metals Ore Co. announces its present prices for tungsten ores as follows: 1% ore, \$2 a ton; 1.25%, \$4.50; 1.50%, \$6; 1.75%, \$7.50; 2%, \$10.50; 3%, \$25; 4%, \$35; 5%, \$45; 6%, 55; 7%, \$65; 8%, \$75; 9%, \$85; 10%, \$95; 15%, \$150; 20%, \$200; 25%, \$250; 30%, \$300.

Ouray.

A flotation unit will be installed in the near future at the mill of the Wanakah Mining Co., which is under the management of J. T. Roberts, Jr. The smelter, which was formerly operated by this company, was sold to the Ouray Smelting & Refining Co., which is a reorganization of the Brown Mountain Smelting Co. No active steps for its operation, however, appear to have thus far been taken.

Leadville.

At the Allegheny property under lease to W. E. Bowden preparations for the resuming of operations are under way. Recently a new steam surface plant was installed and it is planned to replace it with a modern electric plant as soon as possible, following the completion of work now under way. A contract has been given for retimbering the shaft its entire depth of 400 ft. When this is finished, the shaft will be put down an additional 50 ft.

Leasing companies on the Ibex are producing 200 tons a day. It is being mined through the Garbutt and Ibex No. 3 shafts under the management of John Cortellini. The deposit is a porphyry cap carrying gold values averaging \$20 and is the largest body now open in the district. During the past 12 months it is reported that close to \$1,000,000 was extracted and the latest estimate of the remaining ore in sight gave 2,000,000 tons. Preparations for the erection of a concentrator have been under way for some time, and it is now stated that the plant will be built early this winter. The work of opening up and blocking out the ore body has been in progress for several months and plans for producing a

COLORADO.

Cripple Creek.

Crosscutting has been commenced by the War Eagle Con. on the 125 level. It is being done from the new 3-compartment

greater tonnage are nearing completion. A small fissure vein of rich gold and copper ore is also being mined through the Garbutt. The values received from this vein are high and the ore is being extracted at several levels. Bunches of tungsten continue to occur in the big stope, but owing to the low market now prevailing no effort is being made to save it.

Georgetown.

In the 180 level of the Onondaga a 10-in. vein of steel-grained galena has been encountered, which should be worth \$125 as broken. Four Leyner machine drills are on development. A new hoisting cable has been installed in No. 1 raise. This raise is going up 95 ft. to the 500-ft. point, when a contract for drifting 500 to 600 ft. will be let to reach a point directly over the No. 9 raise of the Capital Co.'s ground, but which is now controlled by the Onondaga Company. Guides and a cage will be installed in No. 1 raise if practical. If not, a cross head will be put in so as to make the hoisting of men in the bucket safe. Crosscutting in the Kane adit has now reached a point under the drill hole sunk from surface. Raising to tap the drill hole and remove the bit left therein and to secure ventilation has been commenced.

IDAHO.

Wallace.

The Interstate-Callahan Mining Co. declared on the 15th the regular quarterly dividend of \$1.50, or \$697,485, on the issued capitalization of 464,990 shares. This will make the payments for the current year \$2,092,455, and will increase the grand total to \$4,649,900, or \$10 a share, the par value of the stock, that has been paid since dividend disbursements were inaugurated on April 1, 1915. Now that there is assurance of the O. W. R. & N. building a branch line up Beaver creek, it is generally believed that the company will soon begin construction of its proposed 1200-ton concentrator at Enaville, where a site was purchased several months ago. Plans for the plant already are prepared, and it is anticipated that it will be completed and operating within the next year.

Because production at the Idora and Tuscumbia mines, in the Beaver creek district, has increased to a point beyond the facilities of the Idora mill operating 12 hours daily, arrangements are being made to work the plant two 10-hour shifts, according to Charles E. Mallette, secretary-manager of the Idora Mining Co., which owns the concentrator. "We probably should have begun working the mill longer hours some time ago, as both Ehrenberg & Nelson, who have a lease on the Tuscumbia mine, and the Idora Co. are producing more ore than we can store without going to considerable expense," said Mallette. "On the 11th we turned over the plant to the Tuscumbia leasers for 2 weeks to give them an opportunity to treat some of the ore they have ready for milling, and in the interval we will begin some new development at the Idora. The work planned will open on the No. 3 level the ore shoot in the western part of our ground that to date has been reached only by the No. 2 level and connected workings. Conditions indicate that this is the same shoot that is being developed by the Sunshine Co. in the Toughnut claim, within 100 ft. of our end line and about 70 below our No. 3 level. Supt. E. L. Latta of the Idora reports that the showing in the Toughnut is rapidly improving as they approach our lines, and he is confident that we can pick up this shoot under our No. 2 workings by extending the No. 3 level about 100 ft. He says also that there never before has been so much ore in sight in the Idora, and that he could put a force of 20 men to work mining if the mill was able to handle the output."

Information secured from reliable sources closely in touch with the management of the Nabob Mining Co., which owns the Nabob group on Pine creek, and recently secured a lease and bond on the Denver claim, adjoining, states that eastern investors are seeking to secure control of the stock of the Nabob, and that if the deal is consummated development of the property will be inaugurated on an extensive scale. The company now is capitalized for 1,500,000 shares at \$1 each, of which 250,000 still are in the treasury, but a meeting of the stockholders will be held Oct. 2 to increase the capital stock to 2,000,000 shares. If this is done the eastern syndicate will

take over the added capitalization and the treasury stock at a price said to be considerably in excess of the prevailing market price. Its representatives already have secured enough of the issued stock in the last few weeks to assure control if the capitalization is increased.

The option to purchase the Douglas mine, in the Pine creek region held by the Anaconda Copper Co., has been extended for 6 months. Development of the property is proving conditions that are satisfactory, and if urgent demand had been made the option would have been exercised on the original date of expiration, but certain elements in the situation made it advisable to request an extension, which was readily granted. There is no doubt but that the option will be exercised eventually, as the property is standing up to the estimates of the engineers.

Mullan.

Important strikes are reported in both the Morning mine of the Federal Co., and in the 1200-ft. level of the Hunter mine. The strike in the Morning was unexpected, the exposure evidently being a new vein, lying north of the Morning vein, encountered in an extension of the No. 6 tunnel. The shoot, about 20 ft. wide, is principally sulphide, and it is said that as high as 60% zinc has been shown by assays, but what the entire deposit will average has not been made public. Development is being rushed to prove the extent of the shoot.

The Hunter Co., after months of searching, has located the ore on the 1200-ft. level. The vein faulted on this level, and it was thought that the company would have to go deeper, but a continuation of the work through the fault finally located the ore, and in larger quantity and better grade than in the old portions of the mine. The company now has a model mine and mill plant.

LAKE SUPERIOR.

COPPER.

Houghton.

Michigan is now drifting on the Ogimah lode in the amygdaloid which, with a width of 7 ft., lies along the hanging-wall side in a high-grade shot copper stamp rock, after passing through a stretch that was not so good, but commercial. The rock is of a fine chocolate color and is softer than most of the amygdaloids. The drift was first carried along the longitudinal fissure which lies 5 ft. above the lode proper in fairly good ground giving indications of betterment. The western drift has two longitudinal fissures about 5 ft. apart and about 5 ft. wide, which are displaying the mass copper and stamp after passing through a narrow fault. The eastern drift is being carried up towards the 5th or next level, where a little work is also being done in drifting; all of this work is producing the usual good mass and stamp grades.

Isle Royale is now mining on the Portage lode, which is about 150 ft. west of the Isle Royale from the crosscut on the 31st level of No. 2 shaft, finding the ground to be of the average of the Isle Royale lode, mass of different sizes predominating.

Calumet & Hecla has begun to sink to the 17th level at No. 17 shaft on the Osceola amygdaloid in order to test the ground. This is the only sinking that is being done at either lode.

Wyandot is showing nearly 28 lbs. No work is being done on the 8th level, as two stopes have been opened on the 9th; one with a very good width across the lode and a good length along it—all of very good copper—and the other considerable less so far in extent but of equally high value. Drifting will be started on the 10th at once. The metal has been better in occurrence on each successive level.

Victoria new Nordberg double-skip hoisting engine, good for 5000 ft., is now running smoothly. From now on the tonnage will be gradually rising.

South Lake the week ending the 9th sent 900 tons of rock to the Franklin mill. The mine at the rate of about 130 to 140 tons daily pays expenses and at the rate of 200 tons, which it is expected to reach soon, will yield a very good profit. The Butler has a very fine stope now cut out to a width of

30 ft. across the lode and the limit has not yet been reached. No. 3 of the South lodes in its progress to the Lake boundary is meeting with quite uniform metal.

New Baltic's directors called an assessment the 15th of \$1, payable Oct. 14.

Hancock is getting a yield of 15 to 16 lbs. of copper. There were milled in August 20,183 tons, from which 306,000 lbs. were recovered. The yield from the Quincy shaft is about 18 lbs., and that from No. 2 has risen considerably lately. The management will soon have all the men that are necessary.

Franklin forwarded to the mill 23,000 tons last month, which is only a little below the rate of 1000 tons daily. Conditions are favorable for somewhat of an increase this month, the only drawback having been the want of men who are now appearing almost daily.

Negaunee.

A Sullivan hoist, which for the past 7 or 8 years has been doing service at the Queen mine of the Oliver Iron Mining Co., is being re-erected at the Sec. 16 mine. It is a duplicate of one now in operation at the Prince of Wales mine, which has been illustrated in the Mining & Engineering World. These hoists are single-drum Corliss plants, with link-motion reverse and steam-actuated brakes. They are of heavy-duty, frame type, and the engines have cylinders 26 ins. in diameter by 60-ins. stroke, twin-engines driving each hoist. The drums are 10 ft. long by 10 ft. in diameter, and are keyed to the shaft. Each drum accommodates two ropes for double-compartment hoisting. The hoisting speed of these plants is about 2500 ft. per minute and the load hoisted in each case is 8 tons of ore. Each hoist is equipped with a Sullivan automatic throttle closing mechanism and automatic brake to prevent overwinding, making it unnecessary for the engineer to close the throttles or apply the brakes in handling the hoists.

IRON.

Marquette.

Up to Sept. 1, the Marquette range shipped 2,469,708 tons, with 3 months of shipping remaining this season. This is a good increase over the movement for the same period of 1915. Most of the Ishpeming mines have cleaned up the ore that was in stock when navigation opened and there will be very little remaining. The Lake mine pile is about gone, and the Cliffs Shaft will have all its piles cleaned up soon. A shovel has been working day and night at the Cliffs the greater part of the past few weeks. Section 16 was late in getting started this year because the new crushing plant was not in condition, but the shovels are loading ore at a good rate now. Some ore has also been shipped from the pile at the old Hematite mine. North Lake has been a steady shipper all season, while some ore has been shipped from the Chase, at Dexter, which was abandoned in 1915. The Cascade district has four shippers this year: the Volunteer, Isabella, Richmond and Empire. The Richmond will send out in the neighborhood of 250,000 tons. This is the Isabella's second year shipping, but the tonnage will be quite satisfactory. The Empire was late in opening and will not be able to get out a great deal of ore. The Volunteer is working a large force of men and moving most of its ore. The Gwinn district is doing better than for several years. There was a heap of ore in stock there when shipping commenced and it will not be possible to move it all. The Republic and Ohio, the only two properties in the western part of the county that are being worked this season, are doing well. The operators of the Ohio recently gave orders to mine ore all winter. There are 100 men employed at the property at present. The Negaunee mine, the largest producer in the district, has sent a good tonnage, but the Maas has not been so fortunate. Some ore has been loaded from the Maas, but there will be considerable left in stock. The Rolling Mill, Cambria and Breitung properties, Negaunee, have been steady shippers all year, as has been the Queen.

Quinsec.

The McKenna property is to be explored by the St. Clair Co., and one diamond drill is already in operation. The lands are considered to be well located and favorable for mineral deposition.

MISSOURI-KANSAS.

Joplin, Mo.

Following the threatened railroad strike, with its depressing influence on the zinc ore market, came the proposed strike of the coal mines in the Pittsburg field. For several weeks the coal mine operators have been attempting to arrange a new wage scale but with indifferent results. The miners have been off from work for over 2 weeks, and practically all of the surplus coal available has already been shipped out and consumed. Those zinc mine operators who have a small supply have already begun using. The demand for fuel has already reached considerable proportions here. Coal companies are not promising delivery of coal, and are taking orders only subject to delivery at the option of the coal operator. There is no relief coming from gas companies, as they cannot even supply sufficient fuel for gas engine plants and the domestic consumption, hence there will be no possibility of utilizing gas in place of coal, nor is it going to be possible to substitute electric power for steam power, as not only does the Empire District Power Co. have its entire available output contracted, but it will be impossible in 6 months to a year's time to obtain deliveries on motors of the size necessary for milling plants. There has been some hope of a settlement of the wage dispute this coming week, but the reports coming have not all been optimistic on this score. Whatever action is taken this coming week will therefore be watched with intense interest by this district, as it will vitally affect, not only the possibility of production, but the future cost of coal, because of the rapid consumption of the surplus stocks.

It was anticipated that this week's ore production would naturally obtain better prices, partially upon account of the above conditions, but while there was some appreciable demand for medium and lower grades, there was not any vital increase in the prices paid, the base range running from \$40 to \$65 per ton, with very little ore being sold at either of the extremes. The bulk of all the ore sold brought from \$50 to \$60.

The Old Cherokee mine at Tuckahoe is under lease by a company made up of Alec Smith, John Schulte, L. P. Mahoney and associates. They pumped out the water which has been one of the principal reasons why the property has proven difficult of operation. The property at one time was well developed at the upper level and a very large production was made, but an attempt was made to work the lower levels, however, it was found impossible to hold water at 155. Since the water was pumped out the old ground has been re-timbered and sufficient ore is now in sight to warrant production by hand jig plant. The crush rock will be handled over a custom plant in that vicinity. It is this same group of men that opened up and developed the Captain "E" mine in the Thom's Station field.

McDonald & Belchic have a lease on 40 acres of the St. Paul Mining Co.'s land near Saginaw, on which three holes have been drilled showing 13 ft. of good silicate ore at a depth of 75 ft. Assays of the cuttings show that they will run better than 40%. In one hole at a depth of 20 to 50 ft. some dry bone has been discovered. More drilling will be done. Three shafts are already down and there has been considerable mining at shallow levels covering quite a period of time.

Galena, Kans.

The Empire Zinc Co. are sinking a large 3-compartment shaft north of Galena. The company is sinking the shaft to open up an ore deposit at the 280 level, which at this lower level is found in limestone. A considerable area has been drilled in the northern portion of Galena showing this formation, and at the Eureka mine, and also at the old Herald mine north and northeast of this point there has been some mining in this formation, also south of Galena at the old Hartford. At none of these three places were mining operations extensive, or at least not sufficient to demonstrate the feasibility of generally working this formation. This formation usually has a thickness of 40 to 70 ft. showing the zinc ore disseminated throughout that thickness of the limestone.

Sufficient work was done on the milling, however, showing that it is difficult to handle on the regular type of mill in this field.

The new concentrating plant of the Andrew Mining Co. on the Martin land north of Galena, is expected to start operation this week. The ground has been thoroughly tested with 18 drill holes, 15 of which are reported to have shown ore at 55 to 120 ft. Three shafts have been sunk and preparations are being made to obtain ore from all three of them. The mill is designed to handle 200 tons of ore per shift. Robt. Andrews of Joplin is general manager of the property.

The Murphy flume on Short creek, destroyed by the big flood of June 19, is being reconstructed, and is expected to be ready for operation this week. In addition to James Murphy the Missouri, Kansas & Texas railway is assisting in rebuilding the flume.

The Andayer Mining Co. has just completed its fifth drill hole on a 40-acre lease $3\frac{1}{2}$ miles southwest of Galena. This prospect showed a 9-ft. face of good lead and jack at the 90-ft. level. A new shaft is being sunk which has already reached the ore, although it is not sunk entirely through it. The company has purchased the old New Market mill and has moved it to the present location. This company will be ready for production within another fortnight.

Miami, Okla.

S. Y. and A. H. Ramage have purchased a half interest in a tract of 200 acres southeast of Picher, Okla., and acquired a lease on additional tracts in the same vicinity. The Ramages contemplate drilling 10,000 ft. of prospect holes in order to test the holdings.

Aurora, Mo.

The Scottish Mining Co. is erecting a new 150-ton mill. This company has thoroughly drilled out the 40-acre tract known as the old Sherwood, and has proved up what is believed to be a very good body of ore.

MONTANA.

Helena.

Ore carrying native copper, as well as good values in silver and lead, has been broken into at a depth of 60 ft. in the shaft of the Looby group in Grass Valley, under lease and bond to the Cruse Con. Mining Co. The strike is considered the most important ever made in the history of Helena mining district. In addition to the native copper, bunches of cobaltite ore were also found. A general sample of the ore taken a few days ago, before the copper strike was made, assayed \$59.35 in lead and silver.

The estimated value of bullion produced in August from 1713 tons of ore from the North Moccasin of the Barnes-King was \$15,000. There was no improvement in the bottom workings, where the vein has been narrow and of low grade for several weeks, but the showing in the upper workings is somewhat better than a month ago. The amount of ore worked in the mill of the Piegan-Gloster was 1798 tons, including about 1300 tons from the Shannon, and the bullion yield was about \$18,000. This, however, included the product of 700 tons of Gloster ore worked, but not cleaned up, in June. The winze from the 500 level of the Gloster was unwatered, and it was found that 498 ft. of drifting had been done from the bottom, which is 300 ft. below the 500 level. These workings will be thoroughly sampled, but appearances do not justify the belief that much pay ore can be expected there. The 400 west drift was driven 141 ft. during the month, and for the last 30 ft. the ore assayed \$8 for a width of $4\frac{1}{2}$ ft. The rope tramway at the Shannon is working smoothly, and a good production from the mine may now be expected. The road from the Woodrow Wilson mine to the county road, a distance of 3 miles, was finished, and hauling of ore commenced Sept. 1.

Butte.

Thomas F. Cole of Duluth, president of the North Butte Mining Co. and at the head of the Rainbow Development Co., which is developing the property of the Butte & London Co. in addition to the Rainbow group, is in Butte on an inspection

of his interests. Mr. Cole expressed himself to friends as well satisfied with the progress of development work and the showing of the ore bodies at the North Butte, following his conference with Supt. Norman Braley.

Work will start at the Butte-Duluth property this week, determination of the exact date awaiting the arrival of H. A. Frank. For 2 weeks men have been employed at the mine, their services having been retained in order to comply with the provisions of the lease. As soon as possible the plant will be put in shape preparatory to handling a large quantity of ore. The plant and mine will be placed in operation before changes in the capacity of the plant will be made. In compliance with the lease the plant will be increased to daily capacity of 500 tons. The Butte-Duluth has been idle for more than a year since it was thrown into the hands of Receiver Charles M. Everett on petition in district court of the Provident Securities Co., who held bonds on which interest payments had defaulted. The negotiation of the lease opens up a way for revival of mining in that district and much satisfaction is expressed in mining circles that one of the principal properties of the East Butte district is again to be worked.

An excellent showing, which it is believed gives indication of development into a silver property of merit, has been disclosed on the Black lease, in the southern part of the city, just east of the Emma property. Lessees, sinking on the claim which lies just east of Main street below Silver, encountered the lead scarcely more than 25 ft. below the surface and the vein uncovered has been pronounced a very promising prospect, a number of tons of ore already having been extracted. The belief prevails among Butte mining men that a good silver property will be developed.

Superior.

At a meeting of the directors of the Intermountain Mining Co., held in Spokane last week, a dividend of $\frac{1}{2}$ ct. a share, or \$8000, was declared, payable Oct. 20 to stockholders of record Oct. 10. This is the first dividend paid by the corporation, and no announcement has been made relative to future disbursements. The Intermountain Co. is composed of Spokane and Coeur d'Alene men, and it was organized over a year ago to take over and operate the old Amador mine. The property had been idle for several years, and the undergrounds were flooded. The workings have been unwatered, a 100-ton daily capacity mill has been constructed, and the railway to Iron Mountain has been repaired and placed in operation. The output of the mine is being shipped to the British Columbia Copper Co.'s smelter at Greenwood, under a very favorable contract.

Iron Mountain.

The Intermountain Mining Co., after paying its initial dividend of $\frac{1}{2}$ ct. a share, declared Sept. 9, payable Oct. 20 to stockholders of record Oct. 10, will have a surplus of approximately \$15,000, including the earnings for September, according to the official report of the management. Steady production has been inaugurated at the property, and regular shipments now are being forwarded to the British Columbia Copper Co.'s smelter at Greenwood, B. C. The financial report that has just been submitted to stockholders is a remarkable showing, considering the conditions that the management has had to face since the company took over the mine and the success achieved places the property in the first rank of those old northwestern holdings that have demonstrated their ability to "come back."

NEVADA.

Ely.

A contract was signed last week for remodeling the Giroux Con. concentrator, near Kimberly. It will be equipped with Callow flotation machines and is expected to be ready for operation within 90 days. The plant will have a daily capacity of 500 tons and tests indicate a high copper recovery. Water for the plant will be pumped from the old Giroux shaft where a good supply is available. Work has been resumed at the Morris shaft which will be unwatered and sunk 250 ft. deeper and levels extended to open the ore bodies.

Ore will be mined by the caving system. G. N. P. Dougall is superintendent.

Additional equipment is being added to the plant of the Nevada Con. with a view to increasing the capacity from its present 12,000 tons daily to 16,000 tons. The product going to the smelter averages about 2%. From the surface workings of the Ruth mine some 5% ore is being shipped.

Goldfield.

Pending installation of additional thickeners and filters the use of flotation has been temporarily discontinued at the Goldfield Con. mill. Minor changes in the plant will also be made to meet changing ore conditions. It is expected the plant will resume within 60 to 90 days. Meanwhile the company will revert to the cyanide process. It is stated the success of the process, however, has been established.

The west crosscut from the 1750 level of the Atlanta has entered the main Consolidated vein and prospecting is proceeding to seek the shoot formerly worked on the 1500 level of the adjoining Grizzly Bear property. Work is advancing in quartz yielding encouraging assays in gold, silver and copper.

Goldfield Merger has started a southerly crosscut from the 900 raise above the 1260 level to seek the extension of a rich ore body worked in the adjoining Grizzly Bear. The latite formation at this point will also be thoroughly prospected and endeavors made to open seams of rich ore exposed in connecting the Grizzly Bear and Merger workings. This work is being carried on by way of the Grizzly Bear shaft. The extensive work in the vicinity of Jumbo Extension has proven fruitless.

Eureka.

This old camp is evincing much activity and the Eureka Mining Bureau has been formed to aid prospective investors. California gulch is the main center of activity, and several mines at this point are shipping. The ore is largely silver, with some lead and gold. Lessees are shipping ore from the California that ranges from \$10 to \$50, the deposits occurring near the rhyolite, an unusual thing in this district.

On the Connolly, controlled by New York capitalists, a shaft is being sunk, a headframe erected, and surface buildings constructed. Good ore is being sent out by lessees. Company work is in charge of Major H. G. Catlin. The Mortimer, Marne, Huebner and several other claims are undergoing development and good ore is showing at numerous points.

Tonopah.

Unwatering of the Great Western mine has been accomplished after 3 months of steady work and as soon as the new pumps are in position the shaft will be sent 300 ft. deeper. From the 1500 level crosscutting will start shortly to thoroughly prospect the rich stringers encountered before water drove the miners out.

The Belmont Co. has acquired the 12 claims comprising the property of the Tonopah Panama Pacific Co., lying east of the East End group. This territory is a short distance from the Halifax mine, where good ore is being developed at a depth of 1300 ft.

Searchlight.

A monthly gold output of \$100,000 is maintained by companies operating in El Dorado canyon, and the outlook is favorable for a marked increase within the next 12 months. Six companies are producing, and several others are prosecuting developments. Plans are being perfected to list several companies on the San Francisco stock exchange.

Rand.

The late strike of the Queen Regent Merger Mines Co. on the 2nd level, 460 ft. from the shaft, of a cross vein 8 ft. thick, has aroused a great deal of interest in the camp. The ore differs from any heretofore discovered in the district, as it carries in addition to the gold and silver values, 7 to 8% copper, and about 8% lead. About one-third of the vein runs from \$60 to \$70, the balance being an excellent grade mill ore. Wm. P. Miller, the consulting engineer of the company, states that the character of the ore is the best evidence so far disclosed in the camp as indicating permanency and depth of ore bodies. This is the fourth vein opened in the mine, and is the only one showing excellent values in copper

and lead. To determine if the veins go to depth the shaft is being sunk to the fourth level, where drifts will be run. At the annual meeting of stockholders recently held the former board of directors was unanimously re-elected with J. E. Kerr of San Francisco, as general manager.

The Last Hope mine adjoining the Queen Regent on the west, has been incorporated under the name of Nevada Rand Mines Co., for \$100,000 with 1,000,000 shares of a par value of 10 cts., with 400,000 shares in the treasury, the balance having been paid for the purchase of the property. Charles Huber, president; Charles Koegel, vice-president and superintendent, and C. R. Murdoch, secretary. These with J. J. Turney of Philadelphia and W. B. Rudderow of Palmyra, N. J., are directors. The company owns 70 acres without indebtedness. Prior to incorporation more than \$30,000 worth of high-grade ore was shipped from the mine, and it is estimated that upwards of \$200,000 has already been developed. The mine is well equipped with machinery and it is reported that the shaft will be carried to the 600 level, with lateral development work at each level, the shaft having already been sunk 250 ft.

The Lappatt mine has lately shipped 6 carloads of excellent ore and the owner states the mine is developing in a satisfactory way that will permit regular shipments to continue.

Winnemucca.

The Craven Copper Co. has started work at its property, 35 miles northwest of Winnemucca, and plans to start shipments within a few weeks. A good tonnage of 7% ore is exposed. P. H. Craven, of McGill, is president and general manager.

NEW MEXICO.

Elizabethtown.

Payora Mining & Milling Co., controlled by J. G. Schnell, Pueblo, Colo., president, and A. T. McIntyre, manager, and their associates, has opened a 4-ft. vein of ore in quartzite. The ore consists of copper sulphide, assays of which show 17% copper, 10 ozs. silver, and from 0.3 oz. to 1.2 ozs. gold, these metals being in a quartz gangue. The company has a 20-ton Huntington mill and Wilfley tables, on which a test



PORTAL OF CROSSCUT ON PAYORA PROPERTY.

run of average ore was made. The result showed a recovery of metals worth \$47.70 per ton. The vein was opened by a 190-ft. crosscut, giving a depth on vein of 110 ft. Plans contemplate driving a deeper tunnel at a point 1000 ft. farther down mountain slope, whereby the vein will be intersected at 700 ft. depth, by driving 1000 ft.

Lordsburg.

This district is quite busy, the silicious ores being in good demand at the smelters. The 85 is working full shifts in an

effort to ship 15,000 tons of ore this month to meet the requirements of the smelters. The shipments will be proportioned between the El Paso and the Douglas smelters; the freight rates being about the same on shipments going either way. All arrangements are completed for the installation of the new Atlas Deisel engine which is expected in a few days. It will be the second unit of 450 h. p. installed at this property. Construction will shortly begin upon a 40-room hotel at the camp.

The Bonney is working full shifts on Shafts No. 1 and 2. In No. 1 shaft a drift is being run in ore on the 220-ft. level to undercut a good showing of red oxide ore that was cut on the 175-ft. level; the ore body here being 3 ft. of red oxide carrying high values in gold, silver and copper, within a vein of lower grade that shows a face of 7 ft. from the foot wall; no hanging wall having as yet been encountered. Two carloads of ore secured during development will be shipped this week. On shaft No. 2 good ore has also been found at the 300-ft. level; a drift has been started to undercut this ore body. A full force is working unwatering shaft No. 3. When completed, drifting will be started both ways from the shaft upon a deposit of rich sulphides known to exist upon the 400-ft. level. A new strike of sulphides ore assaying from \$70 to \$90 has been struck on the East end of the Lone claim, one of the Bonney group, on ground leased by M. Alercon.

Development on the Weldon property, which adjoins the Bonney on the north, has reached a depth of 75 ft. A strike was recently made of some high-grade copper sulphides carrying good gold and silver values. A lease has just been closed on the claim by H. H. Wells of Lordsburg, who is preparing for considerable development.

J. Robinson, who has a lease on the Manilla group, which joins the Bonney on the east, will ship a car of ore this week.

Mogollon.

At the Johnson mine, purchased from The Oaks Co. by Socorro Mining & Milling Co., some time past, the new shaft has reached a depth of 200 ft. and had good ore most of way down. Thus far there has been no trouble from water.

Sinking of shaft below 500 level has been started at Pacific mine and it is the intention to continue to the 600 with allowance for ore pockets and sump. Drifting is being conducted on several levels. Leyner machines are used, the compressor operated by electricity from plant of the Socorro Co.

A raise started from tunnel level on Clifton mine by The Oaks Co. the past week encountered a good grade of mill ore. Other development headings on both the Clifton and Eberle are also yielding pay rock.

Louis Cramas, owner of Gold Eagle group, is about to resume operations. Some 400 ft. of tunnels and 80 ft. of shafting has been done, a large part of which was in ore, and the last few shipments to custom mill indicated a value of \$14 to \$16 per ton.

Socorro Mining & Milling Co. shipped approximately 70,000 ozs. bullion from operations in August and the Mogollon Mines Co.'s output for period was over 50,000 ozs., a total of more than 3½ tons of gold and silver for the month, in addition to several tons high-grade concentrates. From a portion of this district 3 miles wide by 5 long more gold and silver is being regularly produced than in all the balance of New Mexico combined.

Leidendorf.

Randell and Crocker, leasing on the Nelly Bly, are shipping an average of a carload a week, principally copper sulphides with some bornite, all of their shipments being from above the 60-ft. level.

OREGON.

Sumpter.

Four carloads of wood pipe are now at the Congar mine and will be used in constructing a water supply line for the mill. It will run from Granite creek to the mill.

The Virginia mine is being operated by Able and Petty

and they are now hauling the ore to their stamp mill near the Greenhorn.

Greenhorn.

Bishop, Calif., interests are examining S. C. Richardson molybdenite property and also a chrome property located this summer.

Larsen and Dixon are fixing up their lately discovered gold property on Olive creek. They have a shaft house and hoist ready. The shaft is partly timbered so that work can proceed during the winter months without interruption.

The Psyche ore is being hauled to the Blackhawk mill for treatment.

SOUTH DAKOTA.

Lead.

With a 300-ton cyanide mill on the ground development with 6 men has progressed during the past 6 months so that Harry Griffith and associates see it possible to profitably operate the Bismark mine. The possibility of treating low grade ore at a profit was demonstrated during the time that Fred Hitchings was in charge of the operations. They know the quality of ore that must be uncovered and it is understood their prospecting has brought them in contact with a considerable quantity of rock that is known to be of commercial value. The 300-ton mill is in good condition and with a small amount of repairs, will be ready for use.

Custer City.

The 12-ft. vein of gold ore is now well opened at the Grimshaw property on Elk creek. This vein of gold bearing ore has been opened by a shaft 135 ft. deep and has been drifted on for 500 or 600 ft. Besides these, which are the principal workings, the vein has been exposed in a number of other short tunnels and pits, and wherever exposed the ore taken from it and from its cappings have assayed well. Many samples have been taken from the shaft and tunnel which have gone \$12. After the last samples which have been taken are assayed and the returns received preparation will be made for the resumption of development. It will be continued in until the vein has been opened up at depth, and followed along the course of it in the main tunnel. The vein also carries values in copper. Some fine rock has been taken from it, that will go at least 2% copper. For the present the attention of the owners will be directed to further developing the gold possibilities. The vein is on the strike of the Clover Leaf vein, which has produced so much very rich ore.

UTAH.

Alta.

Open cut work for starting a new tunnel at the Wasatch is nearly complete. When driving underground has started, 2 machines will be employed in the heading and two shifts employed and perhaps three shifts will be put to work. With two shifts the tunnel will be advanced at a rate of between 325 and 350 ft. per month. The long open cut, which is about 12 ft. wide, will be covered to protect it from snowstorms. All of the buildings that house the machinery have been completed. The tunnel is to be 7 by 9 ft. in the clear, and it will be more than 400 ft. long. The portal is located at the extreme southwestern portion of the company's holdings. A large ditch will be cut on one side of the tunnel to take care of the water, as it is expected that a considerable flow will be encountered. The bore will give an additional depth of 300 ft. below the 400 level and will make available the ore bodies in the bottoms of the old stopes. These stopes were mined down to the level of the Columbus tunnel, and it is believed that all territory in that vicinity will be drained by the new tunnel.

American Fork.

After nearly 7 years of idleness a contract for 500 ft. of tunnel at the Mineral Flat Co.'s property has been let. The main tunnel is in a distance of 2100 ft. The first 150 ft. was driven through the side rock, the next 300 ft. through limestone shale lying above the quartzite, after which the tunnel

penetrated the limestone formation proper. The limestone dips away from the direction in which the tunnel is being driven and the middle member of the series is a gray soluble limestone, in which the ore occurs. The objective of the tunnel is to cut the middle member where it is intersected by one of the main ore-bearing fissures. This fissure strikes northeasterly and dips northwest. There are four porphyry dikes traversing the property parallel to fissures. The ore croppings on the surface where the fissures are exposed consist of iron, with lead and silver scattered through the mass. The company owns its power plant, connected with 4000 ft. of 10-in. water line and a 4-in. air line in the tunnel. The plant develops sufficient power to run 6 drills. The company has leased the plant to the Red Cloud Co., which is putting the plant in repair and will furnish Mineral Flat air.

At 1500 ft. from the portal a crosscut to the east has been started to explore the overthrust contact, known as the Cardiff. At 1200 ft. from the portal a crosscut was started west to get under the Brockbank tunnel, now in 600 ft. It will be tapped by a raise 187 ft. in height, which will drain it and make possible exploration of ore stringers that have been cut. The west crosscut will be driven ahead to cut the west limestone-quartzite contact. The Brockbank tunnel will also be continued to explore the system of fissures traversing the area.

Beaver.

The Croff Mining Co. has let a contract for sinking the shaft an additional 100 ft. The ore body was struck in a crosscut from the shaft driven from the 155 level. The fissure in which the ore was opened was first encountered in the Lucky Boy shaft, at the 55 level. At that level it was 2½ ft. wide. When it was opened on the 155 level and crosscut it proved to be 9 ft. wide. This increase in width in an additional depth of 100 ft. indicates the strength of the fissure, and it is expected that it will be found quite as wide when it has been opened at the 255 level.

At the Leonora a 6-in. vein of copper-silver has been encountered. The strike was made in the face of the drift being driven on the east-west fissure. The showing is being followed to the east. Work has been done on the property in the past few months for prospecting the contact between the monzonite and limestone. This contact was cut in driving along the north-south fissure which intersects it. In driving along the north-south fissure miners encountered its intersection with the east-west fissure and a showing of ore was developed. The work of driving to the contact was continued, and when it was reached considerable work was done along it, both to the east and west of where it is intersected by the north-south fissure. Recently Superintendent Nebeker started miners driving east along the east-west fissure, which has resulted in striking ore. This has been cut at a depth of 325 ft. One promising indication is the prevalence of quartz that is increasing in the fissure as the work is pushed forward. The ore showing has been improving and Nebeker is of the opinion that ore in commercial quantities will be opened when a more favorable limestone formation is reached.

Fortuna.

A well defined dike has been under development for the past 2 months by the Independence Gold Mines Co. The results have shown that there is gold values that were not expected. It is the intention of the company to put down a shaft close to the dike and crosscut to prospect it. It has been traced for a distance of 4500 ft. and for 6 to 20 ft. on the ledge good values are shown. For 200 ft. from 6 to 8 ft. of vein matter can be shown that carries \$6 to \$8 gold. The shaft now being put down is by hand, but it is the intention to shortly put in machinery. On the Paymal property some high-grade ore has been found recently and one sample, which was picked, showed 85 ozs. gold, although the entire face in the tunnel shows 6 ft. of \$50 ore.

Park City.

The 750-ton plant of the Big Four Exploration Co., for treating tailings, has been completed. It has reached a capacity of 400 tons and will increase until it has reached its rated capacity. About Sept. 20 it should have reached its capacity and then the management announces that it will be earning net profits at the rate of \$30,000 a month. Additional

flotation equipment will be installed soon and the capacity will be raised to 100 tons. On this operation the Big Four officials announce that profits will be at the rate of \$40,000 a month. The Big Four blocked out the tailings and had them carefully sampled before starting mill construction. It has been demonstrated that the tailings deposit is 3½ miles in length and 600 ft. wide on the average. The average depth is 5 ft. and all this has been sampled from the grass roots to 18 ft. below surface. It will be the policy of the company to make quarterly disbursements to stockholders. A surplus will be built up that will give the company ample capital to engage in other mining enterprises.

According to President W. R. Elliott the fissure being followed below the 500 level in the Three Kings property is widening out and the vein matter is containing more mineralization. The winze is down 70 ft. below the level on the No. 1 fissure and has broadened out from 18 ins. to the full width of the winze. The shaft at the property was started on the Park City formation. This has continued all the way down, and where the present work is being carried on it has a depth of 750 ft. in the formation. As a usual thing the ore bodies are found on the contact between the Park City formation and the quartzite and this varies from 750 to 850 ft. The winze being sunk on the No. 1 fissure, encountered in running a drift on the 500 level, is being put down to cut through this formation to the contact. A little air hoist has been installed at the winze and is giving satisfaction. Thus far the work has been through a series of lime beddings. Thus far the mineralization in the vein has been increasing. In the vein is found a well mineralized lime and quartz, which contains from 8 to 9 ozs. silver.

WASHINGTON.

Spokane.

The influence that the establishment of automobile stage and freight lines into the regions surrounding Spokane is having on the mining industry is indicated by the fact that the Columbia Copper Co., whose holdings are near Turk, is shipping its product to Spokane by one of the auto-transportation companies, the ore being delivered here to the Great Northern railway for delivery to the Canadian Con. smelter at Trail. The ore is transported by teams and automobiles to Davenport, where it is turned over to the Spokane-Davenport Auto-stage Co. for delivery at the railway in Spokane. The cost of hauling from the mine to Davenport is \$8 the ton, and the stage rate from Davenport to Spokane is \$2.80. Regular consignments are arriving daily in Spokane, and the management of the mining company states that the freight charges are materially less by auto stage from Davenport than by the Northern Pacific railway.

The Gem Mining Co. has been incorporated in Spokane to develop the Stepstone group of eight claims 10 miles north of Nespelen on the Colville reservation. The incorporators are: Walter L. Jones, president; Otto H. Gerboth, vice-president, and Grant J. Bowman, secretary-treasurer. The capital stock consists of 1,500,000 shares at 10 cts. each, of which one-half will go into the treasury. "On one property a tunnel was run 20 ft. and crosscut a stringer of zinc and galena that ran from \$25 to \$50," said Mr. Bowman. "Another tunnel about 80 ft. lower on the hill was driven with the expectation of striking the same stringer at a lower depth. Before the stringer was reached a solid body of iron ore was encountered. In this are gold, silver and nickel in small values. On another claim the shaft is down 80 ft. and it is said there is a foot of nickel here and 14 ft. of lower grade matter containing nickel and cobalt. We intend to put men at work at once."

WISCONSIN-ILLINOIS.

Highland.

Shipments of carbonate zinc ore are beginning to come from new producers, the Saxe-Lampe shipping its initial car,

30 tons, to Mineral Point; Simmons-Richter Co. to Sandoval Zinc Co., 1 car, 26 tons; New Jersey Zinc Co. to Mineral Point, 3 cars, 75 tons. Another new outfit is going into commission for the New Jersey Zinc Co. and shipments are being arranged from the Red Jacket mine, idle several years.

Linden.

Improved tone was shown here last week on shipments, the Linden Zinc Co. shipping 1 car high-grade, 40 tons, to Lanyon Zinc Co.; Milwaukee-Linden Development Co. to Cuba, 42 tons; Optimo No. 3 to Linden Zinc Refinery Co., 4 cars, 143 tons; Stoner Mining Co. to Mineral Point, 30 tons; Ross Bros. Co. to Mineral Point, 30 tons; Linden Development Co. to Cuba, 40 tons; Saxe-Pollard Co. to H. Lewis for Eagle-Picher Lead Co., 32 tons. The reserve is estimated in excess of 2000 tons concentrates. Numerous strikes have been made recently, one on the Vial land adjoining the Ross mine, showing 8 ft. of milling area, up and down. A new company is being organized on this property.

Cuba.

Receipts of ore at the National Refinery were 18 cars last week. Shipments were light on finished product, 1 car going to Illinois Zinc Co., 40 tons, and 4 cars to Granby Con., 163 tons.

Platteville.

Reports for the field for week of Sept. 16 show shipments of 167 cars of zinc ore from mines and separating plants for a total of 6831 tons. Only 1 car of lead ore cleared, 56,000 lbs.; iron pyrites from separating plants, 570 tons. The gross recovery mine run ore for the week totaled 5800 tons crude ore; net to smelters, 2798 tons. The Mineral Point Zinc Co. shipped 12 cars refinery ore to smelter at DePue, 490 tons. Prices for zinc ore remained stagnant, standard 60% ore and top grades going on a base of \$56, with the range down to \$50 for medium and second.

Local conditions in the Platteville district showed improvement; Klar-Piquette, Mann & Harding, East End, Hodge, Star and Block House Mining companies shipping a total last week of 15 cars, 711 tons. The Klar-Piquette mine, after years of successful operations and the payment of \$200,000 in dividends, is pulling up pumps and will abandon the mine. Low prices and low-grade production is offered as the cause of this suspension.

Montfort.

The O. P. David mine shipped 3 cars of zinc ore last week, 1 to LaSalle, 40 tons, and 2 cars to Sandoval Zinc Co., 89 tons. Production is being increased from new ground showing heavy deposits of much improved quality.

Potosi.

The Wilson mine was included among shippers last week, shipping 1 car concentrates, 60% zinc, to LaSalle.

Hazel Green.

Old producers alone reported last week. Kennedy to Mineral Point, 5 cars, 200 tons; Cleveland mine to Cuba, 2 cars, 80 tons; Lawrence mine to Wisconsin Zinc Co.'s refineries, 3 cars, 122 tons. Monmouth Zinc Co. is installing the heaviest pump equipment yet supplied to any of the mines of this field. Production is maintained and several hundred tons of ore have accumulated in bin.

Benton.

Reports for week of Sept. 16 show shipments to have reached the highest point ever recorded for the district, 80 cars of mine run ore reaching track for a total of 6,800,000 lbs. Not all the shippers were accounted, for a scarcity of cars prevented others from getting to track, while several cars were in process of loading, which did not clear in time to be included in the figures given. Vinegar Hill Co. turned in 12 cars to Cuba; New Jersey Zinc Co. to Mineral Point, 15 cars; Frontier Mines Co., 10 cars; Champion of the Wisconsin Zinc Co., single-handed, 12 cars, 557 tons; Grand View, a new producer, shipped 3 cars to Cuba, 118 tons; Sally Mining Co., another new producer, 3 cars to Galena, 131 tons; Wisconsin Zinc Co., Skinner refining plant, all high-grade ore, 14 cars, 550 tons; Fields Mining & Milling Co. to separators at Galena, 4 cars, 190 tons; the Wilkinson Mining Co., a new producer, 3 cars to Mineral Point, 120 tons. Extensive developments are under way for the Frontier Mining Co. on the Hird mine, fully equipped and being placed in

shape for heavy production. Drills checking up the ranges on other allotments have been rewarded with phenomenal strikes and heavy turnin of zinc ore is assured for a dozen years to come. On the Grotkin land a new shaft is in ore and a new plant will be provided. In the New Diggings camp production is under way on new ore for the Wisconsin Zinc Co. in the C. A. Thompson mine. Other producers are coming to the front. The Vinegar Hill Co. has begun the construction of a new 200-ton plant on the Meloy land, drilled out extensively with great results.

Shullsburg.

The Oliver Mining Co. makes its initial shipment, 3 cars to Edgar Zinc Co., 122 tons. The surface equipment includes everything essential to a Wisconsin low-grade producer. An independent unit refines ore as quickly as delivered from the concentrator. The Winskill mine delivered 5 cars last week to Galena, 214 tons.

Galena.

Black-Jack shipped 4 cars last week, 150 tons; Galena Refining Co., 3 cars high-grade, 122 tons; Birkbeck, a new producer, made shipment of 1 car, 40 tons; Federal mine, another Wisconsin Zinc Co. producer, 3 cars, 120 tons; Day Mining Co., a new one, to Cuba, 40 tons; North Unity to Cuba, 3 cars, 131 tons; Wisconsin Zinc Co. to LaSalle, 2 cars, top-grade, 73 tons.

Miffin.

Peacock Mining Co. is shipping again. The Cokers shipped 8 cars to Mineral Point, 337 tons. Other local producers were not reported, low-grade ores being in poor demand. The reserve in this district is estimated at 1800 tons.

WYOMING.

Cheyenne.

The assets of the United Smelters & Railway Co., which was formerly the Penn-Wyoming Copper Co., will be sold on Sept. 21. The total amount of claims is \$2,376,750 and bonds of subsidiary companies will be sold as follows: \$518,500 Saratoga & Encampment Ry., \$500,000 Encampment Smelting Co., \$100,000 Encampment Pipe Line Ditch Co., \$50,000 Emerson Electric Light Co., \$350,000 Encampment Tramway Co., \$50,000 Encampment Waterworks Co., \$8000 Encampment Land & Town Lot Co., \$750,000 Battle Lake Tunnel Site Mining Co., \$1,000,000 Haggarty Copper Mining Co., \$20,000 Carbondale Coal Co. and \$22,000 North American Mercantile Co.

CANADA.

BRITISH COLUMBIA.

Silverton.

The most important strike ever made in the Standard Silver-Lead Mining Co. operating the Standard mine and mill, was encountered last week in the Alpha claim. "It is the finest ore showing of the kind I have ever seen," said Martin Welch, one of the owners of the Echo mine, adjoining the Standard, who inspected the property soon after the strike was made. "The showing is in the upper Alpha tunnel, and the face shows 9 ft. of solid galena that averages 75% lead and 200 ozs. in silver, the high silver values being due to the presence also of grey copper in the ore. The extent of the deposit has not been determined as neither wall has been reached. Another tunnel on the Alpha, about 100 ft. lower, has tapped this same ledge, but it will have to be driven between 70 and 80 ft. to get under the new showing. About half of the face of the tunnel is in ore of the same character and value. These workings are in the upper portion of the Alpha claim, which adjoins the Echo, now owned by the Echo Mining Co., in which E. F. Burns, John Jordan, Jack Thompson and myself are the controlling factors. We opened the ledge by a tunnel starting on the Alpha claim which is on nearly the same level as the upper tunnel recently driven by the Standard. It shows a long shoot of good concentrating ore with some ore of shipping grade mixed through it and appears to have explored the vein just above the apex

of the ore shoot found by the Standard, whose workings are now within 30 ft. of our line in their upper tunnel. The lower tunnel is being driven by them and us jointly and is about 100 ft. from our line. A little further down the hill than the new workings the former owners of the Alpha took out ore to the value of \$140,000 from a small glory hole several years ago. The ore body proved to be isolated and not in place. It is evident that it had broken away from a ledge higher up the hill, but they never made any effort to locate the vein. There is absolutely no doubt in my mind that the new workings of the Standard and ourselves are on the ledge from which this ore body broke away. The ore in the new workings is of the same character as came from the old glory hole, which was notable at that time for its high silver values and remarkable showing of grey copper."

The directors on Sept. 15th declared the regular monthly dividend of $2\frac{1}{2}$ cts. a share, or \$50,000, on the issued capitalization of 2,000,000 shares, payable Oct. 10 to stockholders of record Oct. 1. This will make the 1916 disbursements \$500,000, and will increase the total payments to \$2,300,000, or \$1.15 a share, 15 cts. a share more than the par value.

Trail.

During the last week of August 15,134 tons were shipped to the smelter here. This is nearly 50% larger than during any previous week. The total for the month was 47,620 tons. Mines which made their initial shipments this year during the last quarter of August were: Burton, East Kootenai, 20 tons; Quantrel, East Kootenai, 17 tons; Vancouver, Salmo, 23 tons; Lucky Jim, Bear Lake, 75 tons; Panama, Bear Lake, 29 tons, and Silver King, Nelson, 3 tons. The Vancouver group is a free-gold property adjoining the Queen mine in the Sheep Creek district. The Panama is situated in the dry ore belt above Bear lake, which is the source of Kaslo creek, and is owned by A. Giegerich. It has been an occasional shipper in the past, and its product is high grade silver. The Lucky Jim shipment was doubtless made to Trail because of the expiration of its contract with eastern smelters in United States pending the obtaining of new smelter contracts, in connection with which Receiver A. G. Larson is now in the east.

The following table shows the deliveries of ore at Trail during the last week of August and during the entire month by those mines or companies which have a special interest to Spokane people by reason of their control or ownership being wholly or largely held here: Center Star, Rossland, 5016; Le Roi, Rossland, 3808; Le Roi No. 2, Rossland, 483; Sullivan, East Kootenai, 2603; St. Eugene, East Kootenai, 96; Giant, East Kootenai, 20; Burton, East Kootenai, 20; Quantrel, East Kootenai, 17; Emerald, Salmo, 148; Vancouver, Salmo, 23; Enterprise, Slocan, 34; Galena Farm, Silverton, 76; Standard, Silverton, 248; Slocan Star, Sandon, 33; Rambler-Cariboo, Slocan, 79; Idaho-Alamo, Slocan, 41; Gallagher, Ainsworth, 20; Highland, Ainsworth, 224; Florence, Ainsworth, 3; Electric Point, Boundary, Wash., 357; United Copper, Chewelah, Wash., 225; Keystone, Bayview, Idaho, 68; Panama, Bear Lake, 29; Lucky Jim, Bear Lake, 75; Silver King, Nelson, 3; other mines, 385.

Slocan.

W. T. McCurry on returning from this district says: "A strike of more than ordinary importance has just been made in the No. 1 group, between the Reco and the Noble Five properties, which is owned by John M. Harris of Sandon and Jack Whittier of Vancouver, B. C. The Slocan Star is making good progress with the construction of its hydro-electric plant and the installation of the flotation unit in connection with the concentrator. The most important operations in the Salmo district are those of the Hudson Bay and Emerald mines. Both are shipping steadily, the former zinc and the latter lead-silver ore. Shortage of water for power is handicapping development of the Hudson Bay, but it is advancing its lower tunnel at the rate of about 6 ft daily. One of the most fortunate operators in the district is Clarence Cunningham. He is working three properties—the Wonderful, Queen Bess and Sovereign. He has been shipping from both the Wonderful and Queen Bess for some time, having opened up good bodies of ore in both. He broke into ore in the Sovereign, after advancing the drift run by his predecessor only 40 ft. The new showing consists of 22 ins. of clean

galena averaging more than 100 ozs. silver. Another mine in which work was recently resumed is the McAllister property, on the north fork of Carpenter creek in the dry ore belt. They are drifting both ways from a crosscut tunnel at a depth of 250 ft. and in one face they have 5 ins. of high-grade silver ore. The last shipment from the property went better than 250 ozs. silver."

Grand Forks.

The Union mine at the Franklin camp is now making shipments by auto trucks at the rate of one and one-half trips a day. Manager Johnson says one truck is equivalent to three 4-horse teams. The ore is being hauled from Union to Lynch creek.

The Seattle mine on North Fork is shipping at the rate of 6 cars per week.

ONTARIO.

Cobalt.

The best find of late at the Nipissing is in 81 shaft. The Cobalt Lake fault was encountered at the 424 and 520 levels, after crosscutting 159 and 232 ft. respectively. At both levels the condition of the fault is the same. It has a width of 12 ins., contains some calcite, and assays from 4 to 6 ozs. silver. Sixty-seven feet of drifting has since been done at the 425 level and 50 ft. of drifting at the 520 level without any improvement in the condition of the vein. At 80 shaft work has been confined to exploration into undeveloped and favorable territory at the 315 and 380 levels. No veins have been encountered to date. At the 200 level some tonnage was withdrawn from the old stopes. At vein 102 some drifting was done at the 155 level. Results were not encouraging. The vein is being further developed by two raises. Drifting has been started at the 90 level to prospect this vein. At this level it is small, but is usually of sufficient value to send to the low-grade mill. A crosscut is being driven at the 90 level toward vein 96, which shows from 1 to 2 ins. of ore assaying 2000 ozs. at the tunnel level.

Boston Creek.

With starting the steam plant again at the Miller Independence it is intended to continue development uninterruptedly. The No. 2 vein, located a short time ago, is showing up well. Two test pits have been sunk and specimens show free gold and tellurides. The vein was 10 ft. wide where first uncovered at surface, but stripping has shown that place to be a bulge, as the vein is narrowing down as it is uncovered to the east. No. 1 vein has not made its appearance yet, after about 60 ft. of crosscutting. It was thought that at the angle on which the vein was dipping, sinking a shaft 150 ft. north would cut it at about 50 ft. The shaft was put down 75 ft. before crosscutting. If the vein is not cut shortly it will be followed from surface.

Porcupine.

A new compressor has been ordered by the Premier Mining Co. and when this is installed sinking will be continued to the 500 level. The vein found in the south crosscut shows about 15 ft. of ore that will average \$10. The new vein was found 180 ft. south of the vein upon which the shaft was sunk in the contact between quartz porphyry and Keewatin formation. Previous to starting the crosscut all work underground had been done on a vein showing free gold. A new road, partly macadamized, has been built into the property from the Dome Lake. Two 60-hp. boilers, locomotive type, will drive the compressor.

The new vein system on which a shaft was sunk during the summer at the Newray mine has been lost by faulting and a search for it is now being made. The vein has been traced a considerable distance. On the surface it has widened to 20 ft. in places. A previous sampling gave good average assays and of all the channel samples taken along the vein there were no blanks. Another sampling is now being made which will include that large portion of the vein since stripped on the surface and if equally good values are found in the averages a crosscut will be made at the 400 level to cut the vein at that depth. Diamond drilling is under way in an endeavor to locate the lost vein in the shaft. Developments have been so satisfactory in connection with the new find and Manager Charlebois considers its development equally as important as that of the original find.

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(6) Number of pages. Illustrated articles are indicated by an asterisk (*).

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I. GEOLOGY

GEOLOGY AND MINERALOGY

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Andrews, E. C.—*Molybdenite: Its Occurrence and Treatment in New South Wales*. [Abst. from Bulletin No. 23 of the N. S. W. Department of Mines].—Mg. & Engg. Rev. Aug. 5 1916; p 286; pp 2½; 35c.

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Bradley, Walter W.—*Mines and Mineral Resources of Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, and Yolo Counties, California*. [Separate descriptions of mines, deposits and operations of mines and plants].—Calif. Mg. Bur.; pp 208*.

Chapin, Theodore; Canfield, George H.—*Mining Developments and Water-Power Investigation in Southeastern Alaska*. [The gold and copper mines are described by districts in which they are located and reviews are made of sources of water power].—U. S. G. S. Bull. 642-B; pp 56*.

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Eakin, H. M.; Mertie, J. B.; Harrington, G. L.—*The Cosna-Norvina and Ruby-Kuskokwim Regions, Alaska*. [The geology, geography and mineral resources of the country are first reviewed and followed by separate descriptions of the districts].—U. S. G. S. Bull. 642-H; pp 56*.

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Wells, Roger C.—*Experiments on the Extraction of Potash from Wyomingite*. [The mineral contains principally potash and alumina as a silicate].—U. S. G. S. Prof. Paper 98-D; pp 4.

II. ORES AND METALS

(I) METALS AND ORES

Copper

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Manganese

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Silver

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(II) NON-METALS

(A) FUELS

Coal Dust, Fire Damp, Etc.

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III. TECHNOLOGY

MINES AND MINING

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Ore and Metal Markets; Prices-Current

New York, Sept. 21, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Sept. 20 were as follows:

	New York. Cents.	London. Pence.
Sept. 14.....	68 1/4	32 1/4
15.....	68	32 3/4
16.....	68 1/4	32 1/4
18.....	68 3/4	32 11/16
19.....	68 5/8	32 5/8
20.....	68 5/8	32 5/8

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York—1916			London Standard Oz.	
	High.	Low.	Avg.	1916.	1915.
January	57 1/2	55 1/2	56.775	48.890	26.875
February	57	56 1/2	56.755	48.477	27.000
March	60 3/4	56 1/2	57.935	49.926	27.080
April	73 1/2	60 1/2	64.415	50.034	31.375
May	77 1/4	68 3/4	74.27	49.915	34.182
June	68 3/8	62 3/4	65.02	49.072	31.038
July	65	60	62.94	47.519	29.870
August	67	25	64	47.178	31.25
September .....	.....	.....	.....	48.68	.....
October .....	.....	.....	.....	49.285	.....
November .....	.....	.....	.....	51.713	.....
December .....	.....	.....	.....	55.038	.....
Year .....	.....	.....	.....	49.690	.....

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—There has been no abatement in the buying of copper. Domestic users have been steadily placing orders covering requirements over the balance of the year and at this writing few of the leading producers possess any unsold metal for November, while supplies for December delivery are restricted. The pith of the copper market is that demand is in excess of the supply. The copper market today is not a competitive affair. If one interest cares to sell quickly and lowers its price a quarter or a half cent the other producers do not hasten to take similar action. They know that eventually orders will come at the prices they demand. This substantially has been the case in the past week. One of the large interests last week booked a tremendous business, but it was learned that the orders were obtained by slight price concessions. The other producers reported very good orders also at their prices. Brass makers and wire drawers took about 75,000,000 lbs. copper last week, while export business easily amounted to 25,000,000 lbs. Many of the sales called for delivery over the first quarter of next year. One brass mill took 20,000,000 lbs. for delivery over the first half of 1917.

Of prime interest is the pending order for copper to be placed by the entente allies. Copper factors have been constantly discussing this matter, but are reticent as to details. It is learned on the highest authority that the amount is the largest ever taken by the allies, and indications are that the order will be closed while this issue of Mining and Engineering World is being printed. One copper producer intimated that 500,000,000 lbs. may be purchased, on which deliveries are to run over the first half of next year. It is learned that the business will be distributed among all of the producers instead of a select few as previously.

The price situation shows no change aside from a stronger feeling on the part of dealers, who are holding spot and October electrolytic at 28 cts., while for November and December dealers ask 27 3/4 cts., with the first quarter of next year held at 27 1/4 cts. These prices are about a half cent higher than those previously quoted by dealers. On the other hand the large producers are taking orders for the last quarter at a flat price of 28 cts., with October sold at 28 1/4 cts., November and December at 28 cts. Spot casting copper holds firm at 26 1/4 @ 26 1/2 cts. In connection with the pending allied order certain well-informed factors state that 26 cts. will be the price on the immense tonnage.

Consumers are resorting to all means at their command to cover needs over the fourth quarter. It is generally ad-

mitted that there is a scarcity of copper. Some users have placed their inquiries with all of the large producers. This accounts for duplication as to the total active business in the market. However, producers assert that the amount of business that they have declined has been extensive in itself. One producer is sold out for November; in fact, oversold to the extent of 800 tons; another declares that he can take orders for about 2,000,000 lbs. more for that month. Few of the large sellers report unlimited stocks for November. Users who sought October copper failed in many instances to secure full allotments.

Labor conditions alone will be the prime factor in solving the copper situation. As pointed out by one large refiner, capacity can be increased two-fold, but if labor is unobtainable then refinery yield will not increase. Thus there are many who believe that refinery yield will not go over 180,000,000 lbs. a month by the end of the year. Among the eastern refineries labor is extremely scarce. The western refineries are also affected, but not so seriously.

At London the market has been steadily improving. Last week electrolytic advanced £3 10s, while standard advanced £6 in spot and £4 10s in futures. With respect to the official London quotations it is believed that the prices cabled are well below the actual market values and although there still remains some interest in fluctuations abroad, the influence that these changes have on this market is nil. The stocks of copper in Europe on Sept. 15 totaled 7118 tons, as contrasted with 7514 tons on Sept. 1. The supply afloat was 5550 tons, as against 5000 tons a fortnight ago. The visible supply on Sept. 15 totaled 12,668 tons, as against 12,514 tons on Sept. 1, an increase of 154 tons.

Exports of copper in August totaled 32,190 tons, making the total exports reported since the first of the year 215,199 tons, as against 171,786 tons in the same period of 1915. Since the first of September exports reported total 12,635 tons.

Quotations for copper per pound at New York for the week ended Sept. 20 were as follows:

(For Fourth Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
Sept. 14.....	28 @ 28 1/4	28 @ 28 1/4	25 3/4 @ 26
15.....	28 @ 28 1/4	28 @ 28 1/4	25 3/4 @ 26
16.....	28 @ 28 1/4	28 @ 28 1/4	26 @ 26 1/4
18.....	28 @ 28 1/4	28 @ 28 1/4	26 1/4 @ 26 1/2
19.....	28 @ 28 1/4	28 @ 28 1/4	26 1/4 @ 26 1/2
20.....	28 @ 28 1/4	28 @ 28 1/4	26 1/4 @ 26 1/2

Quotations for copper per ton at London for the week ended Sept. 20 were as follows:

Sept.	Standard		Futures.	Electrolytic.
	Spot.	.....	
11.....	£117 0 0	£113 0 0	£113 0 0	£133 0 0
15.....	116 0 0	112 0 0	112 0 0	134 10 0
16.....	116 0 0	112 0 0	112 0 0	134 10 0
18.....	116 0 0	112 0 0	112 0 0	135 10 0
19.....	116 0 0	112 0 0	112 0 0	135 10 0
20.....	116 10 0	113 0 0	113 0 0	135 10 0

MONTHLY AVERAGE PRICES OF COPPER.

Month	New York—Lake Superior.			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.26	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September .....	.....	.....	.....	17.758
October .....	.....	.....	.....	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057

May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.223
September				17.705
October				17.859
November				18.826
December				20.348

Year 17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York—1916			London—1915	
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.33	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.850
September					68.660
October					72.577
November					77.400
December					80.400

Year 17.47

Tin.—The market was a quiet affair last week, but despite the dullness prices were firmly held. Consumers were not interested in forward positions, while some tin just ex-steamer was slightly shaded by sellers, who preferred to take a lower price rather than put the tin in store.

Spot Straits ranged from 38¼ to 38½ cts. since our last report, while spot Banka held from 37¼ to 37½ cts. Some business in Banka was done at 37 cts. No. 1 Chinese tin was quoted at 37 cts. At this writing Straits tin for September delivery is quoted at 38¾ cts., with October held at 38¼ cts., November and December at 38½ cts. and January and February at 38 cts. Foreign markets have been irregular, but closing prices showed a net gain of 5s to 10s at London, while Singapore advanced £1 15s during the past week.

Arrivals of tin since the first of the month total 1540 tons, while the stock afloat to this country totals 3380 tons.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Sept. 20 were as follows:

Month.	New York—1916		London—1916	Singapore—1915
	Spot.	Futures.	Straits, spot.	Shipments.
Sept. 14	38¼c	38¾c	£170 15 0	£172 0 0
15	38½c	38¾c	170 10 0	173 5 0
16	38½c	38¾c	170 10 0	173 5 0
18	38½c	38¾c	171 0 0	172 10 0
19	38½c	38¾c	171 10 0	173 0 0
20	38½c	38¾c	172 5 0	173 15 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.68	34.886
September				33.13
October				33.077
November				33.375
December				38.755

Year 38.664

Lead.—On Tuesday the American Smelting & Refining Company advanced its price 25 points to 7 cts. New York and 6.92½ cts. St. Louis. Independents topped this advance by 10 to 20 points asking 7.20 cts. New York. The market is now at a standstill pending indications as to how the advance will affect buying. It is thought that consumers will readily concede the higher prices.

Spot metal is very scarce. Few of the independents have lead for September delivery. Canadians bought freely, while other export business is also noted. Lead for October delivery sold at 6.90 cts. New York and some sellers asked that price for November delivery. Just before the A. S. & R. Co. announced its advance an independent gave an option on 1000 tons for export November delivery at 6.75 cts. New York, which was exercised on Saturday. Domestic users were also in the market for a substantial amount of lead. Some large cartridge contracts have been placed in this coun-

try. Generally the lead situation is very tight. Indications are that lead will remain scarce over the rest of the year.

Quotations for lead per pound at New York and per ton at London for the week ended Sept. 20 were as follows:

Sept.		New York		London	
		Indpts.	A. S. & R. Co.	Spot.	Futures.
14	.....	6.77½c	6.50c	£30 0 0	£28 15 0
15	.....	6.90c	6.75c	30 10 0	29 0 0
16	.....	7.00c	6.75c	30 10 0	29 0 0
18	.....	7.00c	6.75c	30 10 0	29 0 0
19	.....	7.10c	6.75c	30 15 0	29 5 0
20	.....	7.05c	6.75c	30 15 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York—1916			London—1915	
	High.	Low.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.60	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August	6.70	6.95	6.32	4.750	30.260
September				4.627	22.953
October				4.612	23.932
November				5.152	28.240
December				5.346	28.884

Year 4.675 23.099

Lead Ore.—The change has come in the ore market of the Missouri-Kansas-Oklahoma district and ores were up \$5. The best grades sold as high as \$75, though the greater part of the ores went at \$70. Production for the week was up again and was recorded at 2,205,215 lbs. for the week ended Sept. 16, this bringing the total for the year to date at 74,772,062 lbs. The week's production was valued at \$76,480 and the year's at \$3,134,461

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.60	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	78.35	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September				48.25
October				51.80
November				63.00
December				71.375

Year 53.34

Zinc Ore.—Though the top price of this ore showed no change from the previous week's in the Missouri-Kansas-Oklahoma district, the general tone of the market was stronger in that all of the lower grades were in better demand and brought higher prices. The top price paid was \$65, but this ranged only down to \$50 rather than \$45, as during the week ended Sept. 9. There were produced during the week 13,109,486 lbs. of concentrates, bringing the total for the year to 465,215,930 lbs. and these amounts had respective values of \$389,980 and \$20,472,821.

Calamine.—The market remained about the same, with prices ranging from \$30 to \$40. Production of late has been low and during the week ended Sept. 16 276,300 lbs. were produced and valued at \$5442. The year's production to date is 21,048,910 lbs., valued at \$745,788.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	63.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.60	62.50
April	100.00	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	68.75	60.25
September				76.76
October				82.40
November				92.50
December				87.00

Year 102.95

Spelter.—Business in spelter has been very brisk. The heavy buying of copper by brass makers has also resulted in a very large demand for spelter and producers have taken some very good orders for the fourth quarter. Demand for

brass special and also for higher grades has been good. Export buyers took some round lots of brass special. Spot prime western advanced $\frac{3}{4}$ ct. last week and continues to move higher this week. There is very little spot to be had. For the fourth quarter sellers took business at prices ranging from $9\frac{1}{2}$ to $9\frac{1}{2}$ cts. St. Louis, the outside price prevailing at this writing. Sales of brass special for spot delivery were done at $10\frac{1}{2}$ cts. St. Louis. For the first quarter of next year some dealers offered prime western at 9 cts. St. Louis. Canadians took about 500,000 lbs. spelter, France bought a round tonnage, while the amount taken by one large Connecticut brass maker is estimated at close to 3,000,000 lbs. The point uppermost in sellers' minds is whether spelter has come back. The production figures and statistics of increased capacity always loom up to combat the belief that spelter will again go above 15 cts. Last week at London spot advanced £4 and futures £3, with further advances reported this week.

Quotations for spelter per pound at New York and per ton at London for the week ended Sept. 20 were as follows:

		New York.		London.	
		Spot.		Spot.	Futures.
Sept. 14.	.....	9.50c		£54 0 0	£47 0 0
15.	.....	9.50c		54 0 0	47 0 0
16.	.....	9.50c		54 0 0	47 0 0
18.	.....	9.70c		55 0 0	49 0 0
19.	.....	9.70c		56 0 0	49 0 0
20.	.....	9.65c		56 0 0	49 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

		New York			London		
		—1916—			1915.	1916.	1915.
Month.		High.	Low.	Avg.	Avg.	Avg.	Avg.
January	....	19.42½	17.30	18.801	6.519	89.840	80.819
February	....	21.17½	18.67½	20.094	8.866	97.840	39.437
March	....	20.50	16.60	18.40	10.125	100.720	44.278
April	....	19.37½	17.75	18.76	11.48	98.103	48.942
May	....	17.50	13.75	15.98	15.825	89.507	67.320
June	....	13.62½	11.25	12.72	22.625	67.410	100.320
July	....	10.75	8.75	9.80	20.803	53.00	98.150
August	....	9.75	8.37½	9.11½	16.110	56.00	68.250
September	....	.....	.....	.....	14.493	.....	64.400
October	....	.....	.....	.....	14.196	.....	64.196
November	....	.....	.....	.....	16.875	.....	88.240
December	....	.....	.....	.....	16.675	.....	89.153
Year	.....	.....	.....	.....	13.914*	.....	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—The market held unchanged at \$75 per flask for spot virgin metal during the past week. Business has been of small volume, but sellers assert that the price has been firmly established. Imports are fair. Hope is entertained that some large powder orders will soon be placed that may cause a better demand for mercury. In the meantime sellers are taking few orders.

Antimony.—Business continues of very small account, but sellers appear to be holding the market firm at 11@12 cts. for spot. Chinese interests are offering freely, but consumers are well covered and are not disposed to accept metal at the concessions.

Tungsten Ore.—Prices continue to decline on tungsten ore on freer offerings by sellers. There is only a fair demand and some interests are holding good-sized stocks. Offerings to consumers are noted at \$15@17 per unit delivered New York. Some export business has been done, the entente allies being in the market.

Aluminum.—The market has been very quiet, but prices are firmly maintained. Sellers are not pressing supplies on the market, holding to the opinion that there will be an early improvement in the demand. Spot virgin ingots are quoted at 61@63 cts. per pound in ton lots. For No. 1 remelted sellers ask 58@60 cts., while No. 12 alloy can be had at 46@48 cts. On contract renewals for 1917 sellers are asking 35 cts. f. o. b. smelter on virgin ingots. Aluminum sheets are in fair demand, with job lots for prompt shipment held at 80 cts. to \$1. For automobile body sheet sellers quote 90 cts.

Ferromanganese.—As a result of the domestic competition and the fact that English makers are unable to guarantee regular shipments prices on English ferromanganese

have been lowered to \$165 seaboard. Domestic furnaces are also offering at the same price. One Philadelphia interest has taken orders for about 4000 tons domestic alloy in the past week.

Pig Iron.—Business continues on a large scale, especially in basic iron, for which there has been widespread buying. Sales of about 110,000 tons basic iron were reported last week. A fair amount of foundry iron was also sold. The situation generally reflects the endeavors of large users to cover first half needs before prices are advanced.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.07½	to	.08½
Nitric, 40 deg.....	.09	to	.09½
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured 133 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.72
Alum—Powdered, lb.....	4.60	to	4.65
Lump, lb.....	.04	to	.06
Ground, lbs.....	4.10	to	4.12½
Ammonia—			
Muriate, white grain, lb.....	.09½	to	.09¾
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06	to	.06¾
Red, lb.....	.60	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.14	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	2.75	to	2.80
Foundry.....	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese.....	165.00	to	.....
Ferroaluminum, 50%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
White crystals.....	.15½	to	.15¾
Broken, cakes.....	.14½	to	.15
Powdered.....	.17	to	.17½
Lead—Granulated, lb.....	.15½	to	.....
Brown sugar.....	.13½	to	.14½
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	50.00	to	55.00
Potash Fertilizer Salts—			
Kainit, mln. 16% actual potash.....			32.00
Muriate, 50 to 55%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.39	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.45	to	.50
Prussiate, yellow.....	.62½	to	.65
Prussiate, red.....	1.75	to	1.80
Salt-peter—Crude, lb.....	.12	to	.14
Refined.....	.25½	to	.26
Soda—Ash, 48% (43% basis), bbl.....	3.12½	to	3.65
Strontia Nitrate, casks, lb.....	.31	to	.35
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.29½	to	.30
Oxide, lb.....	.43	to	.45
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to date	Latest						Paid in 1916	Total to date	Latest		
						Date	Amt.							Date	Amt.	
Acacia, g.	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,916	\$1	\$.....	\$93,916	Sept. '01	\$0.01	
Adams, s. l. c.	Colo.	80,000	10	.....	773,000	Dec. 15, '09	.04	Golden Star, g.	Ariz.	400,000	5	.....	120,000	Mar. 15, '10	.05
Adventure, c.	Mich.	100,000	25	.....	60,000	July 20, '16	.50	Gold Com. Fra. g.	Nev.	922,000	1	.....	92,111	Oct. 15, '09	.10
Ahmeeck, c.	Mich.	200,000	25	1,200,000	5,250,000	July 10, '16	3.00	Goldfield Con.	Nev.	3,559,148	10	.....	28,999,831	Oct. 31, '16	.10
Alaska Goldfields.	Alaska	250,000	6	.....	403,250	Jan. 10, '16	.16	Good Hope, g. a.	Colo.	500	100	.....	941,250	Jan. '01	.25
Alaska Mexican, g.	Alaska	190,000	6	.....	3,507,381	Nov. 23, '15	.10	Good Sp. Anchor, z. a.	Nev.	550,000	1	33,000	119,758	June 15, '16	.01
Alaska Mines Sec.	U. S.	600,000	6	.....	90,000	Nov. 1, '06	.60	Grand Central, g.	Nev.	600,000	1	.....	1,645,200	Dec. 23, '16	.02½
Alaska Treadwell, g.	Alaska	200,000	25	6	54,060	2,045,270	Feb. 28, '16	.30	Grand Gulch, c. s.	Utah	239,845	2.50	9,694	11,992	June 1, '18	.03
Alameda, g.	Mich.	100,000	25	450,000	650,000	July 15, '16	2.00	Granite, g.	Alaska	430,000	1	17,200	17,200	May 10, '16	.02	
Amalgamated, c.	Mont.	1,538,829	100	.....	103,444,983	Aug. 30, '16	3.77	Gwin, g.	Cal.	100,000	10	.....	451,500	Feb. '08	.25
Am. Sm. & R. com	U. S.	600,000	100	1,500,000	30,333,333	June 1, '16	1.50	Hazel, g.	Cal.	900,000	1	.....	1,114,000	Jan. 5, '16	.01
Am. Sm. & R. pf.	U. S.	600,000	100	1,500,000	66,546,386	June 1, '16	1.75	Hecia, s. l.	Idaho	1,000,000	0.25	950,000	4,705,000	Aug. 20, '16	.16	
Am. Sm. Sec. A pf.	U. S.	170,000	100	765,000	11,455,000	July 1, '16	1.50	Hercules.	Idaho	1,000,000	1	1,850,000	12,630,000	Aug. 15, '16	.20	
Am. Sm. Sec. B pf.	U. S.	300,000	100	1,125,000	16,335,000	July 3, '16	1.25	Hidden Treasure, g.	Cal.	30,000	10	.....	457,552	Sept. '00	.10
Am. Zinc, L. & Sm	Mo.	193,120	25	2,754,190	3,806,070	Aug. 1, '16	1.60	Holy Terror, g.	S. D.	600,000	1	.....	172,000	Jan. '00	.01
Anaconda, c.	Mont.	2,380,250	60	11,656,250	175,914,271	Aug. 1, '16	2.00	Homestake, g.	S. D.	251,160	100	1,306,032	37,011,740	Aug. 25, '16	.65	
Annie Laurie, g.	Utah	25,000	100	.....	439,561	Apr. 22, '06	.50	Hope Dev.	Cal.	500,000	1	.....	1,600	Dec. 31, '15	.01
Argonaut, g.	Cal.	200,000	6	40,000	1,690,000	June 27, '16	.10	Horn Silver, L. s. z.	Utah	400,000	1	40,000	5,182,000	June 30, '16	.06	
Arizona, c.	Ariz.	100,000	25	621,164	30,212,154	Apr. 1, '16	.50	Imperial, c.	Ariz.	600,000	10	.....	300,000	June 24, '07	.20
Atlantic, c.	Mich.	100,000	25	.....	990,000	Feb. 21, '06	.50	Inspiration Con.	Ariz.	920,657	20	3,091,233	3,091,233	July 31, '16	2.00
Bagdad-Chase, g. pf.	Cal.	81,819	6	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, com.	U. S.	1,673,384	25	6,435,498	30,941,335	June 1, '16	2.00
Bald Butte, g. s.	Mont.	250,000	1	.....	1,354,648	Nov. 1, '07	.04	Inter'l Nickel, pf.	U. S.	89,126	100	401,067	4,745,320	Aug. 1, '16	1.80
Baldy, c.	Mich.	100,000	25	.....	7,950,000	Dec. 31, '13	2.00	Inter'n Sm. & Ref.	U. S.	100,000	100	.....	4,100,000	May 2, '16	2.00
Barnes-King, g.	Mont.	40,000	6	60,000	60,000	June 1, '16	.07½	Interstate-Callahan	Idaho	464,990	10	1,394,970	3,952,415	June 30, '16	1.60	
Barst Tunnel Con.	Utah	1,000,000	0.10	.....	940,000	Nov. 15, '07	.02	Iowa, g. s. l.	Colo.	1,666,667	1	.....	270,167	Dec. 31, '15	.00½
Big Four Expl.	Utah	400,000	1	80,000	80,000	Aug. 15, '16	.06	Iowa Tiger, g. s. l.	Colo.	3,000	1	.....	25,179	Jan. 15, '16	.60
Board of Trade, z.	Wis.	120,000	1	.....	78,000	Jan. 16, '11	.05	Iron Blossom, l. s. g.	Utah	1,000,000	1	250,000	2,750,000	July 20, '16	.10
Bonanza Dev.	Colo.	400,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Cap pf. c.	Ariz.	33,451	10	6,422	29,803	July 1, '16	.35
Booth Reorganized	Nev.	999,266	6	349,949	349,949	June 25, '16	.05	Iron Clad, g.	Colo.	1,000,000	1	.....	50,000	Nov. '06	.05
Boma, g.	Nev.	408,500	1	.....	402,350	Dec. 10, '14	.10	Iron Silver.	Colo.	500,000	20	.....	5,500,000	Dec. 31, '16	1.00
Boston & Colo. Sm.	Colo.	16,000	10	.....	402,350	Oct. '07	.75	Isabella, g.	Colo.	2,250,000	1	.....	742,600	Mar. '01	.01
Boz. & Mont. Con.	Mont.	100,000	25	.....	63,226,000	May 16, '11	4.00	Isle Royale, c.	Mich.	150,000	25	150,000	300,000	July 31, '16	1.00
Breece, L. s.	Colo.	200,000	25	.....	203,316	Sept. 15, '16	.08	Jackson, g.	Cal.	390,000	10	.....	373,300	Jan. '11	.02
Brunswick Con. g.	Cal.	300,000	1	.....	2,768,400	July 11, '08	.10	Jerry Johnson, g.	Colo.	2,600,000	10	.....	187,600	Nov. 5, '14	.00½
Bullion B. & Champ	Utah	100,000	10	.....	10,000	July 1, '07	.01	Jim Butler.	Nev.	1,718,020	1	848,504	615,406	Aug. 1, '16	.10
Bullwhacker, c.	Mont.	450,000	1	.....	851,000	Aug. 4, '16	.02½	Joplin Ore & Spelter	Mo.	400,000	6	62,000	62,000	July 22, '16	.04½
Bunker Hill Con. g.	Cal.	200,000	1	40,000	17,917,500	Aug. 4, '16	.40	Jumbo Ext. g.	Nev.	1,550,000	1	194,000	634,998	June 30, '16	.05	
Bunker Hill & Bull	Idaho	327,000	10	1,154,500	1,054,119	Apr. 10, '16	10.60	Kendall, g.	Mont.	500,000	5	60,000	1,655,000	Apr. 3, '16	.10	
Butte Alex Scott.	Mont.	75,000	10	841,662	125,000	Aug. 1, '10	.60	Kenefek Zinc.	Mo.	200,000	.....	60,000	60,000	June 30, '16	.10
Butte-Ballaklava, c.	Mont.	250,000	10	.....	4,700,000	Dec. 1, '11	.25	Kennecott.	Alas.	250,000	10	7,000,000	12,000,000	June 30, '16	1.60
Butte Coalition, c.	Mont.	1,000,000	16	5,662,993	11,853,017	June 30, '16	10.75	Kennedy, g.	Cal.	100,000	100	.....	1,801,001	June, '00	.05
Butte & Superior, z.	Mont.	272,697	10	625,200	1,507,581	Aug. 5, '16	.03	King of Arizona, g.	Ariz.	200,000	1	.....	398,000	Aug. 2, '09	.12
Caledonia, L. s. c.	Idaho	2,605,000	1	625,200	25,714,031	June 20, '16	2.00	Klar Piquet, z.	Wis.	20,000	1	.....	167,500	Dec. 16, '12	.25
Calumet & Hecla, c.	Ariz.	641,923	10	3,000,000	132,250,000	June 23, '16	15.00	Knob Hill, g.	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00½
Calumet & Hecla, c.	Mich.	250,000	25	100,000	10,243,964	Jan. 1, '16	.17½	La Fortuna, s.	Ariz.	250,000	1	.....	1,200,600	Oct. '02	.01½
Camp Bird, g.	Colo.	1,750,000	25	113,584	250,000	June 1, '16	.16	Lak View, v.	Utah	600,000	.05	60,000	1,150,000	Feb. 23, '08	.02	
Cardiff, l.	Utah	600,000	1	.....	60,000	Dec. '06	.01	Last Dollar, g.	Colo.	1,600,000	1	.....	180,000	Feb. 23, '03	.01
Carissa, s. c.	Utah	600,000	1	.....	4,000,000	Apr. 25, '16	1.00	Liberty Bell, g.	Colo.	133,551	5	.....	1,762,795	Jan. 31, '16	.05
Centennial Eureka, g.	Utah	100,000	25	100,000	392,087	Feb. 15, '16	.06	Lightner, g.	Cal.	102,256	1	1,020	331,179	June, '06	.06	
Center Creek, l. z.	Mo.	100,000	10	55,000	9,742,925	June 30, '16	2.25	Linden, z.	Wis.	1,020	10	.....	11,200	Dec. 31, '15	3.00
Central Eureka, g.	Cal.	100,000	1	.....	650,000	Aug. 1, '16	.15	Little Bell, s. l.	Utah	300,000	1	15,000	75,000	Apr. 22, '16	.06
Century, g. s. l.	Utah	1,000,000	1	44,000	799,159	Mar. 5, '06	.05	Little Florence.	Nev.	1,000,000	1	.....	430,000	Jan. '08	.03
Champion, c.	Mich.	100,000	25	5,000,000	392,087	Feb. 15, '16	.06	Lost Packer.	Idaho	150,000	1	.....	37,500	Oct. 23, '13	.25
Chile Con.	Utah	882,960	1	132,323	15,000,000	Aug. 8, '16	6.40	Lower Mammoth.	Utah	1,000,000	1	.....	67,000	Dec. 15, '16	.01
Chino Copper c.	N. M.	889,980	5	3,044,930	483,360	Aug. 2, '16	.05	MacNamara, g. a.	Nev.	734,678	1	.....	46,800	Apr. 23, '06	12.00
C. K. & N. g.	Colo.	1,431,000	1	.....	9,742,925	June 30, '16	2.25	Magma, c.	Ariz.	240,000	6.00	240,000	480,000	June 30, '16	.60
Cliff, s. l.	Alaska	100,000	1	.....	171,851	Nov. '04	.01	Mammoth, g. a. c.	Utah	400,000	10	60,000	2,390,000	June 30, '16	.02
Clinton, g.	Colo.	200,000	10	.....	115,000	Feb. 5, '16	.03	Manhattan-Big 4, g.	Nev.	762,400	1	.....	30,243	Aug. 15, '11	.06
Colo. O. Dredging.	Colo.	200,000	10	109,000	90,000	Jan. 1, '13	.10	Mary McKinney, g.	Colo.	370,000	5	25,467	1,169,366	July 28, '14	.07	
Colorado, s. l.	Utah	1,000,000	0.20	.....	60,000	Dec. '03	.30	Mex. Madonna, g. a. l. z.	Mich.	100,000	15	100,000	93,106	May 1, '16	.07
Colombus Con. l. a. c.	Utah	283,540	6	.....	425,000	Feb. '03	1.00	Mess Con. c.	Utah	800,000	0.25	40,000	284,000	Aug. 15, '16	1.00
Combination, g.	Nev.	320,000	1	.....	2,600,000	Oct. 14, '07	.20	May Day.	Utah	800,000	0.25	40,000	284,000	Aug. 15,	

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest		
						Date	Amt.	Date							Amt.	Date	Amt.
Petro, g. s.	Utah	500,000	\$1	\$55,000	Aug. 9, '06	\$0.04	Success	Ida.	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03			
Pharmacist, g.	Colo.	1,600,000	1	91,500	Feb. 1, '10	.00%	Superior & Pitts, c	Ariz.	1,499,792	10	10,318,568	Dec. 21, '15	.35				
Phelps, Dodge & Co	U. S.	450,000	100	5,400,000	53,771,527	June 30, '16	6.00	Tamarack, c.	Mich.	60,000	25	9,420,000	July 23, '07	4.00			
Pioneer, g.	Alaska	5,000,000	1	2,041,526	Oct. 7, '11	.03	Tamarack-Custer	Idaho	2,000,000	1	106,575	Aug. 30, '16	.02				
Pittsburg, I. z.	Mo.	1,000,000	1	249,104	July 15, '13	.02	Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75			
Pittsburg-Idaho, I.	Ida.	1,000,000	1	29,100	July 15, '13	.04	Tightner	Cal.	100	100	160,000	Jan. 3, '14	.24				
Pitts Silver Peak	Nev.	2,790,000	1	840,600	Dec. 1, '14	.02	Tomboy, g. s.	Colo.	310,000	6	74,400	3,861,655	June 30, '16	.24			
Plataville, I. z.	Wis.	500	60	179,500	June 15, '07	10.00	Tom Reed, g.	Ariz.	909,555	1	2,555,934	Sept. 8, '15	.01				
Plumas Eureka, g.	Cal.	150,625	10	2,831,294	Apr. 8, '01	.06	Ton-Belmont, g.	Nev.	1,600,000	1	562,500	8,205,627	July 1, '16	.12%			
Plymouth Con.	Cal.	240,000	6	259,300	Aug. 10, '16	.24	Ton-Extension, g.	Nev.	1,272,901	1	413,660	1,400,656	July 1, '16	.15			
Portland, g.	Colo.	3,000,000	1	10,447,050	July 20, '16	.24	Tonopah, g. s.	Nev.	1,000,000	1	460,000	13,450,000	July 21, '16	.15			
Prince Con. s. l.	Nev.	1,000,000	2	125,000	July 1, '16	.06	Tonopah Midway, g	Nev.	1,000,000	1	250,000	250,000	Jan. 1, '07	.05%			
Quartette, g. s.	Nev.	100,000	10	375,000	July 31, '07	.20	Trenniss	Cal.	200,000	2.50	234,000	Apr. 25, '15	.02				
Quicksilver, pf.	Cal.	43,000	100	1,931,411	Apr. 8, '03	.50	Tri-Mountain, c.	Mich.	100,000	25	1,100,000	Oct. 30, '12	3.00				
Quip, g.	Wash.	1,500,000	1	67,000	Feb. 1, '12	.01	Tuolumne, c.	Mont.	800,000	1	496,525	Apr. 15, '13	.10				
Quincy, c.	Mich.	110,000	25	770,000	Dec. 22, '11	.02	Uncle Sam Con. s.	Utah	500,000	1	470,000	Sept. 20, '11	.05				
Ray Con. c.	Ariz.	1,671,279	10	1,571,273	6,141,406	June 30, '16	.50	Union, g.	Colo.	1,250,000	1	444,244	Jan. 27, '03	.02			
Red Metal, c.	Mont.	1,000,000	10	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	167,070	Nov. 16, '15	.10				
Red Top, g.	Nev.	1,000,000	1	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	1,600,000	Apr. 15, '07	3.00				
Republic, g.	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	6,125,000	Aug. 6, '07	1.75				
Richmond, g. s. l.	Nev.	64,000	1	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	211,627	Oct. 15, '07	.50				
Rocco-Home, I. z.	Nev.	300,000	1	152,500	Dec. 22, '05	.02	United Copper, c. a	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01				
Rochester Ld. & L.	Mo.	4,900	100	190,846	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1	440,435	Jan. 1, '10	.04				
Round Mountain, g.	Nev.	889,015	1	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	3,335,000	June 30, '16	18.00				
Sacramento, g.	Utah	1,000,000	6	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	60,000	100	11,000,000	Sept. 23, '10	6.00				
St. Joseph, I.	Mo.	1,464,793	10	10,974,651	June 20, '16	.25	United Verde, c.	Ariz.	300,000	10	1,845,000	38,272,000	Aug. 9, '16	.75			
St. Mary's M. L.	Mich.	160,000	25	6,880,000	Aug. 28, '16	2.00	United Verde Ext.	Ariz.	1,000,000	50	500,000	Oct. 1, '16	.50				
Schoenh'r Walp. z. l.	Mo.	10,000	10	90,000	Sept. 20, '11	.20	U. S. Red & R. com.	Colo.	59,188	100	414,075	Oct. 9, '03	1.50				
Scratch Gravel, c.	Cal.	1,000,000	1	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,458	100	1,775,930	Oct. 9, '03	1.50				
Seven Top, Cn. g. s.	Nev.	1,443,077	1	252,532	Apr. 1, '15	.02%	U. S. R. & M. com	USMx	351,115	60	965,556	July 15, '16	1.00				
Shannon, c.	Ariz.	300,000	10	750,000	Jan. 10, '13	.50	U. S. S. R. & M. pf	USMx	486,350	60	18,084,366	July 15, '16	.87%				
Shattuck-Ariz, c.	Ariz.	350,000	10	4,200,000	June 20, '16	1.25	Utah, c.	Utah	1,624,490	10	8,934,695	June 30, '16	3.00				
Silver Hill, g. s.	Nev.	108,000	1	88,200	June 24, '07	.06	Utah Apex, s. l.	Utah	523,200	6	264,100	July 1, '16	.25				
*Silver King Coal'n	Utah	1,250,000	6	14,147,485	July 1, '16	.15	Utah Con. c.	Utah	300,000	5	460,000	June 26, '16	.75				
Silver King Con.	Utah	637,682	1	942,373	July 22, '15	.10	Utah M. & T. l.	Utah	750,000	1	1,285,495	Aug. 15, '16	.50				
Silver Mines Expl.	N. Y.	100,000	100	250,000	June 16, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	May 29, '16	1.00				
Sioux Cons. I. s. c.	Utah	745,389	1	872,105	June 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	207,600	Apr. 23, '10	.04				
Skidoo, g.	Cal.	1,000,000	5	385,000	Oct. 2, '14	.01	Vindicator Con. g.	Colo.	1,500,000	1	135,000	3,397,500	July 25, '16	.03			
Smuggler, s. l. z.	Colo.	1,000,000	1	2,235,000	June 22, '06	.03	Wasp No. 2, g.	S. D.	600,000	1	619,466	May 15, '16	.02%				
Snowstorm, c.	Idaho	1,500,000	1	1,169,510	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,000,000	1	1,050,000	July 1, '16	.02				
Socorro, c.	N. M.	377,342	6	196,070	Aug. 1, '16	.05	West End Con.	Nev.	1,788,486	1	555,645	Jan. 15, '16	.05				
South Eureka, g.	Cal.	299,951	1	1,409,754	Aug. 15, '16	.07	West Hill, c.	Wis.	20,000	1	40,000	June 23, '16	.10				
South Hecla, c.	Ida.	500,000	1	39,450	Aug. 10, '16	.16	White Knob, g. pf.	Cal.	200,000	10	190,000	Aug. 25, '16	.10				
So. Swansea, g. s. l.	Utah	300,000	1	257,500	Apr. 3, '04	.01%	Wilbert, c.	Ida.	1,000,000	1	30,000	Oct. 9, '04	.01				
Spears, c.	S. D.	1,600,000	1	165,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	380,000	8,760,000	Apr. 1, '16	6.00			
Standard Con., g. s.	Idaho	178,394	10	6,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,674	15	53,403	Nov. 15, '15	.25				
Standard, c.	Ariz.	425,000	1	69,600	Sept. 8, '05	.60%	Work, g.	Colo.	1,500,000	1	1,697,685	Apr. 31, '12	.02				
Steward, I. z.	Idaho	1,238,362	1	2,043,297	Dec. 31, '15	.05	Yak.	Colo.	1,000,000	1	120,000	June 30, '16	.07				
Stratton's Crip. Ck.	Colo.	2,000,000	1	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	167,500	Feb. 1, '13	.01				
Stratton's Ind.	Colo.	1,000,000	5	6,028,568	Dec. 23, '06	.012	Yellow Aster, g.	Utah	100,000	10	1,189,789	Aug. 1, '16	.02				
Str'n's Ind. (new) g.	Colo.	1,000,000	.30	691,250	Jan. 31, '16	.16	Yellow Pine	Cal.	1,000,000	1	1,643,008	Aug. 15, '16	.15				
Strong, g.	Colo.	1,000,000	1	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	102,583	July 15, '14	.10				

Corrected to September 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675.00.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Am't.							Date	Am't.
Ajuchitian	Mex.	50,000	\$ 5	\$.....	\$337,600	July 1, '13	\$0.25	Las Caballitas	Mex.	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00
Amistad y Concordia g	Mex.	9,800	50		429,358	July 15, '08	1.28	La Roi No. 2, g.	B. C.	120,000	25		1,827,320	Dec. 15, '15	\$0.24
Amparo, s. g.	Mex.	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.06	Lucky Tiger	Mex.	715,337	10	321,902	3,885,293	Aug. 20, '16	.08
Bartolo de Medina Mill	Mex.	2,000	25		103,891	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,692	1	202,293	4,058,061	July 1, '16	.03
Batopilas, s.	Mex.	446,288	20	60,000	55,870	Dec. 31, '07	.12%	Mexican, I. pf.	Mex.	12,500	100	100,293	1,018,750	May 1, '12	3.50
Beaver Con. s.	Ont.	2,000,000	1		710,000	Apr. 29, '16	.03	Mexico Con. of El Oro	Mex.	240,000	10		660,000	Mar. 10, '05	.25
Boleo, g.	Mex.	120,000	20		721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex.	150,000	6		4,478,500	June 26, '14	.96
British Columbia, c.	B. C.	691,709	6		615,399	Jan. 5, '13	.15	Minas Pedrazzini	Mex.	1,000,000	1		497,500	Jan. 23, '11	.06%
Buena Tierra.	Mex.	330,000	6		160,380	Jan. 30, '16	.24	Mines Co. of Am.	Mex.	900,000	10		4,958,600	July 25, '13	.12%
Buffalo, Ont.	Ont.	1,000,000	1		2,877,600	July 1, '14	.06	Mineral Corp. of Canada	Can.	2,075,000	1	259,375	1,037,600	Mar. 30, '16	.12%
Canadian Goldfields.	Can.	600,000	0.10		237,099	July 15, '14	.01%	Montezuma, I. pf.	Mex.	6,000	100		402,500	Nov. 15, '12	3.50
Cananea Central, c.	Mex.	600,000	10		360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex.	500,000	1		100,000	July 20, '09	.04
Cariboo-Cobalt	Ont.	1,000,000	1		295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11
Cariboo-McKinney, g.	B. C.	1,250,000	1		66,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex.	100	300		3,190,000	Oct. 11, '09	.25%
City of Cobalt	Ont.	300,000	1		138,375	May 15, '09	.01	N. Y. & Hond. Rosario.	C. A.	200,000	10	220,000	3,970,000	July 23, '16	.50
Cobalt Central, s.	Ont.	4,761,500	1		192,845	Aug. 24, '09	.01	Nipissing, s. l.	Ont.	1,200,000	6	900,000	14,340,000	July 20, '16	.25
Cobalt Lake, s.	Ont.	3,000,000	1		465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1		533,000	Feb. 1, '10	.02
Cobalt Silver Queen	Ont.	1,600,000	1		315,000	Dec. 1, '08	.03	Paloma, g.	Mex.	3,000			99,600	Dec. 1, '12	5.00
Cobalt Township, s.	Ont.	199,252	6		1,042,259	Aug. 20, '14	.24	Panuco	Mex.	10,000			7,465,000	Nov. 4, '09	5.00
Coniagas, s.	Ont.	800,000	5	400,000	8,240,000	Aug. 5, '16	.25	Panoles, s. g.	Mex.	120,000	20		6,451,687	Sept. 30, '13	1.25
Con. Mg. & Sm., g. s. c.	B. C.	53,650	100	420,517	2,740,654	July 1, '16	2.50	Perezgrana, pf.	Mex.	10,000	100		328,656	Sept. 1, '10	3.50
Crown Reserve, s.	Ont.	1,999,957	1		8,102,408	July 15, '15	.03	Peterson Lake	Ont.	2,401,820	1	84,064	340,257	July 1, '16	.01%
Dolores	Mex.	400,000	5		1,374,965	July 24, '11	.22%	Pinguico, pf.	Mex.	20,000	100		780,000	Apr. 15, '13	3.00
Dome Mines, s.	Ont.	400,000	10	400,000	590,000	June 1, '16	.60	Porcupine Crown	Ont.	2,000,000	1	180,000	600,000	July 2, '16	.03
Dos Estrellas, (El Oro)	Mex.	300,000	0.50		15,405,000	Sept. 30, '13	1.60	Providencia, (S. J.)	Mex.	6,000	15		963,360	Apr. 1, '08	1.00
El Favor	Mex.	3,500,000	1		210,000	Apr. 30, '14	.01	Rambler-Cariboo	B. C.	17,500	100	70,000	490,000	Aug. 15, '16	.01
El Oro, g. s.	Mex.	1,147,500	6		9,136,842	July 11, '13	.24	Rea Mines, Leasing	Ont.	200,000	1		12,750	Feb. 20, '15	.06%
El Rayo, g. s.	Mex.	260,020	2		140,410	Apr. 24, '11	.15	Right of Way	Ont.	1,685,600	1	16,855	560,614	June 18, '16	.00%
El Triunfo, c.	Mex.	2,000,000	1		20,000	Aug. 28, '11	.01	Rio Plata	Mex.	374,818	6		345,744	Feb. 1, '13	.06
Esperanza, s. g.	Mex.	450,000	10		13,521,230	Dec. 31, '15	.10	San Francisco Mill	Mex.	6,000	25		445,086	Oct. 15, '08	1.00
Oranby Con. c. g. & s.	B. C.	1,000,985	100		6,350,311	Aug. 27, '11	2.00	San Rafael	Mex.	4,400	25		6,798,260	Jan. 11, '12	2.00
Greene-Cananea, c.	Mex.	474,411	100	2,431,045	6,666,830	Aug. 28, '16	2.00	San Toy, s. g.	Mex.	6,000,000	1.00		540,000	July 24, '13	.01
Greene Con. c.	Mex.	1,000,000	10	2,500,000	12,544,000	July 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex.	1,600,000	5	364,500	2,819,772	June 16, '16	.24
Greene Gold-Silver, pf.	Mex.	300,000	10		194,871	Mar. 28, '07	.40	Sta. Gerty's Guadalupe, g.	Mex.	60,000			3,960,000	Mar. 27, '08	1.50
Ouanajuato Con.	Mex.	540,000	5		590,000	Oct. 6, '06	.07%	Sta. Maria del Paz	Mex.	9,600	12%		5,606,000	Jan. 2, '12	2.00
Guanaajuato Dev., pf.	Mex.	10,000	100		274,356	Jan. 1, '11	.20	Seneca-Superior	Ont.	478,941	1	622,549	1,543,761	Aug. 15, '16	.30
Guggenheim Explorat.	Mex.	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.85	Soledad, s. l.	Mex.	960	20		4,439,840	Oct. 17, '11	5.00
Hallebury, s.	Ont.	60,000	1		60,000	Apr. 6, '11	.60	Sortesa, g. s.	Mex.	19,200	20		3,979,240	Jan. 6, '11	34.00
Hedley	B. C.	123,000	10	120,000	1,948,520	June 30, '16	.60	Standard, s. l.	B. C.	2,000,000	1	400,000	2,200,000	Aug. 10, '11	.02%
Hinds Con. g. s. l.	Mex.	6,000,000	1		88,000	Feb. 27, '03	.12	Temiscamg' & Hud. Bay	Ont.	7,761	1		1,940,250	Nov. 10, '16	.03
Miner	Ont.	240,000	100	1,160,000	8,370,000	Aug. 14, '16	.60	Temiskaming, s.	Ont.	2,500,000	1	75,000	1,631,150	July 22, '16	.03
Jimulco, c.	Mex.	10,000	100		975,000	Aug. 27, '11	2.00	Teriutan, c.	Mex.	2,500	100		1,985,000	Jan. 1, '09	1.00
Kerr Lake, s.	Ont.	600,000	5	300,000	6,470,000	June 1, '16	.25	Tough-Oak	Mex.	531,500	6	199,311	265,750	July 3, '16	.12%
La Blanca	Mex.	140,000	20		2,775,700	Mar. 31, '13	.90	Tretheway, s.	Ont.	1,000,000	1		1,061,988	July 15, '14	.05
La Republica, s.	Mex.	400,000	5		110,000	Aug. 15, '11	.05	Wettlauffer-Lorrain, s.	Ont.	1,415,690	1		656,386	Oct. 20, '13	.05
La Rose Con. s.	Ont.	1,498,627	6	224,793	6,611,913	July 20, '16	.06	Yukon, g.	Y. T.	3,500,000	5	825,000	8,108,110	June 30, '16	.07%

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HOISTING WORKS OF THE RICHMOND-EUREKA.



SUMMIT QUEEN MINING CO.'S PROPERTY.

Review of Conditions in the Eureka Mining District, Nevada

A. G. HILLEN.

The mines of the Eureka district should be among the most productive in the state in the future as they were in the bonanza days of early pioneering. After an absence of 12 years, during which period there have been many changes and much development, the writer is more impressed with this condition than would be an ordinary visitor. Twelve years ago it was my privilege to go through the various old properties, make examination of their workings and study the formations, both underground and through the various geologic sheets, and by contact and much field work with many individuals who had been active in the early development, many of whom are still on the ground and active in mine development work.

Studying the same geologic sheets, and visiting the same properties and many others, and reviewing development during this period, much new light is thrown upon mining conditions here at this time.

In the earlier period one was struck with the enormous production of silver, lead and gold ores, and the difficulty of defining clearly the method of deposition of these ores, just where they might or might not be found, and defining the course, direction or extent of the fissuring or faulting of the formations. It must not be understood from these remarks that the work of Joseph Story Curtis, the geology expert of the government, who completed the survey in 1884, was not of an exhaustive character, or that his conclusions

generally were not correct. With perhaps one or two exceptions, which later development has thrown much additional light upon, Curtis' work is authoritative and complete.

To get a comprehensive view of Eureka district and mines, the topographical features may be briefly outlined. The center or greatest elevation of the district, Prospect mountain, 9600 ft., constitutes the great pivotal uplift of this area, and is situate 3 miles southwesterly from Eureka, south and east some 3 miles is the Secret canyon section, with Hoosac mountain intervening, 8500 ft., north of Prospect mountain and immediately contiguous is Mineral hill, and divided only by a small gulch on the north of Mineral hill, is Ruby hill, 7500 ft., where it has been stated there was found a \$50,000,000 outcrop of ore, perhaps the richest of any known mineral deposit in the state. Again to the north and at an elevation of 6500 ft. is Adams hill, distinguished by perhaps 200 different mine shafts and tunnels, nearly all of which produced or show ores of good grade.

The course of this plane, which with its adjacent spurs form an anticlinal fold, is nearly due north and south, except at Ruby hill, where it turns towards the west, and has a width of a half mile at its narrowest point, and more than $1\frac{1}{2}$ miles at its widest, being at least 7 miles in length, or from the Holly property on the north slope of Adams hill, to the

Geddes and Bertrand mine at the southern point in Secret canyon, 5 miles south of Eureka.

Development the past 32 years, the period since Curtis' examination and report, has gone steadily forward, with years of little or no great development, and others when development proceeded with strides and with important results. Perhaps the most active of any during this interval being the years 1907 to 1911, inclusive, when the consolidation of the Eureka Con. and the Richmond-Eureka was effected, these mines resuming development and shipments of a large daily tonnage during this period, and were purchased and operated by the U. S. Smelting & Refining Co. In 1911, the railway connecting Eureka with the main line of the Southern Pacific, was washed out by heavy floods, and a general financial depression prevailed throughout the country, and the mines were shut down.

This line of railway has been repaired, and its operation resumed, but with freight rates at \$20 per ton, and the smelters having more ores than may be profitably handled in the plants at Murray and Midvale, which are the smelting centers of the intermountain territory, the larger mines of the district still defer operations, though they are in excellent condition and may be started on 24 hours' notice.

Much Development in Recent Years.

Much development of vital importance to mining in the Eureka section has been consummated in recent years. Development of bodies of ore in contact with the porphyry, in contact with the rhyolite and in contact with what has recently been pronounced granodiorite by the University of Nevada, in contradistinction to the classification of Curtis as being granite, but which is probably a mineralized porphyritic granite, or at least a much altered granite. At this writing, it is a matter of discussion whether the rhyolite, or porphyry, or both, do not extend the entire distance from the north end of Adams hill, southerly to and beyond the Geddes and Bertrand property in Secret canyon. There are numerous outcrops along the strike of the formations, cutting both the limestone and quartzites over this area. In some places the rhyolite may be traced considerable distances; in others the only evidence of its intrusion is in underground workings, which are extensive and would probably aggregate more than 100 miles in this 7-mile mineral area.

There are numerous lime-shale contacts, rhyolite-lime contacts, fissures and faults in lime and quartzite and ore bodies in contact with porphyry in the lime, and with an extensive faulting or fissuring system the mines have developed, the Eureka district offers splendid opportunities for development of productive mines, and many large areas where outcrops of ore are numerous, including many properties that are only partially developed, but which have pay ore exposed.

This is the condition seen in making a trip around

the district. The intrusives undoubtedly created a condition which fissured the surrounding areas of lime, making possible the deposition of extensive bodies of rich ores, by replacement of areas in the "mineralized" limestone in chambers and caves, by deposition of ore in contacts and fissures and faults, and to an extent that is beginning to be understood and appreciated.

The district has produced more than \$50,000,000 in lead-silver and gold ores, and no great depth attained, most of the production coming from above the 600 and 700 levels. There are two or three shafts below this, but difficulties of pumping water has prevented extensive development below the 6th or 7th levels in these properties. A new 1000-ft. 3-compartment shaft has been sunk on the Richmond-Eureka, and the mine equipped with a fine hoisting plant, which will go to 3000 ft. Centrifugal compound high-pressure pumps are now at the plant ready for placing in the mine when operations are resumed.

On the west side of Prospect mountain, and portions of the Adams hill area, gold and silver ores predominate, while lead-silver ores, practically all of which carry gold, run through all the mines from the Bullwacker, to the Geddes in Secret canyon, and many thousands of tons of rich silver-lead ores have been shipped from the Silverado district, and beyond to Newark and the Hamilton district, 40 miles to the east and south.

Mining Development in Various Properties.

Richmond-Eureka, comprising the former Eureka Con. and Richmond groups, have probably 30 miles of underground workings, and have produced jointly something over \$40,000,000. The property, is owned by the U. S. Smelting & Refining Co., and is equipped with a large hoisting plant, machine shops, etc., costing upwards of \$200,000. These two mines were famous for their extensive ore bodies and rich ores. Underground chambers or caves were opened in development work, containing large bodies of ore, between the 300 and 700 levels. Practically all the ores of commercial grade were reduced in local smelters, or "lead stacks," as they were called, the evidence of which remains in the huge "slag" piles at several points in the district.

There can be no doubt but that these properties will again be put in productive condition, and that conditions favor as rich or richer bodies of mineral below the 1000 level, as formerly existed in the upper levels, and that the upper levels at the present time contain large bodies of low-grade ores. I. H. Rogers, of Eureka, is general superintendent of the Richmond-Eureka.

Next in point of importance is the Diamond mine, 3 miles south of Eureka, with some 40 miles of underground work, hoisting plants and equipment, both on the surface and in the various tunnel levels, and which has produced about \$4,000,000, most of which was shipped to the Salt Lake smelters. The property is

at present idle. The greatest depth in the Diamond is between the 700 and 800 levels. The property embraces a large area of patented ground. There are conditions at the Diamond that should make this one of the big properties of the district.

One of the late developments in the Eureka district has been the bonding of several well-known groups in and near the California and in California gulch, by a group of New Yorkers headed by Major Catlin, who is on the ground in charge of development. Machinery for complete hoisting plant has been purchased. The Old Dunderberg mine, the New Dunderberg, the Uncle Sam, and others, have all been segregated under Catlin's management. Ore bodies

reaching the 100 level, the ore is hoisted and shipped as broken in the mine, and these shipments are now running about \$65 per ton in carload lots. It is stated more than 50% of the purchase price has been paid in royalties since shipments were started, and there is no doubt they have opened a body of ore that will make huge profits. Some of the better grades will run up to \$200. A new hoist and engine equipment is being installed and new development planned.

Immediately adjoining is the Murphy lease on the Helen Mortimer claim. Here are two sets of lessees. Both are taking out shipping ore of practically the same character and grade.

Above the Mortimer is the property of the Hueb-



THE DIAMOND PROPERTY.



SUMMIT SOUTH OF DIAMOND PROPERTY.



ADAMS HILL, LOOKING SOUTH—ORIENTAL AND BELMONT MINES.



ADAMS HILL, LOOKING NORTH—HOLLY MINE IN DISTANCE.

are being opened up, new ground developed by shaft and tunnel, and ore is now being shipped by leasers from this group.

Within 100 yds. of the proposed shaft house and head frame of the Catlin property, leasers are shipping high-grade ore from the California property now under bond and lease to Rebellette & Kelly. Since taking hold of the property a little over a year ago, they have steadily worked the property, sinking and drifting on a body of low-grade ore, or iron capping, and have run a tunnel in about 50 ft., sinking 50 ft. where shipping grade ore was encountered. Since striking the ore about 20 carloads have been shipped, which ran well over \$50 per ton. At first the ore had to be sorted, but at present, and in fact ever since

ner Bros., now under bond to D. States, formerly of Salt Lake. The Huebners and A. Affranchino have been shipping from this property at intervals for more than a year, and have developed several faces of shipping grade of ore in four or five different drifts and raises. Running through the last three properties mentioned is a strong outcrop of rhyolite, with a strike a little west of north and east of south, that also appears on the Uncle Sam property, and is reported on the Hamburg mine to the southeast and at the Windfall mine, a mile farther southeast. Ore has been found in the contact and making in the lime in the California and Mortimer, and it is expected this contact will be cut in the Huebner claims in the lower development tunnel that is proposed. Fine

faces of shipping grade ore have been exposed in development of the Huebner claims. The illustration shows ore sacked for shipment at the mouth of tunnel and at the side of the road about 300 ft. distant. On this property there is an east and west fissure and north and south "break" or fracture showing mineral of good grade, all in the lime. There is a strong outcrop of rhyolite running parallel with and cutting through a portion of this property. The tunnel is now in 150 ft. The property lays between the California on the north, and the Diamond on the south, and was acquired early in 1915. A tunnel started on a heavy iron outcrop developed \$12 ore near the surface. Sufficient ore has been shipped to pay for all development and leave a good surplus for equipment.

The Silverado District.

The Summit Queen Mining Co. is planning extensive development work. This company, recently organized by Charles L. Broy, C. Johnson and associates, acquired the Queen and Result properties. This company also owns a group of claims known as the Summit, between the Diamond and Geddes and Bertrand, in the Secret canyon section, where a good grade of lead ore is sacked for shipment. The south 2000-ft. drift in the Diamond approaches the northerly line of the Summit. In this south drift a body of ore was developed and shipped said to have exceeded 18,000 tons of \$80 average grade. The Summit will be developed by both shaft and tunnel.

The Summit Queen Co. also controlled the Oriental and Belmont claims on Adams hill. Leasers are sacking and shipping ore from the Belmont. Much development has been done on both the Oriental and Belmont and a great deal of silver-lead ore shipped. In the early days the Belmont shipped quantities of lead-silver ore, but little depth was attained. At the Holly and Bullwhacker, at the northerly portion of the Adams hill region, large bodies of ore have been developed in the lime and, at or near the porphyry contact, and a great deal of high-grade ore shipped.

At the Marne group on Adams hill, Harris and Fine have developed bodies of shipping ore during the past several months. There are numerous workings on this property, some of which are connected underground, but the deepest shaft is only about 100 ft. It has been the practice of leasers on various properties (still being carried out in places), that when the ore bodies showed signs of depletion, to start work at some other point and fill up the older workings with waste from the newer workings, and there is no doubt that many workings on Adams hill would show good ore at the present time if the older workings were cleaned out. There has also been much caving of the older work. Harris and Fine are developing a very promising property, and are making shipments to more than compensate for the expense and labor involved.

Alex. Fraser, with his associates, has under de-

velopment the Wild West property, adjoining the Cyanide mine on the southwest, the property between the Wild West and the Marne on Adams hill. A large amount of ore has been shipped from the Wild West, and at present a drift is being run from the lower level to get under a big outcrop on the surface upon which a tunnel was driven in early days and much ore extracted. This drift will reach a point where the ore is expected in the next 50 ft.

The Cyanide property is equipped with hoisting plant and has an incline down 300 ft., with various levels and drifts, and gold-silver ore of good grade is being extracted.

Owing to limited space, a description of the Holly, the Bullwhacker, the Windfall, the Geddes and Bertrand, the Hamburg and others is omitted.

A. Affranchino & Sons, of Eureka, owners of the Pack Saddle group, are shipping \$40 lead-silver ore from the Lucia Tuffa, located in the mineral-bearing lime belt between the Hamburg and the Old Dunderberg mines, $3\frac{1}{2}$ miles southeast of Eureka, and on similar formations to the Richmond-Eureka. A strong fissure is being followed in the Lucia Tuffa and Pack Saddle southeasterly and northwesterly, and is mineralized throughout, so far as developed. Cross fractures occur leading off from this fissure to the shale, at intervals of from 50 to 150 ft. Along these cross fractures and in contact with the fissure the ores make and in contact with the lime and shale. In the contact the ores are heavily oxidized and occur in quartz and iron. Values run about \$7 gold, 1 oz. silver, 30% iron with some lead.

The Extension, adjoining the California, is owned by M. Murphy, and Ban Repetto and Alf. G. Repetto have shipping grade of ore. The property is developed by tunnel, shaft and drifts, the shaft being in the tunnel about 200 ft. Shipments averaging \$45 per ton, and a carload per month are reported.

The Silver group, comprising claims 1, 2 and 3, on Adams hill, is owned by Ban Repetto and associates, and have a big iron outcrop, showing values, and is considered a very promising property.

M. Murphy and Phil Paroni have a property adjoining the Silver group on Adams hill, showing considerable development in varying grades of ore carrying lead, silver and some gold values.

Business and mining men of the Eureka mining district have organized a mining bureau for the dissemination of information of reliable and authentic nature covering mining operations in this section. The Eureka Mining Bureau is composed of the leading operators of the district and every attention will be given inquirers desiring information.

The occurrence of mica deposits in many countries insures future supplies of mica for the world for years to come, and the numerous undeveloped mica deposits of the United States may be considered among these resources.

The Atmospheric Problem in the Deepest Mines

G. CHAMBERS.*

The mines spoken of, the deepest working mines in the world, are in Brazil. The problem of reaching depths considerably greater involves mainly the question of human endurance. The system of distribution of the air is becoming, as greater depth is attained, defective and requires modification. On rare occasions the downcast air at the bottom of the mine is comparatively low in moisture, by the time it has passed over two horizons. Consequently the efficiency of the men on the stopes above is considerably impaired; in fact, 86° wet bulb (which represents the conditions of, say, horizon 16, at any rate during the rainy season) is supposed to be the limit at which men can work with full efficiency, and as the mine deepens this will, of course, be more seriously felt. But by largely increasing the volume of air passing through the deepest explorations, and by leading the allotted quantity (after it has passed over the stopes of one horizon, or at the outside two) directly to the upcast and away to the surface, instead of passing it over the stopes above as in the old and existing system, the best possible conditions will be obtained.

Due to the fact of our now being in a much better position as regards the mainway into depth, namely, of its being in advance of the explorations, Captain Watts has proved that it is possible to work each block by one vertical winze only, and our calculations show that this one winze and a steel pipe of 3 to 4 ft. in diameter will, with the eastern paved airway, give ample ventilation to the stopes during the working out of a block of mineral. Consequently, one winze for mineral and filling to act as a temporary upcast, which during the working out of each block disappears as the mineral is removed, is sufficient for the mining operations, and by sinking another vertical winze from one horizon to the other, never less than 50 ft. from the average line of the north wall of the lode, and some connecting tunneling, a permanent return airway will be formed at a cost no greater than that of the old system working out each block with two vertical winzes and a western wood-block airway and the eastern paved airway, as the large saving in the temporary western airway in the form of a 3 to 4 ft. steel pipe over the wood-block airway formerly used is more than sufficient to pay for the tunneling between the top of one permanent upcast winze and the bottom of the next, and that connecting the temporary winze with the permanent. There is another advantage in this system—namely, that when it is completely established we have a second permanent way into depth from horizon 17 down.

It was difficult to determine the point at which

the improved system should commence, but for various reasons No. 23 winze offers the best opportunity for an independent upcast airway, and consequently it has been decided that the new system should commence from this point.

The benefit of the proposed alteration in the ventilating system will not be felt on the blocks of mineral to be worked out from horizon 17 up, but from 17 down. Those of us who have been responsible for the reopening of this mine from surface to its present depth of 5826 ft. have had the opportunity of realizing the steady rise in temperature as the depth has increased and have been frequently reminded of the difficulties in store for us, especially at such times when an inadequate volume of ventilating air had been passing over the stopes or through explorations, caused by the partial closing of airways, the failure of fans, or by the explorations progressing more rapidly into depth than the main ventilating system. However, for many years it was possible to keep down to a reasonable figure the temperature to which the miners were subjected, and it appeared that by increasing the volume this condition could be maintained.

In the first place, natural ventilation was sufficient, later, furnaces had to be adopted during the hot season to assist the natural ventilation. As the mine became still deeper a Capel fan was installed at the top of the upcast "C" shaft to ensure a more constant volume of air. Finally, a Sirocco fan of large capacity was installed in place of the former, the output of which could be increased by additional power when required. Besides this, auxiliary fans are used on all explorations beyond the main system.

The existing ventilating system, which is referred to above as not satisfactory at the present depth, was forced upon us at a time when a more elaborate one of an entire independent airway from surface down, which naturally recommended itself, would have been too expensive. The former represented the cheapest means of ventilation, and until quite recently met the case satisfactorily. As depth has been attained the necessity for modification in the distribution of the air becomes imperative. The lode has so far shown no signs of failure in size or value in the lowest explorations. The prospects of this company being able to work it profitably to a great depth seem only to be limited by cost of winding, hauling, handling, mineral and other engineering matters.

It was decided some years back to institute investigations with the object of obtaining information as to the increasing air and rock temperatures and add to cost the deeper the mine is sunk. Bore holes were made, and the temperatures taken.

From the temperature readings we were able to

*Superintendent of Morro Velho Mine of the St. John del Rey Mining Co.; excerpts from report.

construct a rock temperature grade as a guide to what we might expect in depth.

As before stated, without this rise in temperature from the rock and other causes, the probable running engineering expenses in working the mine down would not mean a very serious increase, and this has proved itself in practice as far as we have gone. Supposing the lode continues the same in size and value to horizon 20 (a vertical depth of 7626 ft.) it could be worked profitably to that point and even a much greater depth, but from the grade on our temperature chart the rock at horizon 26 would be no less than 126.5° F. at the moment of opening.

We have, of late, realized from practice that the best we can now expect in the absence of artificial cooling would be a point where the efficiency of the men would be affected.

The temperature of the rock that had been laid open and exposed to the ventilation for some time year by year fell to some extent, but the deeper we went the cooling effect of the ventilating air would become less efficient, as we were year by year largely increasing the rock area; but beyond certain reasonable limits we could not increase the volume of the air, and consequently, unless the air could be artificially cooled on surface, advantage being taken of the operation to deprive it of some of its moisture, the possibility of working the mine to horizon 26 would be small, unless the working hours were reduced by the introduction of four shifts in the place of three. It was decided to make further efforts in obtaining more reliable information as regards this important question so as to arrive at the most economical and efficient means of reducing both the temperature and moisture of the atmosphere within the mine.

The increase of air temperature, due to the air becoming more dense as it passes down the mine, showed under normal conditions an increase in rock temperature of approximately 1° F. for every 180 ft., while the increase in rock temperature is approximately 1° F. for every 125 ft.

During the cold season an experiment was tried by night, when the temperature was considerably below the normal, in which a known volume of air was passed through a measured distance of the adit tunnel into the mine, the rock temperatures being taken throughout the distance of the tunnel and period of trial, and at the end of 5 hours it was interesting to find that a considerable fall in the rock temperature had taken place, and it would no doubt have continued to do so to some extent had it been possible to maintain a supply of cool air, but as the sun rose the air became warmer and the rock rose again to its original temperature.

The drying of the air has always been considered necessary in conjunction with the cooling operation, but its importance was not so fully understood until information was gained from a valuable paper by Prof. John Cadman. Unfortunately, the drying of the atmosphere is somewhat antagonistic to a satisfactory solution of the dust question, which necessitates watering of the roads and stopes to keep down the dust. However, the proposed distribution of the air, previously referred to, will apparently do far

more to overcome the dust trouble than the drying of the air will make against our efforts in this respect, as the allotted quantity of air, after passing one stope or at the outside two, will go directly with what dust it has taken up, to the upcast and away to the surface, instead of the present system, in which the same air passes the bottom stopes, thence over the remaining stopes, with some slight addition of fresh air at each horizon, but accumulating dust all the way, until it finally reaches the highest stope, and thence goes to surface.

The actual necessities as regards cooling and drying to ensure that as greater depth was attained the miners would work in a perfectly healthy atmosphere (even more so than in the upper sections) having been appreciated, the next point to determine was where the operation of cooling and drying should take place. Some advice had been offered to the effect that it would be most advantageous underground, and it is true that some benefit would be derived from this; but the increase in mechanical appliances underground represents a serious obstacle to our particular form of mining operations, and, further, on account of our principal cooling agent (water) being found on surface in abundance, while underground there is very little, and that at a high temperature it has been decided that the cooling plant should undoubtedly be installed on surface.

Eric Davies, whose duty it has been to carry out the investigations, has also been entrusted with the designing of a plant which we consider most suitable for the purpose, and careful study has led to the proposing of this plant, not for extreme cooling or drying of the air, but one in which each operation will be performed to the most economical point, at the same time making use of ordinary cooling appliances which in practice have long since proved their reliability in cold storage, dry blast for furnace and other installations, and in consequence it represents a thoroughly practical scheme, which will effectually remove the one serious obstacle against the company being able to work the mine to a great depth. As regards the necessary power for driving the plant, this is not excessive, amounting to approximately 400 h. p., and as to the provision of this power, with that of 200 h. p. for ventilation, and other additions necessary for the working into depth, it has been satisfactorily arranged for.

The mine captain considers the efficiency of the miners is very little affected so far, and the writer is inclined to think that men who have been used to the damp, hot climate of Brazil for some years are probably more capable of working efficiently in 86° wet bulb temperature than men in England accustomed to a damp, cold climate on the surface. Often enough in the hot season here the change from surface to the bottom of the mine is only slight, but the change in England would, of course, be a far more severe trial. Even in the hottest places in the mine the contractors are eager to work 12 hours, and had it not been for our complying with this to some extent we should have lost our men. It is, however, evident that in spite of the apparent possibility that this climate is favorable to the efficiency of men working in hot mines, 8 hours is quite sufficient for steady workers at the present depth.

American Institute Holds Successful Meeting in the Southwest

Members of the American Institute of Mining Engineers indulged in an enjoyable novelty last week when they went to the great mineral southwest to hold their annual session. Starting at New York City on last week Thursday evening the party arrived at Chicago where the Chicago section of the Institute entertained the delegation with an automobile ride over the city's boulevards and through the various parks. After a 2 hours' ride dinner was served in the La Salle hotel. With 60 persons in the party a start was made in the evening for El Paso.

Attached to the special train was the private car of Benjamin B. Thayer, president of the Anaconda Copper Co. and past president of the Institute.

Through the courtesy of Carl Scholz, president of the American Mining Congress, members were given an opportunity to study the geological conditions and mineral resources of the country through which they were passing and its environs by the use of a geological map. At Kansas City, Mo., on Saturday morning, the party was joined by the Missouri delegation.

El Paso was reached on Sunday afternoon and the visitors were met by a reception committee, which had supplied automobiles for an inspection of the city's points of interest. In the afternoon the party was guided through the smelter of the American Smelting & Refining Co. by Karl Eilers. In the evening a typical Mexican dinner was served.

Arriving at Santa Rita Monday, the morning was spent in inspecting the pits of the Chino Copper Co. Following this visit the party was taken in automobiles to the mills of the Empire Zinc Co., which demonstrated new magnetic processes to the visitors. A 10-mile auto trip through a section of the valley now being opened by prospectors completed the morning's program.

Upon arrival at Hurley, 2 hours were spent in a study of the methods of the Chino Copper Co.'s mill.

Tuesday was spent in Douglas and the smelting plants of the Calumet & Arizona Mining Co. and the Copper Queen Con. Mining Co. were inspected. The first of the technical sessions of the convention were held here on the general subjects of "Smelting" and "Leaching." Before the opening of these sessions the several hundred attending members visited the reduction works of Copper Queen Con. Mining Co. and of the Calumet & Arizona Mining Co.

A. G. McGregor, of Warren, Ariz., in an address on the "New Copper Smelting Plants in Arizona," told the engineers that in Arizona during the past 5 years there has been more activity in copper-smelting plant construction than in the same length of time in the history of the world. Mr. McGregor said that

in this period five new copper-smelting plants had been constructed and put into operation. The monthly output from these plants, he said, averages from 5,000,000 to 18,000,000 lbs. He then described new problems which had been met successfully and new features in plant design and equipment which had been developed.

At the evening session on "Leaching," Frederick Laist and Harold W. Aldrich described the 2000-ton leaching plant at Anaconda, Mont. A paper on "Possibilities in the Wet Treatment of Copper Concentrates" was read by Lawrence Addicks, and "Leaching Tests at New Cornelia" were discussed by H. W. Morse and H. A. Tobelmann. In the course of the day's proceedings John C. Greenway welcomed the members to Arizona and L. D. Ricketts, president of the Institute, responded for the delegates.

A further handicapping of the chemical industries and the paint and dye manufacturing interests of the country, due to a lack of manganese ores, was predicted at the Bisbee meeting on Wednesday. This statement was contained in a paper by E. C. Harder of the U. S. Geological Survey, presented to the Institute members for discussion.

Mr. Harder's treatise explained that even at the beginning of the European war there had been a great decrease in imports of both ores and alloys of manganese and that since 1914 the price had risen from \$37 per ton to \$100 per ton with ferromanganese selling considerably higher.

Another feature of the session was the statement in a paper by David B. Reger, of the West Virginia Geological Survey, to the effect that "the exhaustion of oil and gas in the United States is proceeding at a rapid pace." Mr. Reger predicted that this problem will first be partially solved by securing of deeper producing horizons in the high-grade oil regions and later by the possibility of mining deep sand oil and gas.

Other papers attracting considerable attention of the delegates were: "The Geology of the Warren Mining District," by Y. Bontillas, J. B. Tenney and Leon Feuchere; "Co-operative Effort in Mining," by Joseph P. Hodgson, and "Gold and Silver Deposits in North and South America," by Waldemar Lindgren.

In this last paper Dr. Lindgren stated the conclusion that the South American mineral resources in precious metals are less than those of the northern continent and that "even progress and enterprise will be unable to raise its production to approach the figures attained by North America."

Possible means of developing the flotation process to the greater benefit of the country's mining inter-

tests were taken up in the sessions held at Globe. Conclusions reached by the delegates, who include representatives of 20 of the leading metal producing companies of the country, were to the effect that the flotation process is now in its infancy and that with the further discovery of new flotative agents and generous expenditures a brilliant future record could be obtained for this process.

During a part of the day the visitors descended many hundred feet into the mines of Old Dominion Copper Co. and later visited the reduction works of this company. During the evening technical sessions were held on the subject of "Fine Grinding" in which F. C. Blickensderfer of the Detroit Copper Mining Co. described a comparative test of the Marathon, Chilian and Hardinge mills.

Flotation discussions were particularly important to mining interests because of the first public presentation of a report of experiments on several miscellaneous wood oils which seem adaptable to use in the flotation process. A statement of some of the values of these oils was presented by R. C. Palmer of Madison, Wis., Glenn L. Allen, of the Shattuck Arizona Copper Co., and O. C. Ralston, of the U. S. Bureau of Mines.

Another especially striking feature of this discussion was a description by Dr. Rudolf Gahl, representing the Inspiration Con. Copper Co., of the exhaustive research and experiment of his company in an effort to develop the flotation process. Said Dr. Gahl, "The flotation process is in its infancy. In what direction future changes may take place is perhaps indicated by tests which have been made partly on a laboratory scale and partly on a somewhat larger scale. The fact that the Inspiration Co. has been able to design a commercially successful flotation plant must be attributed to the policy of spending great sums of money for the purpose of investigating the flotation process on a commercial scale."

A serious gasoline shortage on the Pacific Coast, the effect of which would extend throughout the entire country during the next year, was predicted at the Globe session. W. R. Hamilton of San Francisco presented the gasoline industry data to the engineers. According to Mr. Hamilton the only possible means of increasing gasoline production is by increased production of either light oil or casing-head gasoline, lowering the grade of market gasoline, or by successful innovations in refining methods. Most of these solutions Mr. Hamilton explained as impracticable in the immediate future, although stating that by lowering the grade production could be increased 30 to 50%. He attributed the future gasoline shortage to decreased production of refinable oil (the decrease amounting to 6,000,000 bbls. in 1915), steadily increasing consumption, the discontinuance of imports and the heavy exports due to the war demands.

During the course of the meeting at Globe the mining engineers heard the value of chemistry to the

coal mining industry in a paper by Edwin M. Chance. Mr. Chance's conclusions showed that Americans have in the past been purchasing coal on its looks rather than because of its heating power. He made public results of experiments which showed dull appearing coal to have better heating and burning properties than the bright coals which have formerly demanded premiums in the market. It is said that this discovery will greatly help to offset the cost of coal production without materially increasing the costs to the consumer.

On Friday visits were made to the reduction works of the International Smelting & Refining Co., the Inspiration and the Miami companies.

On Saturday a trip by automobile was made over the Apache trail, and a visit to the Roosevelt dam. Dinner was served at Phoenix.

Leaving Phoenix Saturday night the party reached the Grand Canyon early Sunday morning where the day was spent, and from which point the visitors departed for their homes.

Leading metal producing companies from all sections of the country were represented by members of their staff at the meetings. The country's record production of metal during the past year has greatly stimulated the interest in those general mining topics which were discussed at the Institute's sessions.

Some seventy papers were prepared for discussion, bearing largely upon new methods of production and the mining outlook in various parts of the world. Some of the most important of these are:

Automatic Operation of Mine Hoists as Exemplified by the New Electric Hoists for the Inspiration Copper Co. By H. Kenyon Burch and M. A. Whiting.

The Water Problem at the Old Dominion Mine. By P. G. Beckett.

Power Plant of Burro Mountain Copper Co. By Charles Legrand.

Geology of the Warren Mining District. By Y. Bonillas, J. B. Tenney and Leon Feuchere.

Flotation Concentrate at Anaconda, Mont. By Frederick Laist and Albert E. Wiggin.

History of the Flotation Process at Inspiration. By Rudolf Gahl.

The Advent of Flotation in the Clifton-Morenci District, Arizona, 1914-15. By David Cole.

Comparative Test of the Marathon, Chilian and Hardinge Mills. By F. G. Blickensderfer.

The Inspiration Plant, Concentrator and Other Surface Equipment. By H. Kenyon Burch.

The Buffalo Mines, Ltd., at Cobalt, Ontario, will put in operation a 600-ton flotation plant within a few weeks. It is being constructed to treat 150 tons of concentrates and 450 tons per day from the tailings piles. The tailings will be conveyed by belt, loaded by a 12-ton locomotive crane, with 1-yd. clam shell bucket. Grinding will be done by four long tube mills in closed circuit with Dorr classifiers. Callow pneumatic flotation machines will be used, consisting of four 2-compartment, treble length, rougher cells and four 2-compartment cleaner cells. Each rougher cell in conjunction with one cleaner cell will have a capacity of 150 tons per 24 hours.

Making Mine Engineering Calculations

The mine engineer or contractor, as a rule, is alive to and keenly interested in time and labor saving methods and devices which have to do with operation and construction. Show him a machine or a system of operation that will enable him to do more and better work on a job with less effort and expense and you will always find him attentive and receptive.

But with respect to the office end of his work, he is not always so progressive. His methods of accounting are too often crude and insufficient. The accounting and estimating departments are commonly regarded as an overhead expense—necessary of course,

mind does not work that way. It is not a machine and cannot therefore be depended upon for mechanical accuracy. The assembling of figures in any form—addition, multiplication, division, subtraction—is purely a mechanical process. This is true, not only in a theoretical sense, but in a very practical sense. The proof of it is found in the extensive use made these days of adding and calculating machines in all the problems of accounting, including the calculations of engineering and contracting.

An ore stripping contractor not long ago, was surprised to find that he had lost money on a contract



A COMPTOMETER DESK IN MINE ENGINEER'S OFFICE—MAKING PLAN AND ESTIMATE CALCULATIONS.

but incapable of being converted into a constructive force for increasing profits.

Naturally there is a desire to reduce this expense as far as possible—an end desirable in itself, but economic only when achieved without loss of efficiency. If the same logic were applied in the solution of this problem as is habitually employed in the reduction of expense of development in construction work, much economy would result. But the trouble is that while the advantages of mechanical appliances for multiplying the product of manual labor are fully recognized, the idea of handling figures by machinery has been much slower of adoption. Usually the mine accounting office is about the last place to receive attention when improved methods are being considered.

Whether a property shows a profit or loss often depends upon the care and exactness with which the operating cost estimates are prepared. A mistake of calculation may prove disastrous. Accurate figure work is therefore of the utmost importance. A machine always does the same thing in exactly the same way. That's what "machine precision" means. The

which should have yielded a fair profit. The job was put through without a hitch according to plan. The estimates had all been carefully figured and checked in the usual pencil and paper way, and it did not seem possible that a serious error could have been overlooked. Nevertheless on the suggestion of a friend, the figures were gone over again, this time with a machine. It was then discovered that, besides several minor errors, that a mistake in extension of over \$2000 had escaped.

To err is human, but to provide the best safeguard against error is the part of business prudence.

The figuring of costs on engineering work and mine or mill operation requires a large amount of clerical detail; yet without a clear analysis of the cost of material, labor, operating and overhead expense, the price must be more or less guess work. Costs of contracting work can only be obtained by the keeping of careful records of all operations. The more complete the distribution in the recording of expenditures, the easier it is to analyze the cost of each element of construction. It is obviously of great advantage to

the contractor to be able to go over a completed piece of work and with the figures before him, see just what was spent in materials and labor on each part of the job. By this means, he is able to observe mistakes of judgment, mismanagement, or faulty estimates and so forestall their repetition in the future. Every contractor, big and little, knows the value of such information.

Why, then, are they not more interested in securing it?

The answer is, "It costs too much—can't afford to spend any more money on clerical work." This objection is valid only when based upon the old and laborious method of mental calculation. Where the machine idea for handling figures has been adopted in contracting offices, it has been found that the scope of the accounting department has been largely expanded without increasing the expense. This is made possible by the greater speed with which all calculations are handled on the machine.

In a certain engineering office the estimates were formerly figured by two expert mental calculators who found it difficult to keep up their work. One young man with a machine is now doing all this work with time to spare. Like results were obtained in another office on figuring payroll.

Time is often an important factor with an engineer when an estimate has to be prepared in a hurry. There is a big chance for error at such a time. Good contracts have been lost simply because the office force could not make up the figures in time, when it would have been an easy matter to have figured and checked the whole estimate with a machine in the time required.

The average engineer or contractor does not need or want an elaborate or cumbersome system. The system he has developed is usually best suited for his particular needs. What concerns him most is the means for handling the work involved most expeditiously. He can't go wrong if he applies the same principle to the office that makes a success of his outside work: Let machines do the machine work.

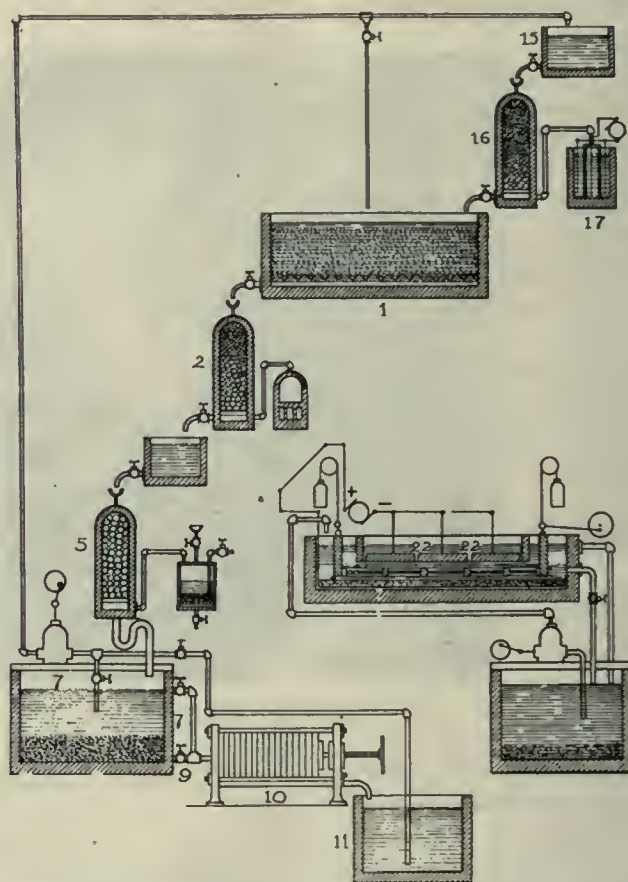
Electrolytic Extraction of Copper.

Cheap precipitation of copper, with simultaneous regeneration of the acid in amount sufficient for a cyclic process, are features embodied in an apparatus devised by William E. Greenwalt, Denver, Colo. At the same time the system overcomes the difficulty of foul solution usually in such electrolytic processes. Explanation of the accompanying diagram will make clear the essential features of the idea, upon which he has received patent.

In the vat (1), the ore is treated with an acid solution and leached. The copper, mostly in the form of cupric chloride, is then filtered from the gangue and passed into a reducing tower (2), to be treated with sulphur dioxide, the copper, iron and other salts being

reduced to their lowest valency. Next, the cupric acid, also containing considerable free acid, passes into a storage tank from which it is delivered in a continuous stream to precipitating tower (5), where it is precipitated with hydrogen sulphide. The precipitate is next allowed to settle in tank (7). The regenerated acid solution is then filtered in filter press (10), the clear liquid being stored in tank (11). From here it may be pumped into tank (15).

This regenerated solution contains all its salts at lowest valency but contains also some hydrogen sulphide. To make it more effective it is oxidized in tower (16). If there is gold in the ore, or if free chlorine is desired in the solution to act on silver in the ore,



METHOD FOR ELECTROLYTIC EXTRACTION OF COPPER.

the chlorine is produced from a salt solution by the electrolyzer (17).

The precipitate in tank (7) is now washed and filtered and treated in electrolyzer (18). The insoluble anode is a lead sheet covering the entire bottom of the tank, and on this the precipitate is placed.

The cathode consists of thick sheets of copper (22) suspended in the solution above the anode, a diaphragm being placed between the two. By oscillating the diaphragm, sufficient agitation is obtained to remove the sulphur in the solution.

Zinc dust oxidizes rapidly, asborbs hydrogen and is chemically very active, resulting at times in spontaneous combustion or explosion.

Chicago Meeting American Mining Congress

The American Mining Congress at its nineteenth annual session which opens in Hotel La Salle, Chicago, Nov. 13, will endeavor to definitely formulate the long-sought-for and long-fought-for revision of the mining laws of the country.

Dr. Foster of Illinois, chairman of the House Committee on Mines and Mining, will be in attendance and will report on the actual progress made on this subject by Congress giving the objections raised to many of the contemplated changes, and his ideas as to what can be passed through both houses of Congress.

The first appeal made by the American Mining Congress for a Bureau of Mines was backed by less than one-twelfth of the members of the House of Representatives. But on May 16, 1910, the bill was signed by the President, and on Feb. 25, 1913, an amended bill was signed covering more particularly the western situation.

Since that time the efforts of the American Mining Congress have been directed in part to securing adequate appropriations for the work of the Bureau. And this struggle has been no easy one, but on the whole extremely satisfactory.

One of the great works of the American Mining Congress is, however, along the lines of planning legislation which provides greater safety for the lives of the men engaged in coal and metal mining operations. The results of the legislation initiated by the American Mining Congress has reduced by nearly one-half the number of men killed per million tons of coal produced. Acting on the humanitarian impulse created by this movement of the American Mining Congress the big organizations of the country have almost without an exception introduced the splendid "Safety First" efforts which have been so productive of good results everywhere.

The American Mining Congress has secured the adoption of laws by many states east and west making misrepresentation of mining stocks a misdemeanor.

It has prepared comprehensive laws for the use of electricity in mines. That which applies to coal mining operations has been adopted as a whole by Pennsylvania and has been considered by other states. Its model law for the creation of mine drainage districts, its work for substantial aids to state mining schools, its protests against federal interference with water power, its comprehensive investigation of mine taxation, are but a few of the many laws which it has so successfully espoused.

The American Mining Congress at the coming session plans to devote considerable attention to the oil industry. The general meetings are to be held in the mornings, and the sections devoted to oil, coal, lead and zinc, copper and precious metals, are to meet every afternoon in their own assembly rooms at the hotel. One of the special questions in the oil

section will be that relating to the rights of the western oil claimants upon lands withdrawn from entry and upon which large development has been made.

But there will also unquestionably be an emphatic protest against policies of the government in the proposed creation of naval oil reserves, and more particularly against the policies which work gross injustice to oil claimants who located their claims and carried on development work under the provisions of then existing legislative conditions.

The government is sending its greatest experts to this convention. There is also the hope that both Secretary of the Interior Lane and Secretary of Labor Wilson will be present and take part in the important discussions. Van H. Manning, Director of the U. S. Bureau of Mines, will deliver an address on "The Past and the Future of Mine Safety Work." This will emphasize the tremendous advance already made through the efforts of the congress and the bureau in the way of safety methods, and outline the greater needs of the future.

W. S. Gifford, Executive Director of the U. S. Commission on Industrial Preparedness, will deliver what promises to be a notable address on "Efficiency in the Handling of Productive Forces." Chairman E. T. Hurley, of the Federal Trade Commission, will speak on "The Work of the Commission and the Mining Industry."

In all of the "sectional" meetings the experts will be present to advise. Dr. F. G. Cottrell's address on "The New Things in Science" will be one of the most comprehensive résumés ever given of the accomplishments of the past few years. C. E. Siebenthal, of the U. S. Geological Survey, is also one of the government experts who has promised to attend.

Dorsey A. Lyon, oil flotation expert, will talk on that topic.

The programs for the general meetings and those for the "sectional" gatherings under "Zinc and Lead," "Precious Metals," "Coal" and "Oil" have now been supplemented by three meetings of "Copper" men.

An assembly hall in Hotel La Salle has been set apart for this section, and its first meeting will take place Tuesday, Nov. 14, at 2 p. m. This will be presided over by Hon. Wm. A. Clark. The principal addresses for the first session will be on "The Copper Resources of the United States," by Walter Harvey Weed, of New York; "The Future of Copper," by Thomas F. Cole, of Duluth, Minn., and one on the "Relation of American Copper Supply to Industrial Development," by a speaker of prominence in this industry.

On Wednesday afternoon in this section the address on "Copper in Its Relation to Preparedness" will be by C. F. Kelley. R. C. Gemmell, of Salt Lake City, is to have an address on the question,

"Should the Export of Copper at Production Cost Prices Be Discouraged?"

Another address of the day will be on "Copper in Its Relation to Industrial Efficiency."

On Thursday in this section, Dr. L. D. Ricketts will preside. The principal address of the day will be on the question, "Should Combinations Be Fostered to Command for Export of Copper a Price Commensurate with Its Actual Value in Commercial Development?" Every effort is being made to have John D. Ryan, of New York, talk on this topic. Another address of the day by an expert is on the subject, "Relation of the Federal Government to Copper Export."

Safe Insulation is Important.

From an industrial safety standpoint few factors are of more importance than correct insulation. As early as 1875 the Dickinson Mfg. Co., Springfield, Mass., and ever since, has made thorough researches to discover insulations best adapted to special uses, having in view quality and safety.

Following are a few of the compositions which have been evolved and which are capable of the widest application, and there is hardly an industry that cannot make profitable application of one or more of them.

Stern-Condensite is one of the latest developments in the field of moulded insulation. The raw Condensite is produced by a reaction between phenol and formaldehyde. This is the first phenolic condensation product made free from water or the impurities incident to manufacture.

Condensite is a high-grade plastic which can be readily moulded in its uncured state into an infinite variety of shapes, with or without metal inserts. It leaves the molds, cured under heat and pressure, presenting a polished, hard rubber appearance, however much stronger mechanically. It possesses high dielectric resistance, withstands most acids, except nitric, sulphuric and strong hydro-fluoric. Climatic conditions do not affect it, and withstands heat up to 350° F. without softening.

Sternoid, the invention of Kurt R. Sternberg, manager of the company, is designed to meet the demands for rough usage and service, and withstands temperature of 500° F. Like Stern-Condensite, it is very strong mechanically, and can be moulded into a variety of shapes containing metal inserts.

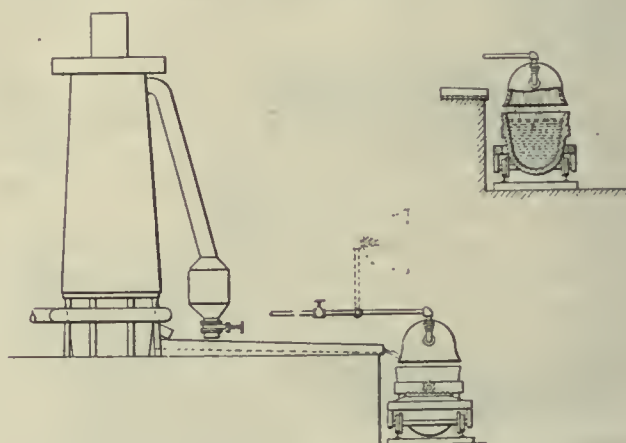
The company uses a number of other compounds for various uses. All these products are capable of an infinite variety of uses for the electrical trade and many others.

The main function of slags is to separate gangue stuff or impurities from metals, and to protect them from injurious action of gases or other substances while they are heated to high temperatures. Being poor conductors, they conserve heat by retarding radiation from the body of metal they cover.

Saving the Values in Flue Dust.

Flue dust from the reduction furnace contains a considerable percentage of metal ordinarily considered as waste product. A method of saving this waste by means of a simple apparatus is described in a patent recently issued to Samuel L. Boggs, Pittsburgh, Pa. Not only flue dust but any other fines which have been stored may be treated in this way. The principle of operation is quite simple, making use as it does of the molten metal incident to reduction in the main furnace, coupled with a blast of gas generated in the same furnace.

The flue dust or fines is mixed with the molten metal as it comes from the furnace. A considerable percentage of the metal in the dust will be reduced immediately. Some, however, will not be reduced in this way and will float on the surface in the form of a matte. It is to this matte that the gas blast is ap-



METHOD OF SAVING VALUES IN FLUE DUST.

plied, completing the reduction. This gas, carbon monoxide, in addition to its great heating powers, has other properties making it peculiarly effective in the reduction.

The illustration indicates the simplicity of the apparatus required. From the top of the blast furnace, the dust falls through a slanting pipe to a collector box having an ordinary outlet valve at the bottom. The molten metal is drawn from the furnace by a spout into an inclined trough or runner leading to the ladle car.

The dust is mixed with the molten metal in the trough where a large proportion is reduced. That which is not reduced forms a matte on the surface in the ladle car. To apply the gas to this matte and complete the reduction, a peculiar bell-shaped hood is arranged so that it can be lowered over the surface. Gas is piped into this hood from the furnace, being ejected downward, as shown in the detail drawing, with sufficient force to agitate the surface and quicken the reduction process.

Lead melts at 327° C. and boils at about 1500° C.

Operations in the Tintic District, Utah

W. A. SCOTT.

Chief Con. Mining Co., Eureka, Utah, of which W. Fitch is president and general manager, gives some interesting data concerning operations for the first 6 months of 1916. In development work there were 9091 ft. of drifting and 600 ft. of raising. Ore shipments amounted to 42,144 tons, yielding \$742,057, after freight, sampling and smelting charges were paid. The metallic contents of these ores were as follows: Gold, 5225 ozs.; silver, 843,535 ozs.; lead, 8,450,932 lbs.; zinc, 519,798 lbs.; copper, 1795 lbs. The assay values were: Gold, 0.124 oz. per ton; silver, 20.02 ozs.; lead, 11.79%; zinc, 30.36%; copper, 1.95%. This gave a gross value of \$30.08 per ton and a net value of \$17.61 after deducting transportation, sampling and smelting charges.

Cecil Fitch, superintendent, reports that a considerable portion of ore now being produced is taken from the flat deposits between the 600 and 800 levels, and that stoping progresses on 900, 1000, 1200 and 1400 levels. A body of zinc ore of good grade was lately exposed on the 1000 level. The ore system between the 1550 and 1800 levels has been developed northward to a considerable extent, where new ore bodies have been opened at the 1800 level, and has been partly proved up to the 1600. It has also been followed to water level at 1820-ft. depth. About one-third of the output is being taken from this part of the mine. A system of development is being carried out on numerous levels, amounting to 2000 ft. per month.

All drifting is being done under contract. Mining in the big stopes, amounting to four-fifths of the mine production, is carried on by company force; the other one-fifth is the result of 3-months leases, of which there are a good many. These are let in 100-ft. squares. The company hoists all waste for leasers, but charges for hoisting ore and for material used. It takes a certain royalty out of the net smelter returns, paying the leaser the balance after deducting charges. These leasing operations result in a systematic clean-up of minor ore bodies throughout the mine.

Geological data concerning the Chief Con. holdings and contiguous territory are constantly being worked up by G. W. Crane, company geologist. By this means the operations have been extended and new groups are being developed. One of these is at Homansville, 2 miles east of Chief mine proper, where the Homansville shaft is being sunk under contract by Walter Fitch, Jr., Inc., organized to do mine development and tunneling. This is a 3-compartment shaft, 6 by 16-ft. outside dimensions, which on Aug. 19 had reached a depth of 335 ft. In this work some new records were made. During 8 consecutive days of 3

shifts an average depth of 9.73 ft. per day was made; and for July an average of 8.26 ft. per day was sunk, amounting to 256 ft. in 31 days. Work was begun on the surface with 3 engineers and 3 topmen. The shaft was lagged from top to bottom as sinking went on, and a staggered ladderway was put in, with a landing at every second set. Three shifts of machine men with muckers worked in the shaft, while one shift a day of 2 timbermen worked above a swinging bulkhead to protect the men at the bottom. This bulkhead was suspended from the set above it by chain blocks, and before putting in a new set of timbers it would be lowered to the proper height above the drill men. While sinking two 15-cu. ft. buckets were used in hoisting. A special dumping device was made use of at the collar of the shaft. Walter Fitch, Jr., manager of this mine contracting company, has numerous contracts in force, sinking and driving. In the shaft work referred to Denver Rock Drill Co.'s clipper drills were used.

Utah Minerals Concentrating Co.

The Utah Minerals Concentrating Co. is operating a custom mill at Eureka in which about 80 tons per day of Tintic district ores are being concentrated. Low-grade, silver-lead ores are obtained from the Eagle & Bluebell dumps, from Bullion-Beck lessees, May Day dumps and other properties. In these ores the lead is mostly a carbonate, and the silver a chloride, there being no zinc. The plant of machinery is electrically operated, and consists of a No. 2 Allis-Chalmers gyratory crusher, 3 sets of rolls, reducing to 5 mesh, the product passing over 7 Isbell tables. A tube mill is included in the equipment for use when finer grinding is required. The tables are adjusted, some of them to operate as roughers and others as finishers. In addition to the concentration of lead-silver ores, this company is milling a considerable tonnage of tungsten ore, the largest shipments being received from the mine of the Byllesby Co., 22 miles from Lovelock, Nev. This consists of scheelite and contains 2 to $\frac{1}{2}\%$ tungsten, present shipments amounting to 600 to 700 tons per month, pending the construction of mill to treat them near Lovelock. The mill at Eureka ships the concentrates to a plant at Denver, where the garnet, which occurs in the lime gangue, is separated from the tungsten product. The company's operations are under the management of Henry M. Adkinson, well known in mining circles in Utah and Colorado. He is assisted by J. H. Hedges.

Tintic Milling Co.

The Tintic Milling Co., Jesse Knight, president; Geo. H. Dern, general manager, and T. P. Holt,

metallurgist, has installed reduction works for leaching copper-silver ores in the buildings and on premises formerly occupied by the Knight smelting plant at Silver City. The blowers and some of the other equipment of the old smelter are utilized in the new plant. The crushing facilities have a capacity of 750 tons per day. Three of the Holt-Dern roasters, 30 to 40 tons capacity each, are now in use, and 8 more of like capacity, but of improved design, are being put in position. These roasters are adapted to oxidizing, sulphatizing and chloridizing; but in this plant the ores are given a chloridizing roast, which results in no volatilization of metals. They are blast roasters, all being connected to the blowers. The ore which enters the roasters at minus 8 mesh is mixed with salt and coal dust, the feed opening being at the top. The leaching takes place in wood tanks, the solution being drawn off into compartments where the metals are precipitated on scrap iron. The ore received at this plant comes from the Knight mines, and others in Tintic district, the approximate content of which is 6 ozs. silver, 0.5 to 1% copper and about \$1 gold per ton.

Eagle & Bluebell.

The Eagle & Bluebell Mining Co., manager for which is Imer Pett, Salt Lake, recently installed new equipment at its 1900-ft. shaft, Eureka. This consists of an Ottumwa Iron Works, double-reel electric hoist, good for a depth of 2500 ft., and an Ingersoll-Rand air compressor of 1700 cu. ft. of free air per minute capacity. These are housed in a new steel and concrete building. A new headframe, set upon a solid concrete substructure, is also in evidence. The property formerly was worked through a 1100-ft. interior shaft, the collar of which is on a tunnel level 1300 ft. from the portal. But this is of use only for ventilating purposes since the completion of the new shaft, with two hoisting compartments, trackage from which leads out to shipping bins on a railroad. The mine workings are connected with the new shaft on all main levels; and development is proceeding on the 1000, 1300 and 1700. At the depth of 1875 ft. a station is being cut out, the bottom of the shaft here being in lead-silver ore. The purpose is to resume sinking and go 150 ft. deeper. The cages are operated only to the 1700-ft. station, where a small air hoist is used to run a bucket between that station and the 1875. In this mine the ore occurs in irregular bodies at the intersection of north-south line strata, with cross-fissures. The limestone bedding dips east, the cross-breaks south. The ore shoots stand in all positions, from vertical to horizontal, irregularity being the distinguishing feature. The greater part of the ore is oxidized and carbonates, although there are considerable bodies of sulphides and mixed ore between the 1400 and 1800 levels. There is no line of demarcation between carbonates and sulphides, how-

ever, as considerable amount of carbonate and oxidized ore exists at the 1900-ft. station.

Inasmuch as the ore shipments from Eagle & Bluebell have been curtailed by the smelters, due to a congestion of ore at their plants, a good part of the mine force is on development work. The cages here, when handling men in the shaft, are completely enclosed with steel folding gates or doors as a means of safety. The door sections are readily opened and folded back and fastened to the cage frame when not required to be closed. Similar appliances are in use in mines of Montana. Wm. Owens is mine superintendent.

The Gemini Property.

The Gemini mine, Eureka, superintended by John H. McChrystal, is shipping 2000 tons per month of silver-lead ore, which is the product of about 130 men working under 90-day leases. The ore samples about 15 ozs. silver and 15% lead, mostly oxidized. They also mine and market close to 100 tons per month of zinc ore, which occurs as a shell, or casing, around the lead-silver bodies, and runs 25%. The company has a force on development work driving northeast and east on the 1500 level to cut the Ridge & Valley ore bodies lying to the north. The Ridge & Valley is operated through the Gemini, and the Eureka Mines Co. holdings of 7 claims are also being developed on the 900 and 1300 levels through Gemini shaft, all these interests being closely allied. The car of ore per week shipped from Ridge & Valley samples 40% lead and 8 ozs. silver. The Godiva, also controlled by McChrystal interests, is producing 8 to 10 cars of ore per month, half lead-silver and half zinc. The zinc ore runs 35 to 40%. The Godiva's zinc ore stopes, between the 400 and 600 levels, are on big bodies of solid ore containing practically no lead. Jackson McChrystal, Salt Lake, is general manager of all these interests.

Oil Flotation Process Improved.

Efficiency of the mixture used in the oil flotation process of concentrating ores is in proportion to the amount of oil required to produce a froth of the necessary amount and consistency to collect all the ore particles. A great many kinds of oil are used, such as coal oil and pine tar, eucalyptus oil, cotton seed oil, etc., but the frothing tendency of all of them can be increased by adding to the oil a certain percentage of resinate of an alkaline metal such as soda, potash or lime. The chemical equivalent of these alkaline metals, ammonia, may also be substituted and combined with rosin to form resinate of ammonia.

That the idea is practicable is evidenced by the fact that the originator, Homer T. Yaryan of Toledo, O., has taken out a patent upon it. He states that, in practice, he was able to obtain a superior flotation oil by mixing together 50% petroleum, 15% pine oil and 35% resinate of soda or resinate of ammonia.

Rotating Ore Classifier.

An original and ingenious idea in the way of an ore classifier has been worked out by William H. Wiegand of Trojan, S. D. It is of the rotary type and is capable of running through a large amount of ore in a short space of time. Four views of the machine are here shown, a plan (Fig. 1) and three ele-

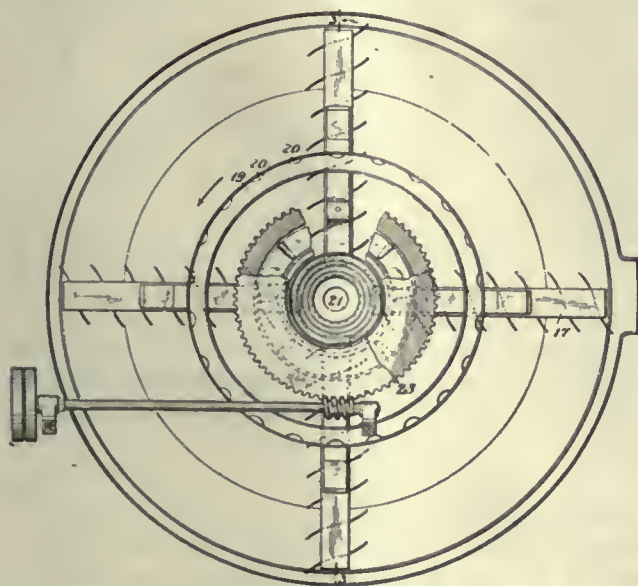


FIG. 1. PLAN.

ventions (Fig. 2) partially in section. Observing first the plan, the ore and water are delivered to a ring shaped trough (19) and fall through holes (20) into the tank below. This tank is conical in form, and arms or sweeps (17) are continuously revolved in it. These arms carry spirally shaped vanes.

As the liquid falls into the tank—slime, water and

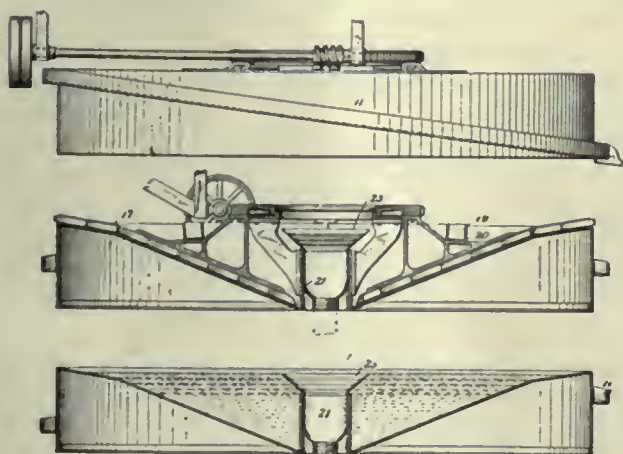


FIG. 2. ELEVATION.

ore particles all mixed together—the latter, being the heaviest, settle to the bottom and the vanes on the arms push them outward and upward along the rising bottom, until they are finally discharged, cleanly washed, into the trough (11) at the outer circumference.

The slimes, which float to the surface, are drawn

off through the funnel-shaped outlet (21). The funnel shape is given to the upper part of this member by detachable rings (23) of varying diameters. These rings can be added to or taken from, as it is desired to increase or decrease the level of the liquid in the tank, and therefore to take out finer or coarser slimes as the case might be.

In the operation of this classifier, the ore particles are thoroughly washed and they travel a long distance, being agitated and overturned in a vigorous manner by the moving vanes. Thus a uniformly graded product is obtained, and, at the same time, the machine is said to be capable of handling a surprisingly large quantity on a given time.

American "Ichthyol."

The current publication of the Geological Survey on the production of asphalt and related bitumens in 1915 contains a brief note on the subject of ichthyol. Prior to August, 1914, this asphaltic material, which is employed as an antiseptic medicament, was imported from Europe. It is derived from a bituminous rock, filled with fossil fish, that is found in the Austrian Tyrol. American imports had increased from 24,000 lbs. in 1910 to 60,000 lbs. in 1914, but dropped off last year to less than 25,000 lbs. In view of the inadequacy of the foreign supply to meet the domestic demand under present conditions, it is interesting to know that in this product, as in others, America has come to depend on its own resources. So far as known, there are in the United States no deposits of asphaltic material of the peculiar type from which ichthyol is derived, but American chemists have solved the problem of supplying the domestic needs in this regard, and favorably recommended substitutes for ichthyol, prepared from domestic materials by synthetic methods, are now available in the markets.

The Survey's general report on "Asphalt, Related Bitumens, and Bituminous Rock in 1915" is now ready for distribution. During the year the natural asphalt of all varieties sold at the sources of production in the United States aggregated 75,751 short tons, valued at \$526,490.

Exports of Grecian Magnesite.—Magnesite shipments from Greece in 1915 are given by U. S. Consul General A. W. Waddell of Athens as follows, in metric tons:

To—	Raw.	Calclned.
England	43,545	7,627
United States	33,641	6,318
France	13,375	4,331
Netherlands	1,750	350
Greece	350	100
Total	92,661	18,726

All Grecian magnesite mines are located in the Athens district, most of them being on the island of Euboea. In 1914 the mines produced 117,430 metric tons of raw magnesite. The total 1915 output is placed at 133,858 tons. The United States bought more heavily in 1915 than formerly.

The Andes Copper Co. to Soon Begin Development.

Actual work of development is soon to be begun on the property of the Andes Copper Mining Co., an Anaconda holding in Chile. This information was advanced by B. B. Thayer, who has been in Chile recently looking over the Potrerillos ore deposits. This is situated about 62 miles in the interior of the Cordillera, from where the railway from Chañaral terminates, and in a region which is absolutely sterile and deserted. When Mr. William Braden visited it for the first time in March, 1913, there were no signs of life and it may be said that the place was virtually abandoned. Some *pirquineros* worked, or rather destroyed, with their own hands, the two or three places in which there appeared veins of metal which might have paid for the cost of transportation down on muleback to Pueblo Hundido. The Potrerillos Mining Co., the former owner, although formed of enthusiastic and intelligent men, was confronted with a very difficult problem. It had no capital, as it had already used up all that which had been paid in by the shareholders, and more, which some banks had advanced on the personal guarantee of the directors. Its mining properties, of lowest grade ore, as it was afterwards verified, was not a paying proposition under the then-conditions of working, and it would have been absolutely necessary to invest large sums in constructing a road, houses and other buildings, apart from solving the technical difficulties in treating the ore. All would have ended in a certain loss. Mr. Braden was interested in studying the property with the ultimate idea of acquiring it, and he saw the possibility that a little exploration might reveal a low-grade ore deposit which would form the basis for an industry of some magnitude. He was able to induce some of the men who are in charge of the Anaconda Mining Co. to take an interest in this work, which was of course somewhat adventurous, and the explorations were begun. They have already lasted 3 years and will have to be continued for some time to come; they have cost the sum of 3,500,000 pesos, which have been spent in explorations, tunnels, roads, houses, and in general, everything necessary to organize and maintain an enterprise in a desert location, having great difficulties to surmount, distances to overcome and the scarcity of supplies to contend with. The result has justified these sacrifices, and has proved Braden's foresight. It has revealed the existence of a great tonnage of ore of between $1\frac{1}{2}$ and 2% copper, which permits the investing of a large capital for its exploitation. For this object the Andes Exploration Co. was successfully organized in New York, and the actual work of development should begin very soon. This company will build the railroad between Pueblo Hundido and the ore deposit, a distance of 62 miles, through the desert; build the hydro-electric power plant, for which it will be necessary to bring the water

from the rivers in the interior by means of canals over 43 miles long and across very difficult ground; and finally it will develop the mines proper. The company intends to begin working with a plant which will permit of a daily capacity 3000 tons of ore and shall go on increasing its capacity as the size of the ore deposit should indicate. Moreover, it will be necessary to construct the port works which are lacking in Chañaral.

According to Mr. Thayer, the company will be inflexible in fighting alcoholism and its vices, but in exchange the workmen will have hygienic habitations, schools, savings banks, etc., and the country will have, in general, always in view, an example of live organization and culture.

Arctic Copper Deposits.

Dr. R. M. Anderson, who recently returned from an inspection of Arctic copper deposits for the Canadian government, gives a brief outline of his discoveries:

"We were instructed to survey the copper deposits already known and seek new ones. Every explorer from the earliest times has noted that the Eskimos east of the Mackenzie used knives, spearheads and other weapons and utensils hammered from copper, and the Coppermine river, which empties into the Arctic, got its name from mineral discoveries many years ago. We found on Coronation gulf and Bathurst inlet vast deposits of copper of low grade. We were not equipped to undertake mining operations, but upon the sides of cliffs we could measure the depth of successive flows of amygdaloidal lava containing nuggets of copper. An Eskimo brought to us a lump of copper weighing 40 pounds. There were seams in the lava that had been filled with pure copper. Our geologist took many samples of rock, which will be assayed. He also made many estimates of the area of ore in sight.

"The ore had many of the characteristics of the Lake Superior copper rock. It is workable from the surface, and is near navigable water. It would be feasible to construct a railroad from the Mackenzie river, which is navigable five months of the year, to Great Bear lake, which also is navigable much of the year. A further railroad line could be built from the lake to the copper fields, enabling the transportation of the ore."

American Smelting & Refining Co.'s exploration work is now carried on through its mining department, of which H. A. Guess, New York, is managing director for that department. Branch offices have been established at El Paso, Tucson, Denver, Spokane and Salt Lake City to handle this work. E. E. Price, resident engineer at Salt Lake, looks after a field embracing Utah, Nevada, Arizona and portions of other states.

What the Mining Companies are Doing

Nevada-Douglas Co., Nevada.

The report of the Nevada-Douglas Con. Copper Co. for the quarter ended June 30 shows as follows:

Receipts—	
Assessments	\$ 88,936.48
Ore settlements	105,344.12
Mine office petty cash	524.25
Miscellaneous	573.97
Insurance claim (fire)	293.90
Accounts receivable	1,851.31
Total	\$197,524.03
Disbursements—	
First mortgage bonds redeemed	\$ 14,000.00
Interest on bonds	12,328.72
Assessment expense	294.80
Mill plant equipment	19,380.16
Mill construction payroll	10,226.22
Mill operating payroll	6,348.17
Mine operating payroll	32,493.99
Notes payable	11,012.75
Interest on notes and accounts	1,041.86
Casualty insurance	465.91
Mine plant fire insurance	1,906.90
Mill plant fire insurance	3,183.35
Nevada Copper Belt R. R. Co. Loans	51,059.55
Power for operations	1,357.35
Western Nevada mine operations	1,558.65
Western Nevada bond and lease	15,000.00
Miscellaneous bills payable	11,384.72
General office salaries	2,227.50
General office expense	393.30
Mine office expense	441.46
New bunk house	150.00
Deferred wages	45.50
Taxes	1,223.17
Total	\$197,524.03

Inspiration Con. Co.

Even with a comfortable cash balance and earning at the rate of \$20 a share, it is not expected that the Inspiration Con. Co. will increase its \$2 per share quarterly.

More than 16,000 tons of ore have been treated daily for some time past in the 18 operating units of the concentrator. The two additional sections, now under construction, are expected to be ready before the end of the year, making possible the handling of at least 1800 tons more per day. Next year Inspiration will doubtless start on a new construction program with the erection of a leaching plant to treat its oxide ores. This will cost several million dollars as the capacity will be in the neighborhood of 5000 tons a day. Further development should result in large additions to the oxide ore body.

Attention will also be given the tailings, and before long a test mill and experimental plant will be in operation at the concentrator to work out this problem. With the completion of its leaching plant—by the end of 1917—Inspiration will be in position to produce 150,000,000 lbs. of copper a year at a low cost. The company will be in position to finance its leaching plant from treasury funds and at the same time have a comfortable surplus against the day when copper sells at considerably less than it does today.

Granby Con., B. C.

The August production of Granby Con. was 3,218,847 lbs. of copper, against 4,268,846 lbs. in July. A shut-down of several furnaces at the old Grand Forks smelter was responsible for the loss. Within the past fortnight, however, one of the idle furnaces has been put into blast and the other will be blown in shortly, so that production from that property should be normal for October.

The company's copper production for the past 8 months shows as follows:

January	3,122,879	May	4,727,929
February	2,690,265	June	4,011,361
March	3,555,411	July	4,268,846
April	3,950,469	August	3,218,847
8 mos., 1916	29,546,097	8 mos., 1915	25,075,403

The company's fiscal year ended June 30. Earnings of about \$5,000,000 were realized. The Midas mine in Alaska,

which Granby bought several years ago, has finally started shipments of ore to the Anyox smelter. This ore runs high in gold values.

Butte & Superior.

The Butte & Superior Mining Co.'s preliminary report for August on oil flotation plant compares as follows:

Comparison follows:	Tons ore.	Costs per ton.	Zinc con- cen. tons.	Value per ton.
August	31,733	\$4.89	7,502	\$49.45
July	45,875	3.64	8,686	48.83
June	48,475	.....	10,830	.....
May	50,688	3.22	11,658	65.25
April	50,112	2.84	12,080	83.79
March	52,089	2.69	12,190	83.62
February	49,800	2.52	10,775	93.56
January	49,428	3.05	10,535	101.60
December, 1915	45,277	2.93	10,409	86.00
November	47,872	2.91	10,386	90.58
October	43,092	2.75	10,473	79.59
September	37,278	3.19	8,968	81.27

Standard Silver-Lead, B. C.

The net earnings of the Standard Silver-Lead Mining Co., Silverton, were \$56,609 in July, according to the official report accompanying the dividend payments for September. The surplus on Aug. 1 was \$296,381. The shipments for the month were 429 tons of lead-silver ore and concentrates, and the zinc sales amounted to \$63,980, including back settlements for several months, the shipments for the period being 500 tons of zinc concentrates.

The financial statement for July follows:

Preliminary settlements for 429 tons of silver-lead ore and concentrates	\$ 47,775
Zinc sales, including back settlements	63,890
Umpires	211
Boarding house	4,696
Total	\$116,572
Less final settlements for May and zinc penalties for February and March	17,028
Net receipts	\$ 99,544
Disbursements—	
Ore production, including mining, tramming, milling, shipping, marketing, power, general expense, salaries, taxes, etc.	\$ 28,521
Boarding house	3,607
Development	3,591
Construction	3,628
Aylard tunnel	1,812
Store supplies	872
Home office expense	904
Total disbursements	\$ 42,935
Cash statement—	
Net profit for July	\$ 56,609
Balance on hand July 1	289,772
Total	\$346,381
Dividend No. 44	50,000
Balance July 31	\$296,381
Recapitulation—	
Cash in banks	\$219,209
Ore shipped but not settled for	122,678
Total	\$341,887
Vouchers payable and payroll	45,506
Balance July 31	\$296,381

American Zinc Co.

American Zinc, Lead & Smelting Co. is credited with August earnings amounting to close to \$350,000. According to a conservative estimate the company and Granby combined should show profits close to \$9,500,000, and given another year of present spelter conditions the cost of the Granby investment can be written off the books from Granby profits alone.

There is a very active demand for the various grades of spelter produced by the American Zinc, Lead & Smelting Co., and the company is making contracts for delivery as far ahead as next June at very satisfactory prices—figures which 2 years ago would have been considered "beyond the dreams of avarice." The American Co. has on its books today

unfilled contracts calling for the delivery of well over 25,000,-000 lbs. of spelter.

At the moment there is an extraordinary demand in the market for both spelter and copper for the manufacture of brass. Some huge orders for brass have recently been taken for shipment to Europe. One specific order of which we have knowledge calls for brass rods to be shipped to English plants, there to be utilized in the manufacture of finished munitions.

Brass manufacturers are buying freely well into the first quarter of 1917 and are paying advancing prices for both copper and spelter.

Federal Mining & Smelting.

Federal Mining & Smelting Co. reports for quarter ended July 31, compared with previous quarter:

Quarter ended July 31, '16.	Quarter ended April 30, '16.
Total .....\$332,294	Total .....\$356,126
Depreciation 64,007	Depreciation 65,235
Net profit..... 268,287	Net profit..... 290,891
Total tons shipped.... 38,972	Total tons shipped.... 31,844

Net profits for year to July 31, 1916, were \$624,029. Two dividends of 1% on preferred, amounting to \$119,861 each, have been paid during year, and another of the same amount declared, payable Sept. 15, 1916. Developments at Iron Mountain mine have been unsatisfactory, and it has been decided to suspend operations there.

Miscellaneous Company Notes.

The Pinar Copper Co. has been incorporated at Dover, Del., with a capitalization of \$5,000,000.

The Arizona Commercial Copper Co. has declared an initial dividend of 50 cts. per share, payable Oct. 31, to stock of record Oct. 10.

Elaborate plans for increasing the production of the Chile Copper Co. are reported under way. Work on these plans has been carried on and will be completed in 2 or 3 months.

Earnings of the National Lead Co. are reported running at a rate that will insure continuation of the 4% dividend on the common stock, even if there should be a considerable slump in the white lead industry.

The shareholders of the Nabob Mining Co. will hold a special meeting in Kellogg, Idaho, Oct. 2 for the purpose of passing on a resolution to increase the capital stock of the company from 1,500,000 to 2,000,000 shares.

For the quarter ended Aug. 31 the Beaver Con. Mines, Ltd., reports as follows: Bullion in storage, 271,022.62 ozs.; ore at smelters, 18,479.11 ozs.; ore bagged at mine, 24,404 ozs.; total, 313,905.73 ozs. Cash on hand amounted to \$43,020.57.

The Kerr Lake Mining Co. reports for the year ended Aug. 31 as follows: Ore sales and miscellaneous income, \$1,212,676; net profit, \$813,000. This compares with ore sales and miscellaneous income of \$908,019 in 1915, and net profits of \$450,774.

During the quarter ended June 30 the Dr. Jack Pot Mining Co. and its lessees produced 5182 gross tons of ore of a gross value of \$43,260 and a net value of \$21,883.23. Net to the company was \$16,974.79. The gross value of all ores shipped during the quarter was \$8.75 per ton.

The production of the Nipissing Mines Co. for August is valued at about \$203,898, showing a profit of about \$121,555, against production of \$288,577 in July. At the present rate of production Nipissing should show increased production for this year over 1915 of about \$500,000 and increases over estimated profits of about \$250,000.

The Goldfield Con. Co. mined 26,700 tons in August, from which there was a net realization of \$30,016.12. Mining costs were \$2.58 per ton, with total operating costs of \$5.62 per ton. Net costs were \$5.63 per ton. On account of the lack of equipment to settle and filter the flotation concentrates,

and on account of changes in the ore, flotation has been abandoned temporarily at the Consolidated mill pending the installation of additional equipment.

The Nipissing Mines Co. has declared a regular quarterly dividend of 5% and an extra dividend of 5%, both payable Oct. 20 to stock of record Sept. 30. Financial statement of Nipissing Mines Co. at end of first quarter shows cash in banks as \$1,218,438, value of ore and bullion in transit \$457,359, value of ore mined and on hand \$499,956.

Directors of the Champion Copper Co. have declared a dividend of \$6.40, payable Oct. 8—making \$74.40 per share since Feb. 21, 1915, when payments were resumed following suspension from Oct. 15, 1913. The dividend disbursements of the company are divided equally between the Copper Range Co. and the St. Mary's Mineral Land Co. as owners of 50,000 shares each.

Stockholders of the New York & Honduras Rosario Mining Co. have voted to increase the board from 9 to 11. One of the new vacancies was filled by the selection of H. A. Guess, managing director of the mining department of the American Smelting & Refining Co. He has been identified with that company for 15 years, and is also consulting engineer of the Braden Copper and Chile Copper companies.

Edward J. Cornish, the newly-elected president of the National Lead Co., has been connected with the company since 1906 and has served as vice-president since 1910. He was born in Sidney, Iowa, 1861. He practiced law in Omaha and formed the Carter-White Lead Co. of that city. When he sold stock of the latter company to National Lead Co. in 1906 he remained president of the subsidiary for a while and then took charge of the National's Chicago branch.

Directors of Mass. Con. Copper Co. are scheduled to meet some time next month to take action on the quarterly dividend, the second to be declared by the company. The initial dividend was paid Aug. 15 and was for \$1 per share, or a total of \$100,000. The company's net profits have ranged from \$17,000 a month in January to \$66,225 in May. At this rate profits are at a rate of \$7 a share per annum.

At the recent meeting of stockholders of the Ohio Copper Co. a committee was appointed to care for the interests of the stockholders in the efforts to take control of the property from the bondholders. To represent the New England holders George E. Macomber, president, of Augusta, Me., Trust Co., was appointed. Westerners have Frank B. Cook of Salt Lake, while from New York there have been selected Charles A. Kittle, E. S. Hooley and Hubert E. Rogers. This committee selected New York Trust Co. as depository for shares. It was the North American Liquidation Co. that secured a stay of final approval of recent foreclosure sale of the Ohio property.

The directors of the New Baltic Mining Co. have called an assessment of \$1 to be paid October 14. In June a year ago an assessment was called which yielded nearly \$70,000, of which \$40,000 was paid to the New Arcadian in part payment for the land purchased, and the greater part of the remainder has been spent for diamond drilling of several holes, taxes, etc. Present assessment was called as a shaft has to be sunk and much development done. Ground has been broken for the shaft, about in the center of the ten acres just secured from the Johnson heirs in northeast quarter of the northwest quarter of Sec. 16. The location is between two diamond drill holes that disclosed good cores.

There is much talk these days of a consolidation of the American Zinc Co. and Butte & Superior Co. Each of these companies is assured of profits this year of between \$9,000,000 and \$10,000,000. Butte & Superior has distributed its earnings in dividends; American Zinc has invested its profits in new property. It is not understood that any merger is close at hand, but if these properties are brought together it will undoubtedly have to be on some basis more favorable to American Zinc than the two-for-one basis at which Butte & Superior recently acquired 35,000 shares of American Zinc. With or without consolidation the new American Zinc Co., according to its own directors, can earn \$1,500,000 on 5-ct. spelter.



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*Illustrated.

Copper Market Strongest in History.

As was very aptly expressed in our metal market review last week, the pith of the copper market is that *demand* is in excess of the *supply*, and the copper market of today is *not* a competitive market by any manner of means.

That this summing up of the situation was correct is corroborated by the placing last week of the largest single order for copper ever negotiated in the history of the copper trade—being no less than for a total of 448,000,000 lbs. of copper, involving an expenditure of approximately \$125,000,000, and at a cost around present market quotations—27 cts. per pound.

This order calls for practically 50% of America's entire output from Jan. 1 to July, 1917. Up to June 1 of this year, a period of 6 months, the Allies purchased copper to the extent of nearly a half billion pounds. Since the beginning of the year including the present order Great Britain and her allies have negotiated for nearly a billion pounds of copper, involving an expenditure in the neighborhood of \$230,000,000.

The closing of the above order places the copper metal in the strongest position known to the industry and an increase in present price is a logical conclusion.

It is figured in the copper trade that if the enormous options signed are taken advantage of to the full, there can be no reduction in price of copper throughout 1917, which should give all copper companies bigger earnings for a year to come than they have enjoyed in the past year, with consequently liberal distributions to shareholders.

John D. Ryan, who has read the copper market correctly for so many months, thinks the metal will command very high prices for another year. The president of the Anaconda bases this view not only on the foreign situation but the probability that domestic industry will be a heavy consumer of the metal during the next twelvemonth. Incidentally there is talk of a boom in real estate and the building industry as a consequence of cheap money and gold inflation. That, of course, tends to bear out the Ryan idea that home demand for the copper metal is going to be an important factor in the latter industry.

Anaconda's Great Activities.

From present indications Anaconda Copper Co. will earn in excess of \$25,000,000 during the first half of 1917. The company is in an excellent financial position, backed up with vast resources in cash and great property assets resulting from efficient management, and the adoption of new metallurgical processes which have made possible substantial economies in all departments.

After the payment of the 1917 half-year's dividends at the rate of \$2 quarterly, amounting to \$9,325,000,

and allowing for the retirement of the \$16,000,000 notes which fall due next March, the result should be a grand total of something like \$28,756,250 net for the 18 months ended June 30, 1917.

The second of five sections of the company's new zinc refinery at Great Falls will be put into commission at once, and by Nov. 1 the entire plant will be put in operation turning out high-grade zinc at the rate of 5,000,000 lbs. per month. The first week's experiment with the first section proved most satisfactory, 5000 h.p. brought from Rainbow and Big Falls plants of the Montana Power Co. being used in operating this section. With its 144 electrolytic tanks it is making between 20 and 25 tons of zinc per day, which is being shipped to Anaconda, as the furnaces at Great Falls are not completed. Two 50-ton furnaces are being rushed to completion at Great Falls, and one of these will be ready by Oct. 1. Tanks for the third section are now being installed, and the third of five rotary transformers that will furnish direct current for the zinc refinery will be ready for operation by Oct. 1.

The zinc concentrator at Anaconda is now handling 1000 tons of crude ore per day making zinc concentrates for both experimental plant at Anaconda and two sections of the zinc refinery at Great Falls. The tonnage will be increased to 2000 tons per day by Nov. 1. The company is rushing work on the developments of the zinc ore bodies at the Douglas, Emma and other mines.

Help the Little Fellow.

Some complaint is made throughout western mining districts to the effect that the custom smelters refuse to receive the ore shipments of small producers. There is a congestion of ore at all the smelting plants, and this is the cause of the curtailment of shipments. However, many of the small operators, whose properties are under development, claim the smelters have not refused to handle the increased tonnage of the larger mines.

The small operator as a rule depends upon the sale of ore to enable him to advance his development, and when the only available markets are closed to him he is severely handicapped. To make a prospect produce ore sufficient to pay for its own development is a method which enhances the mining industry and should be encouraged, not retarded. It would seem that some preference should be given those small producers whose output is incidental to development, and the marketing of which is essential to continuance of operations.

The big producer is relied upon to keep the smelter in operation, and it is easy to understand the good relations between the two; at the same time, the growth of the mining industry depends upon the coming in of new producers, many of which have to

pass through a difficult period of early development. To encourage the small ore shippers is to make possible the opening of new mines.

No sooner does good news come out of Mexico that Gen. Carranza has revoked certain special mine taxes that would prove of considerable benefit to mining men, than comes the announcement that another decree is in contemplation which would work certain hardships. Following the decree of revocation as outlined in our last issue, comes the announcement that a decree is now under consideration which proposes to increase the taxes to a practically confiscatory rate on developed mines in specified districts now closed on account of unsettled conditions, which are not put in operation within 60 days. The report states that this is designed to give employment to idle Mexicans.

Calumet & Hecla is one of the most widely held mining stocks in the world today, having no less than 4300 stockholders, several hundred of whom own but one share. The largest single holding is that being held by the trustees of the Quincy A. Shaw estate—13,100 shares—dividends on which this year will total no less than \$917,000. The Agassiz family control 6193 shares from which they will receive during the year as their share of dividend disbursements the sum of \$433,510. Shares of the company are scattered all over the world, being held in the United States, Austria, Ireland, Germany, France, Spain, England, and Switzerland.

As a result of the present and possibly later scarcity of cyanide, the U. S. Smelting Co. is considering the installation of a new process, eliminating cyanide, for treating its ores. Should plans now under consideration prove successful it will prove of the utmost importance to the company as the shortage of cyanide has restricted the company's operations to a large extent. At present all but a very small percentage of the silver and gold in its Mexican properties is recovered by the two big cyanide units, one with 1200-ton daily capacity for the Pachuca district, and the other of 800 tons in the Real del Monte district.

Mining furnishes employment for all classes of men, from the most highly educated to the most ignorant. The latter, however, are merely laborers. The direction of mining operations as well as much of the actual work involved, requires men of training and more or less education. Owing to the fact that mining involves every branch of engineering and nearly every science, a broad education is necessary for the men who must hold the higher positions. The man farther down the ladder need not despair, however, of getting higher if he is ambitious. Any man who has the courage and persistence can improve his condition by study.

PERSONAL.

Chester Master is now managing the La Blanca mine, Pachuca, Mexico.

D. P. Mitchell, mining engineer, London, E. C., will be in New York during October.

Fred B. Mitchell, Iron River, Mich., has been elected mine inspector of Iron county.

R. A. F. Penrose, mining engineer and geologist, Philadelphia, Pa., is in Denver, Colo.

E. L. Latta, superintendent of the Idora mine, Wallace, Idaho, has been in Spokane, Wash.

Capt. John Warne of the Allouez mine in the Michigan copper country, resigned last week.

George Farish, mining engineer, New York, is examining properties near Boston creek, Ontario.

C. Q. Payne, mining engineer, New York, has gone to San Francisco, Cal., from Oatman, Ariz.

Arthur K. Adams, El Paso, Texas, has been appointed geologist for the Andes Copper Co., Chanaral, Chile.

C. O. Lindberg, mining engineer, Los Angeles, Cal., is in Nelson, B. C., investigating the zinc resources of the province.

R. E. Rickard, assayer for the Seoul Mining Co., Korea, has left for London, E. C., where he will enlist in the British army.

F. Ward Paine of Boston, director in the Lake, Copper Range and other companies, is now in the Michigan copper district.

Wilson Hughes, mining engineer, Los Angeles, Cal., is now superintendent of the Monitor Belmont Mining Co., Belmont, Nev.

Leo Greenough, manager of the Snowstorm Mines Con. Co., Larson, Idaho, has returned to Spokane, Wash., from the property.

Francis C. Lincoln, professor of mining and metallurgy, Mackay School of Mines, Reno, Nev., has returned from Bolivia, S. A.

H. H. Kuox, consulting mining engineer, New York, has left for Siberia on professional duties and will return in January, 1917.

Frank Cottier has resigned as superintendent of the Ella W. mine, Cripple Creek, Colo. The vacancy will be filled by M. Johnson.

W. R. Millard, superintendent of the Granite Gold mine, Valdez, Alaska, has returned from Rochester, Minn., where he underwent an operation.

Ellard W. Carson, formerly general manager of the Cambria Quicksilver Co., Cambria, Cal., is now with the Alpine Quicksilver Co., Hernandez, Cal.

H. W. Witt and J. P. Kender, mining engineers with the Goldfield Con. Co., Goldfield, Nev., are examining properties in the Sheep Creek district, British Columbia.

Fred Hellman, general manager of the Chile Copper Co., has been appointed consulting engineer of the company to succeed Pope Yeatman.

B. L. Thane, resident manager of the Jackling-Hayden interests, Juneau, Alaska, has been reappointed, his contract having expired in May.

J. V. Richards and U. T. McCurry, mining engineers, Spokane, Wash., have recently returned from a trip of inspection to Kaslo, B. C.

Harry B. Barling of Breitung & Co., Ltd., 11 Pine street, New York, has returned east after a professional trip to several western states.

Edward L. Dufoucq, consulting mining engineer, has removed his offices from the Produce Exchange building to No. 18 Broadway, New York.

R. M. Atwater, consulting engineer, New York, and director of the Rex Con. Co., has been in Wallace, Idaho, inspecting the company's holdings.

F. G. Clapp and C. T. Griswold have recently been engaged in geological examinations in Texas on behalf of clients of the Associated Geological Engineers.

Fred G. Farish, mining engineer, Denver, Colo., and manager of the Lluvia de Oro Gold Mining Co., Chihuahua, Mexico, is returning from a trip into that country.

Lyon Smith, former metallurgist with the Snyder Electric Furnace Co., Chicago, is now assistant superintendent of the River Smelting & Refining Co., Florence, Colo.

Capt. Thos. Hoatson of Calumet, Mich., director of the Calumet & Arizona, Keweenaw Copper and other mining companies, is making a trip to California and Arizona points.

W. Earl Greenough, Wallace, Idaho, has resigned as superintendent of the Marsh mine and director of the company. He will later start a consulting practice in Spokane, Wash.

H. C. Bellinger, manager of the Guggenheim Exploration Co.'s smelting interests in Chile, is now in Kiesling, Wash. He will leave shortly by way of New York to resume his duties in Chile.

COMMUNICATIONS.

[This department is for the exchange of ideas bearing on all branches of the mining and metallurgical industries. Mining and Engineering World will not be responsible for the statements made nor opinions expressed by correspondents.—Ed.]

Who Is Your Engineer?

The Editor—I was very much interested in the article in your recent issue by G. A. Collins entitled "Who Is Your Engineer?"

This recalled to me an incident which occurred in one of the western states while I was engineer for a property near by.

Nearly half a million dollars had been spent and not much accomplished on the road to success. In the first place, the eastern stockholders who were putting up the money put a farmer, one of their kin, in the position of manager, thinking in this way they would have a man to be depended upon, who would devote all his energies to the development of the mine. A number of the investors wanted an engineer's report on the property; also they wanted a consulting engineer. These needs were complied with.

The engineer obtained, if he could be called such, had probably never done any real mining, but this made no difference, as he was well known by the promoter and related to several of the stockholders; furthermore, he agreed to take 50% of his salary in stock. This man was chosen to be consulting engineer and to make the official report (as it was called). He explained in glowing terms the great possibilities in store for the investors, citing numerous of the larger mines as examples, and advising the immediate erection of a mill. This was done without even correctly obtaining an average assay of the exposed ore; the only assays being made were from specimens secured by promoters and stockholders while investigating the property.

By the time the mill was completed the type of ore had changed, making the proposed and installed method of treatment almost useless. How the promoters managed to get around this and raise sufficient capital to keep the mine run-

ning, employing about 40 men, is not known to me. Six or 8 months after the erection of the mill they were enabled to secure enough ore to run it about half the time, making a saving of only 50% of the values in the ore.

The consulting engineer finally resigned and an engineer well known by the promoter succeeded him, the manager then resigned, taking a minor place and leaving his son in charge of the property. The young fellow had recently graduated in *pharmacy* from one of the leading universities.

The mine to my knowledge was a very good prospect, and under good, intelligent, technical supervision could have become a good producer, but it was not rich enough to pay dividends under a management of men fitted for other callings in life. The property was operated 3 or 4 years before going into the hands of a receiver.

If the man who invested \$10,000 in stock had first employed an engineer who really knew his business to investigate for him, he would have saved his money, or probably invested in a property which would have yielded him profits; or at least a fair run for his money.

Herculaneum, Mo.

S. PAUL LINDAU.

NEW PUBLICATIONS.

Bibliography of North American Geology for 1915. By John M. Nickles. Washington, D. C., U. S. Geological Survey. Bulletin 645; pp. 144.

In the bibliography proper the classification is made alphabetically according to the authors name. The subject and place of publication are given. There is also an index in which the different articles and publications are classified by subjects and geographically.

Gold Mining in the Willow Creek District, Alaska. By Stephen R. Capps. Washington, D. C., U. S. Geological Survey. Bulletin 642-F; pp. 6.

The gold from this district, as given by the report, is derived principally from three mines, though many others not yet having reached the producing stage, are being worked. Brief descriptions are given of the more important companies and claims being worked in the district.

Construction and Operation of a Single-Tube Cracking Furnace for Making Gasoline. By C. P. Bowie. Washington, D. C., U. S. Bureau of Mines. Technical Paper 161; pp. 16; illustrated.

Drawings and description, with views, are given. The first pages are devoted to the construction of an experimental plant and in the following pages the precautions to be noted in construction and operation are reviewed.

Geology and Underground Water of Luna County, New Mexico. By N. H. Darton. Washington, D. C., U. S. Geological Survey. Bulletin 618; pp. 188; illustrated.

The geology of the formation considered in this bulletin is given only in so far as it is related to helping solve the problem of the probability of underground waters in the area which includes Deming, N. M. In this respect, however, a very complete review of the formation included in the area is made.

Determination of Aluminum as Oxide. By William Blum. Washington, D. C., U. S. Bureau of Standards. Scientific Paper No. 286; pp. 20; illustrated.

A description of the method, apparatus used and results obtained are dealt with and compared with other well-known methods. The method is essentially an ordinary gravimetric method of analysis. Considerable of the method is based on the use of the hydrogen electrode. By means of this piece of equipment the end point can readily be detected and the danger of resolution by the hydroxide precipitant or incomplete precipitation is eliminated. This has been a great fault in many gravimetric methods in which the aluminum is determined as an oxide and is usually precipitated by some base hydroxide.

TRADE PUBLICATIONS.

Lubrication of Internal Combustion Motors. Pratt & Washburn Refining Co., New York. Booklet; illustrated.

Though an advertising medium information of general use is given preference and the proper methods of lubrication of all different types of internal combustion engines is taken up. It further deals with methods of refining oils and testing the same for properties which affect the lubricating properties of the oil. The different grades of oil are spoken of and the parts and places where they can be used most advantageously for lubrication are mentioned. Lubricating systems for different classes of internal combustion motors are described.

Weldcron Steam Receivers. The Elliot Co., Pittsburgh, Pa. Bulletin F; illustrated.

The receivers are made for both vertical and horizontal pipe runs and for connections at angles. Separating the water from the steam is accomplished by slowing up the steam's velocity and changing its direction of flow. The moisture thus drops to the bottom of the receiver and is kept from getting into the outlet by baffle plates. The receiver can be had of either welded or riveted construction or a combination of both. The interior parts, however, are welded to the outside shell and the flanges are screwed onto the inlet pipes and welded in place.

Steam Turbines for Direct Connection. The Terry Steam Turbine Co., Hartford, Conn. Bulletin 20; pp. 8; illustrated.

A separate reprint accompanies the above bulletin on "The Exhaust Steam Turbine," by J. Breslay. This article discusses the advantages of low and mixed pressure turbines for plants already constructed but needing additional power units. Many good curves and drawings of installations are reproduced. The bulletin consists of a number of short talks on the use, proper construction and design of turbines for different uses. Among these are condensing and non-condensing turbines; turbo-generator sets; low-pressure, high and low-pressure and mixed-pressure turbines; turbo-pump sets; turbo-blower sets; vertical sets and belt drive.

Scientific Water Purification for All Purposes. Wm. B. Scaife & Sons Co., Pittsburgh, Pa. Pp. 72; illustrated.

The advisability of softening and filtering water before using it in many of the places where water is commonly used is frequently brought out in the text of this publication. For the greater part softening and filtering systems of fair size only are considered and the methods by which the company studies and makes tests for each particular installation are described. Filtering systems for water to be used in the laboratory, in some operation in the plant, for condensing, cooling and boiler feed water are described in different sections. The reasons why the water should be treated in each of these cases is also brought out and in the case of boiler feed water comparative curves are reproduced showing the consumption of fuel per k. w. hour before and after the boiler feed water was treated.

INDUSTRIAL AND TRADE NOTES.

The Pacific Tank Co. has its offices again at the old location—No. 318 Market street, San Francisco.

The Galigher Machine Co., Salt Lake City, has found it necessary to seek larger quarters for its steadily increasing business and will erect new buildings on Eighth South and Fifth West streets. The main machine shop is to be 330 ft. long by 60 ft. wide. This and the other buildings to be erected will be of steel and concrete. The company manufactures mining and concentrating machinery and has occupied its present quarters since 1903. E. F. Holmes is president of the company; J. E. Galigher, vice-president and general manager, and W. W. Armstrong, secretary and treasurer.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Gold mining in the Willow Creek district is the subject of a report by S. R. Capps, recently issued by the Survey as Bulletin 642-F. The region has recently been the scene of active prospecting, and plans are under way for mining on several properties as the result of the beginning of the construction of the new government railroad, which will pass along the border of this district. For several years gold has been produced from lode mines in this region, and in 1915 the value of this product amounted to nearly \$250,000. Observations made at several of the more developed properties indicate that the lodes persist to considerable depth and that the ore from the deeper levels will probably be free milling.

Knik.

William Martin expects to further develop the Martin-McCoy claims in this immediate vicinity and will freight in the mill and other machinery this winter to be installed next spring.

Ira and Charles Isaacs have bonded their claims in the Willow Creek district adjoining the Martin-McCoy group to C. E. Herron, who has commenced work in further developing the property and has secured Chas. Spaulding to superintend the work. A force of 6 miners has been put to work and a large outfit hauled in for several months' work. It is Herron's intention to haul in timber and machinery this winter for next season's operation. The deal calls for three claims. The bond consideration is \$60,000. This property, now known as the Herron property, is a continuation of the famous Mabel lead.

Juneau.

The Granby smelter, British Columbia, has received 1200 sacks of ore from the Venus mine, one of the Conrad properties on Windy Arm. This makes the third shipment from this mine. James McFarland, superintendent for the Harper interests, is making preparation to commence work on the Montana mine. A force of men are at work taking the ice and water out of the mine. Both of the foregoing mines are being developed by the Harper interests. The Montana has in years passed produced considerable good ore. Among mining men it is known as one of the best properties in the Varcross district. The M. & M. mine, which was formerly worked under the Conrad management and by subsequent lessees, has produced ore valued at \$165. McFarland expects his first shipment from the M. & M. to bring back \$180. He also has begun development work on the M. & M. on Polley Gulch. Three men are breaking and sacking high-grade silver. The outlook is encouraging. Work will be pushed through the winter at practically all of the mines now being opened by McFarland. A good force of men are working on the various properties and indications point to a continuance of shipments during the fall and winter months.

ARIZONA.

Miami.

Underground, on the 6th or main haulage level of Inspiration, a locomotive repair shop is being constructed near the Scorpion shaft. The shop will contain a pit necessary in making repairs to the underside of a locomotive. The pit and the floor of the station will be supported by structural iron, making the station substantially fireproof. A forge, lathe and drill press will be installed, thus enabling the carrying out of

roundhouse repairs without the necessity of having to take the locomotive to surface. The efficiency of reinforced concrete as an underground structural material is well exemplified in the case of the construction of the main shafts, with stations and skip pockets. The openings comprising the stations and pockets are unusually large, yet the reinforced concrete constituting the walls and roof of these openings show, after having been in place almost 1½ years, no indication of the ground pressure.

Douglas.

Nacozari Con. reports that the wagon road from the mine to the S. P. railroad at Old Nacozari has been completed. No. 3 glory hole has recently been commenced in the main tunnel, and has been extended 100 ft., encountering 9½% copper. As soon as this raise has been completed to surface, the main tunnel will be driven through to the Copper King in order to thoroughly open up the Pilares Copper reef, which crosses the Nacozari Con. at this point. Assay returns received from the El Paso smelter covering a carload of ore shows values as follows: 118 ozs. silver, \$1.70 gold, 1.35% copper, 12% lead and 15% zinc. About 40 men are now employed by the company.

Jerome.

One day last week the Venture Hill in a round of shots opened up a body of ore in the face of the tunnel on which the principal development work has been done, revealing 8 ins. of native copper on the hanging wall, paralleled by a vein of malachite from 2 to 2½ ft. in width. The discovery was made 275 ft. from the surface, 87 ft. distant from the old workings in the tunnel. Samples were declared to be identical with the character of the ore found on the 1200 level of the United Verde Extension. Venture Hill stock, following the news of the strike, has made a remarkable advance, and demands for it have been received from all parts of the country. John S. Reilly is superintendent.

Progress in enlarging the shaft on the Jerome-Verde from one to three compartments has been slow during the last week, owing to the fact that heavy ground has been encountered, into which it has been necessary to drive a great deal of piling. The shaft is now enlarged down to more than 490 ft. and the heavy going will soon be passed and sandstone encountered. The water in the shaft is not bothering the workmen, it being kept just a few feet below them. The present pumps on the property are capable of emptying the workings in a few days if necessary.

Among the newer properties that are attracting the attention of mining men and investors is the United Verde Con. Co.'s, Jerome. This company has taken over the Mahurin and United Verde Jr. claims and is mapping out a plan for extensive development work. Engineer George A. Bethune of San Francisco has been looking over the properties for several days, and it is reported exploration with diamond drills will be started on both properties following his report. This company is also reported to be negotiating to take over 10 claims in the Dewey country now owned by George Human. These claims are said to have a good copper-gold showing and will be examined by Bethune within the next few days.

The crosscut that is being driven southward from the 500 in the shaft of the Pittsburgh-Jerome is 4 ft. in quartz and soft talc that is heavy with copper carbonate and glance. The showing was encountered 300 ft. from the shaft, and owing to the soft character of the formation, is considered certain that much of the copper has been leached out and will be found below. As the whole formation is pitching sharply to the north the ore will eventually be cut by the shaft. Work is being concentrated in the south crosscut with a

view of proving the width of the new ore body. As soon as the new road to the Pittsburgh-Jerome property, now under construction, is completed, the new compressor, hoist, and other equipment will be rushed to the mine for installation and development, which should soon bring it into the producing class.

Prescott.

Considerable excitement in the Crown King district has followed the strike made recently in the Fairview mine. A sulphide ore body for the full width of the shaft has been uncovered. A vein 18 ins. wide is located near the mouth of the tunnel and work of sinking has been under way but a short time. Until the time of the recent strike the principal work on the Fairview has been the extending of the tunnel, a 3-ft. body of oxidized ore, giving about \$30 in gold, having been developed.

Perfection of plans for developing the Black Chief mines, near Dewey, has been completed and development started. The main shaft being sunk from the 100 level is progressing rapidly and a depth of about 50 ft. has been reached, with ore conditions satisfactory. Sinking will continue, with other exploration, until the 300 level is reached.

Pumps of sufficient capacity to handle any flow of water that may develop in the shaft, and a new hoist, compressor and other equipment are on the way to the Dundee-Arizona property. The Dundee shaft is now making 600 gals. of water an hour, and it is reported that the new pumps are to have a capacity of 2000 gals. Although no work has been done in the shaft since water was struck last week, the superintendent has been busy since then completing the raise from the tunnel level to the crosscut that was run westward from the 65 point in the shaft.

CALIFORNIA.

Jackson.

With the exception of the Old Eureka mine at Sutter Creek, and the Keystone and Little Amador at Amador City, every gold mining property in Amador county is idle and 1850 men are on strike. Mine operators declare the mines have been closed for an indefinite period and that the demands for higher wages will under no consideration be granted. The miners demand \$3.50 per day and \$3 for carmen and muckers. At the Old Eureka, Keystone and Little Amador the advanced scale prevails. Thus far no trouble has developed. The majority of the men are from southern Europe and it is thought probable that clashes will develop, although leaders assert there will be no violence. Operators met the strike with a lockout. Amador county is the leading gold producer of California and the strike is certain to seriously cut down the annual output of the state.

Grass Valley.

All miners in the Grass Valley and Nevada City districts have been granted an advance of 25 cts. per day in wages and there is no fear of the Mother Lode labor troubles invading this field. Mine managers state the raise was made as much to retain efficient men, tempted by the high wages prevailing in the copper regions, as for any reason. No labor trouble is considered, as this field has been remarkably free of such disturbances and the best of feeling prevails.

The Empire Mines Co. has arranged for the building of an electric railway from the Pennsylvania mine to the Empire mill, a distance of a mile. It has been decided to increase the capacity of the mill from its present 60 to 100 stamps, and to crush ore from the combined properties. As soon as it is in commission the 20-stamp Pennsylvania mill will be dismantled. The enlarged Empire plant is intended to treat 600 tons per day, making it the largest quartz mill in California. Late developments in the Empire at a depth of 4000 ft. have been highly encouraging, the new vein at this point proving to be one of the best ever developed in the district.

Another rich discovery has been made in the Golden Center, the strike being made at an approximate depth of 1000 ft. Much specimen ore shows and the vein is stated to be

over 3 ft. in width. Driving of a crosscut to tap the deposits in the adjoining Peabody mine will be started shortly from the newly opened 1000 level of the Golden Center shaft. Arrangements have been made to materially augment the capacity of the mill. At its Allison Ranch property the company has unwatered the shaft to a depth of 80 ft. and is retimbering portions. Equipment is arriving for the new mine plant and mill and the management expects to have it installed by the end of November. The pumps and hoist will be installed first and unwatering of the shaft rushed.

Keeler.

A caterpillar train, consisting of an engine and 5 trailers, has been placed in operation between the Santa Rosa mine and Keeler. It has a capacity of 25 tons per trip. Driving of a new lower tunnel has started and is designed to intersect the ore bodies 500 ft. below present workings. Satisfactory developments will be followed by the driving of another lower tunnel. The management states 15 north-south veins outcrop, with more than 10 cross veins in evidence. The ore contains silver, lead and zinc, and much is high-grade. The property is controlled by the West End Co. of Tonopah.

Ore shipments from Keeler are the heaviest in history. Motor trucks and mule-trains are crowding the highways, and the railroad is taxed to capacity to get consignments to the smelters. The Cerro Gordo is maintaining a particularly heavy output, and is also shipping to advantage the slag deposited when the old furnaces were operated. Most of the ore going out from the district contains zinc, or silver-lead.

Campo Seco.

Suits filed 3 months ago by 33 Mariposa county farmers against the Penn Chemical Co. have been dismissed by consent of all parties concerned. The suits were brought to recover damages alleged to be caused by fumes from the smelter near Valley Springs. It is understood the company compensated the farmers for all losses demonstrated.

Placerville.

San Francisco people have purchased the Rocky Bar gravel mine in the Fairplay district for \$50,000. Arrangements are being made for operation of the property along broader lines, and considerable new development work will be done. The mine is excellently equipped and has long been one of the premier placer gold producers of the district.

Work has been started at the Pyramid mine, near Rescue, with a force of 15 men. The 500-ft. 2-compartment shaft has been unwatered and repaired and will be sent 200 ft. deeper. The mine contains considerable ore in old workings and is well equipped. Charles Evans is superintendent.

The Badger Hill gravel mine, near Camino, has been reopened after lying idle 22 years. The old tunnel is being placed in shape for extensive work and driving of a 600-ft. lower tunnel has been decided on.

Mokelumne Hill.

The Eclipse gravel mine in Chili gulch has been taken under bond by W. H. Morrison and J. Miller of Stockton, who are arranging for extensive work. The property is traversed by the Blue Lead channel and considerable black sand, carrying gold and platinum, occurs. New devices are being installed to save these values. The Eclipse is owned by A. H. McCarty of Mokelumne Hill.

Tailorsville.

The report of the Engels Copper Co. for the half year ending June 30, 1916, has been issued. It shows gross earnings of \$175,578, and a net income of \$226,224. Large sums were expended on additional equipment and in the extension of new developments. Large deposits of profitable ore were indicated in outside ground by means of diamond drills.

Grass Valley.

The final payment has been made on the purchase price of the Union Hill mine and preparations are being made to send the shaft 400 ft. deeper and crosscut in expectation of intersecting the Union Hill and Georgia ledges. A new electrical plant will also be installed. Some good ore is being worked in the main levels and small shipments of scheelite are being sent out occasionally. The entire purchase price is said to have been about \$80,000. The present ownership is

comprised largely of San Francisco, Los Angeles and Pasadena people. The mine is equipped with excellent hoisting and pumping equipment, and a 20-stamp mill.

Hart.

Oro Belle Mines Co. will be taken over by a new company to be organized and in which John Hays Hammond and associates of New York have agreed with President W. B. Andrews and his directors to assume the controlling interest on an optional basis. This gold mine is for the greater part owned in the Copper Country and in Duluth, and it has 1,000,000 shares. It has a shaft 850 ft. deep that was thoroughly repaired about a year ago with considerable other exploratory work. In the two veins that have been opened there are gold values of commercial importance. R. C. Pryor, H. W. Fesing, R. M. Edwards and Prof. A. E. Seaman of the Michigan College of Mines, all of Houghton, are among the large stockholders, and the main office is located there. The details of Hammond's proposition have not yet been given out, but as far as it is known it is favorably regarded by the stockholders, and there will be no doubt of its ratification, when it is submitted at a meeting soon to be called.

COLORADO.

Cripple Creek.

At the 800-ft. or 10th level of the C. O. D. mine a 6 by 8 hoist to be operated by air has been installed and will be used for sinking. The work has been delayed, but Supt. Williams expects to start Oct. 1. The company is mining a good grade of milling ore from the main C. O. D. vein under development at the 6th level. The raise carried by the Sun Tungsten Co., Denver, on the new vein lying east of the main C. O. D. is entering richer ground and values have risen to as high as \$12 and \$15.

Settlement for a 2-car shipment from the Isabella Mines Co. has been made. The ore was mined by the company at the 15th level of the Lee shaft, from the ore shoot on the Buena Vista vein. One car of screenings brought 4.23 ozs. gold, \$34.60 per ton. A car of coarse rock returned higher values, the settlement having been 4.55 ozs., \$91 per ton. The net returns exceeded \$4000. The shoot on the Buena Vista from which this was mined has been stoped to a point above the 15th level within 40 ft. of the 14th level. A lateral is being carried out from the 14th level to tap this shoot. Ore with an average value of \$30 is also being mined by the company at the 15th level on the East Victor vein, and the winze being sunk to prove continuity of values is down 35 ft. with values holding. Work on the ore house for the Lee shaft is progressing. The building is equipped with ore washers and will be heated by steam. By Oct. 2 three of the bins will be ready for use.

The Gillard Tungsten Mining & Leasing Co. has recently loaded out a shipment from the property of the Gold Bond Con. Mines Co., on which the company has secured a bond and lease. The company recently purchased a hoisting plant from the S. H. Machine Co. of this city, and has ordered a 6-drill compressor from Denver. The company has plans under preparation for a 100-ton mill. Flotation and cyanide processes will be used. It is planned to treat low-grade custom ores.

Leadville.

According to John Nelson, who has the contract for timbering the Mikado shaft, the work will be completed by Sept. 30. Timbering has been finished from the collar to within 74 ft. of the water level at the 900 level. Foundations for the new hoist are being laid and preparations for the draining and developing enterprise planned for the property are being carried out. New surface buildings are being erected at the shaft preliminary to the installation of the power and machinery plant.

The sinking pumps at the Penrose are being moved to the bottom of the station, as sinking has been completed. The compartment containing water pipes from the pumps and cables is being cleared. While sinking was in progress two compartments were devoted to the pumps, both containing a

separate column and power cable. With the lowering of the water to the bottom level and the subsequent installation of the 2000-gal. station pump at the bottom, the service of both sinkers was no longer required. One compartment containing the original column for one of the sinkers and the new column for the station pump was then designated as the pumping compartment was undertaken. The two sinkers were moved from the shaft into the bottom station. One machine is now connected with its relief pump at the 450 level and is operating. The column for the other is being moved. This plan of concentrating the pumping power into the bottom station and gathering the water columns and cables into one compartment is for the purpose of opening two compartments for hoisting. As soon as the machinery is placed it is planned to develop the property on a large scale. Present reports state that the preliminary work at the Penrose will be complete by the end of September. Some development is under way in the upper workings, but this is more of a preparation for the work to come than a new undertaking.

Breckenridge.

Bulkeley Wells, formerly operating the Smuggler-Union mine, and now agent for a mining syndicate, is operating the old Puzzle mine for the Puzzle Leasing Co. He will proceed at once with preparations for sinking a 2-compartment shaft to 150 ft. below the tunnel level. The property is to be equipped with machinery for deep work. Electric drills are to be installed and one is on the ground and in operation. Installation of new machinery, overhauling of the present plant and other preliminary work will delay actual sinking until Oct. 1 or later. At that time it is expected that three shifts will be started. When completed, a depth of approximately 500 ft. will be attained. For the past 2 years, the Puzzle Leasing Co., operating through the Puzzle tunnel, has been developing the Gold Dust property. A shaft has been sunk a distance of 60 ft. from the Puzzle tunnel level and 1000 ft. of drifting has been done. The work has determined so far that lead-zinc ore shoots go down, and that former operators by no means exhausted the ore. On the level below the tunnel a large ore reserve has been blocked. On both the foot and hanging walls are lead-zinc streaks of good width, carrying values in gold and silver. From these streaks the shipping material has been taken. Between them lies a 20-ft. body of lower grade ore, which if determined intact at the depth to which the shaft will go, will furnish a milling proposition.

IDAHO.

Wallace.

The net profits of the Federal Mining Co. for the quarter ended July 31, 1916, were \$268,287, as compared with \$290,891 for the previous 3 months, according to the official report to stockholders, under date of Aug. 27. Shipments during the period were 38,972 tons, as against 31,844 for the first quarter of the current year, and the net earnings for the 6 months were \$624,029. Depreciation charges for the first quarter were \$65,234, and for the second quarter, \$64,006, and dividend payments to Oct. 1 were \$360,000. Shipments in February were 8558 tons; March, 10,627; April, 12,659; May, 13,707; June, 13,375, and in July, 11,890, while the net profits for the same periods, depreciation not deducted, were as follows: February, \$77,663; March, \$131,753; April, \$146,709; May, \$174,934; June, \$99,640, and July, \$57,719.

M. J. Sweeny, president of the Rex Con. Mining Co., which was organized a number of months ago to take over the old Rex mine and mill in the Nine-Mile district, and who also has been general manager since development was resumed at the property, has resigned the latter position, and Raymond Guyer, widely known mining engineer, has been chosen to succeed him. Guyer already has assumed his new duties, and President Sweeny will devote his entire attention to the executive affairs of the corporation. The Rex mill for a number of months was under lease to the Tamarack & Custer Mining Co., which last week bought the Frisco mill at Gem from the Federal Mining & Smelting Co. for \$150,000, and the Rex plant now is being remodeled, preparatory to

beginning treatment of the Rex output. The old workings of the Rex have been unwatered and repaired, and the property now is in excellent condition for active operations. The tramway is being rebuilt, and as soon as the buckets are installed shipments will be begun, probably not later than Oct. 1.

Mullan.

One of the most important strikes in the Coeur d'Alenes in several months was made recently in the Silverado mine, a mile from here, according to N. A. Carpenter, general manager, who says: "The discovery was made in an upraise from the lower tunnel, now in about 4000 ft. The ore is gray copper, carrying from 50 to 60 ozs. in silver, and undoubtedly is the best find ever made in the property. The exposure was made at a vertical depth of about 1400 ft., and the vein is from 6 to 9 ft. wide. We now are constructing a 100-ton mill, and the last of the machinery should arrive on the grounds not later than Oct. 1. It will require about a week to complete the plant after the delayed equipment reaches us, and we should be operating by the 15th. We also have agreed to handle the output of the Nellie mine, near the Silverado, in which recent development has demonstrated some very promising ore bodies."

Burke.

The net earnings of the Hecla Mining Co. were \$766,887 for the 6 months ended June 30, 1916, according to a report sent to stockholders, under date of Sept. 15. This is \$205,135 more than the net profits for the entire year 1915, and establishing a new high record of revenue for the corporation, but the achievement probably will be eclipsed in the last half of the current year, as the output of the property has been increased considerably in recent weeks to take advantage of the prevailing high prices of lead and silver. The company's surplus now is approximately \$550,000, and is being steadily increased from month to month. The financial statement for the period states that smelter receipts from shipments were \$1,079,211, and miscellaneous receipts were \$3376, making the total gross income \$1,082,587. Operating costs were \$291,285, and improvement costs were \$24,415, leaving the net profit \$766,887. Of this \$116,887 were transferred to the surplus account, and the dividend payments were \$650,000, as compared with \$565,000 in 1915. The Hecla mill now is treating 450 tons daily, but the directors have authorized construction of an additional 200 tons daily capacity unit, to be built as soon as plans can be prepared. The leased Union mill is handling 300 tons daily, operating two shifts, and probably will be continued in service after the addition to the Gem mill is completed.

LAKE SUPERIOR.

COPPER.

Houghton.

Victoria's new hoist is running and the skipway is practically completed. About 300 men are employed. The mill is treating about 400 to 500 tons a day. Eight new tables will be added, to raise the daily tonnage to about 700.

Ahmeek is finding that the neglected Kearsarge conglomerate is in both drifts in amazingly good rock. If this richness persists for a good length on the Ahmeek's ground it will pay all of the properties on the Kearsarge to crosscut to it at depth.

Superior's dividend is deemed the proper step, because it will have enough money left—probably about \$300,000—to develop a mine of its size.

Allouez will probably be a great gainer by the revival of interest in the seemingly forgotten Kearsarge conglomerate sometime in the future, as when No. 1 shaft was sunk this lode was met with at the top of the ledge, about 52 ft. from the surface, with a good width and a good disclosure of the metal. If the showing at the 10th level, about 1500 ft. down at the Ahmeek, continues, at some future date, when men are plentiful and conditions propitious, undoubtedly the Kearsarge conglomerate will be given an exploration at No. 1; No. 2 is too far west to intercept it. At the latter, however,

there is a recompense for the lack of the Kearsarge conglomerate, as at the depth of about 180 ft. from the surface the Osceola amygdaloid was traversed with a wide display of good quality.

Cass—the old Norwich—under the direction of D. L. L. Hubbard, is using drills, one above and the other below the first hole which reached the depth of over 1600 ft.; and the upper hole, that on the hanging-wall side, will begin next to the strata in which this original hole stopped, and the other will end in the strata next to those in which it began, so as to make a cross section of the formations, all three being at right angles practically to the series. One of the conglomerates of this part of the copper-bearing formations has been passed through, but is so far away from a point where the known members of the series can be accurately traced that it will not yet be identified until some other conglomerate is entered. Only small quantities of copper have been encountered.

White Pine Extension will discontinue sinking on the 230 level and will crosscut to the two sandstone and intervening shale or slate beds, in order to furnish rock for the experimental mill, where flotation will be employed for the first time in the Lake Superior district. The copper-bearing beds are about 40 ft. from the shaft.

Mass tonnage will run off slightly this month, owing to trouble with the rock crusher at "C" shaft, but it will be remedied in a few days, and the regular production will again be reached. The yield is holding up to about 16 lbs., as for some time in the past.

Keweenaw is entering the high-grade rock of the foot-wall side of the Ashbed lode at the 10th level, and the other two levels at the bottom of the shaft, the 12th and 14th, will be over very shortly. The 7th level east is in high-grade shot copper. On account of the great scarcity of carpenters and surface men the mill test will not be made until about the first of October.

Houghton has now a length of over 120 ft. on the northern drift at the 12th level of good grades almost all of the way. Only a little copper is being found on the 4th level, where drifts have been run for about 6 weeks. On the 6th level to the south a good grade is being stoped.

Franklin will soon be running two of its three stamps on its own rock; it is now using two stamps and a third part of the time. Each of the stamps can handle about 400 tons daily. There is no lessening in the values, as the levels are extended south and the 32nd is just about under No. 2 shaft. The capacity of the stamps can be greatly increased, probably up to 600 to 700 tons when it becomes necessary, by compounding them, which would mean with the changes and increases in the "wash" that would be required the expense of about \$50,000 a stamp.

Lake, at its shaft on the Knowlton lode, has unwatered down to the 3d level, and an examination is being made to ascertain the best points at which to begin the drifting. At its first shaft the lower levels are being stoped and are disclosing as good rock as found on those above.

Calumet & Hecla has for the time declined slightly in its daily tonnage to 9190 tons, which is one of those declines that occur occasionally from a combination of different causes, among which there stands out above the others, the lack of men. This, however, even for a year, would be a very good average.

IRON.

Quinnesec.

The St. Clair Exploration Co. will explore the McKenna property. It already has one diamond drill at work near the small creek. For many years the McKenna property has been considered one of the best prospects on the range and numerous parties have endeavored to secure an exploratory option on the same.

Duluth.

The strike on Mesabi range has been voted off. There were few idle mines when the vote was taken, most of the men having returned to their places some time ago. Some of the agitators have stated that the calling off of the strike

is merely a truce and that trouble will start again in the spring. Ore shipments were maintained during the trouble, more ore leaving the range this year than during any previous season. The strikers succeeded in closing some of the underground mines, but the pits worked steadily.

Ishpeming.

It is rumored that the C. & N. W. railroad will shortly commence a siding extending from the St. Lawrence track to the site of the marble quarries near the Ropes Gold mine. Much marble is now being shipped. In addition there would be the hauling of coal and other supplies to the quarry. The switch will leave the main line in the vicinity of Clowry, and be about 2 miles long. Railroad officials have been looking the ground over, and will probably start work in a short time.

MISSOURI-KANSAS.

Joplin.

With both ore markets showing stronger the outlook is better for mining conditions. Prices for medium and second-grade zinc ores advanced from \$5 to \$10, while prices for lead ores are reported from \$70 to \$75. This heavy advance in price naturally resulted in a large number of sales, and the week just ended will probably mark the heaviest shipments for many weeks. Producers who have been holding low and second grades accepted the opportunity to unload a large portion of their surplus stock, and the reduction that will result from this week's operations are expected to reach in excess of 3000 tons.

With the promise of lower powder cost, simultaneously with better ore prices, there is the likelihood of the opening of a number of properties which have been closed down and the re-employment of a large number of miners who have been thrown out of work.

F. E. Bryan and associates, operating a zinc prospect on Continental ground, west of Joplin, have ceased mining operations for zinc and are now opening up a pocket of coal at a depth of 60 ft. The shaft shows a 15-ft. face of coal, and so far a prospect drift has cut it 20 ft. The prospectors are taking out about 30 tons of coal per day and are marketing it.

Claude Perry is opening up the old Haggerty lease, southwest of Joplin, where a drill prospecting campaign showed ore at the 100 level. The shaft is now down 185 ft.

The Big Six Mining Co., operating on a lease of the Cunningham in South Joplin, has sunk a shaft to 110 ft. and is taking out a promising amount of lead ore. The drill prospecting showed ore from 117 to 138 ft.

On a lease of the City property southwest of Joplin the Adirondack Mining Co. is erecting a new 300-ton modern concentrating plant to be equipped with a gas and a Diesel oil engine. Two shafts are already down in the ore, and if it proves to be necessary, two to three more will be sunk. The company is conducting its operations at the 175 level, which is the one at which the disseminated hard ground ore deposits of the west Joplin field are found. W. H. Roberts is superintendent.

One of the richest old tracts in the Joplin field is the old Roaring Springs mine, directly south of the city, and the Swan Machinery Co. is now making preparations to drain this tract and resume operations at a lower level. At the present time all the operations are above 130 ft. Several companies are operating at shallower levels, nearly all of which show good possibilities. There is a 100-ton custom mill upon the ground which is taking care of the small production at the present time.

Walter Sandford and Cecil Brookshire have opened up a prospect on the Douglas land west of Joplin and at a depth of 73 ft. ore running from 6 to 12% is being taken out. For the present the ore is being cleaned in a custom mill in the vicinity, but with further development a mill is expected to be erected.

After an idleness covering several years, the old Bumble Bee mine, southeast of Joplin, is being reopened and a 150-ton concentrating plant is being erected. Three shafts are

now in ore, and a fourth is being sunk. A very large amount of lead ore is being found at the 150 level, and it is believed that when the mill is finished the ground will be amply open to supply the mill to capacity. M. D. Clark of Kansas City is the principal owner of the Bumble Bee Mining Co.

A. P. Clark, owning a large amount of land along Shoal creek, south of Joplin, reports a large number of new prospect holes put down, with the possibilities of an early production being made. This tract has always been a good producer, both of lead and silicate, the ore being found at shallow levels, from 30 to 70 ft. The ore is all cleaned on hand jigs, and is hand-picked, and the cost of production is low.

A. S. Baldry & Co. has opened up one of the richest silicate diggings in the Joplin camp for many months. In a shaft that was put down to increase the ventilation, a discovery was made from which 10 tons of silicate ore is now being taken per day. The ore was struck at 125 ft. and continues down to the 135 level. At 105 ft. a 10-ft. face of lead ore was penetrated which will be worked later.

The old story of quitting just a foot too soon was repeated this week when an old shaft which was sunk 12 years ago was reopened and work resumed. The shaft was sunk just 1 ft. further and a face of ore opened up which is believed to run 12% zinc. The new company took a lease and put down a drill hole, striking ore at 153 ft., which continued to 170. This prompted the cleaning out of the old shaft, which was found to be 152 ft. deep. The new operators are Wm. Kelley, Wm. Boyd, A. L. Moore, S. A. Smith, C. M. Ramsey, Geo. Ensing and Wm. Saylor, all of Joplin. The company is forming a new corporation, to be known as the Honey Bee Mining Co.

MONTANA.

Butte.

About 200 miners in Butte will receive certificates from the government for their work along mine rescue lines, according to S. J. Rahelly of the Bureau of Mines, who was here last week. These certificates are given only after the men have shown a certain degree of skill in the mine rescue work. Rahelly came here from Billings without the special car which is generally used. The car, which he has been using, has been condemned and he is without a "home" until the new cars, now under construction, are completed.

Articles of incorporation for the Boston-Montana Milling Co., with a capital stock of \$250,000, were filed in the office of the clerk and recorder last week. The company proposes to do a general smelting business. Stockholders in the corporation are: J. Ryan Gaul, Charles A. Blackburn, L. F. Benedict, C. M. McCoy, P. B. Goodwin, E. A. Law and Wyatt M. Fanie.

A large vein apexing in the Three Sphinx claim of the Rainbow Development Co., apparently strikes through the northern part of the property of the Butte & London Co. and it is for this fissure that the crosscut is being driven north on the 1600 level of the Butte & London. There also is a possibility that the Rainbow vein of Butte & Superior fame finds its way into the northern part of the Butte & London, particularly if the fissure curves to the south, providing that the fissure in the Three Sphinx is not the Rainbow vein, which fact has not been established to a certainty, the belief prevailing that the Three Sphinx possibly may be the eastern extension of that fissure. In any event a vein of large size is striking across the north end of the Butte & London. The Speculator vein of the North Butte is believed to strike, across the southern part of the Butte & London, with the possibility that the vein may be found in a fraction bounding the Butte & London on the south, which has been acquired by the Butte & London from Arthur Cory and deeded to the Glendale Exploration Co., of which stock the Rainbow Co. is to be given 51% for its development of the Butte & London property. The 1600 crosscut will be extended south through the Cory fraction. Drifting will be started before long, it is expected, on a 7-ft. vein cut in the south crosscut, the ledge matter of which shows assays of 1½% copper and several

ounces of silver. Three or four veins have been cut on the 1600 level, all of which show the presence of copper in small amounts, but the walls of these fissures are strong with a filling apparently promising of developments with drifting. In the south crosscut one vein carried a foot of zinc ore which ran 9% zinc. If the developments on the 1600 level fail to come up to expectations, the shaft will be sunk an additional 500 ft.

The east and west vein carrying sulphide ore, cut several days ago in the Butte-Bullwhacker, has again been picked up by a crosscut driven from the old Stevens shaft, 50 ft. above the 100 level, where first it was found. The Stevens shaft is situated 200 ft. south of the Bullwhacker shaft. It was necessary to drive about 12 ft. to find the ledge. Where the vein was cut by the Stevens working it shows no sulphide ore, but there is about 2 ft. of high-grade oxide ore, an assay giving 23.46% copper. The drift on the 100 level of the sulphide vein has been driven about 30 ft., 15 ft. east and west from the crosscut opening the vein, showing a continuation of the sulphide body, the width of which ranges from about 1½ to 2 ft. In the east breast sulphide showing was 2 ft. in width, of fairly solid sulphide with an admixture of oxide ore, which will assay close to 40%, there being much altered glance in evidence. The unwatering of the Bullwhacker shaft to the 200 level will be undertaken and from that level a crosscut will be driven to the sulphide vein to determine its character at that depth. The Bullwhacker shaft has a depth of 400 ft.

Great Falls.

The new zinc refinery constructed by the Anaconda Copper Mining Co. here is now in operation. It has a capacity of 5,000,000 lbs. of refined zinc every month. The two new furnaces of 50 tons each in which the zinc is to go through the final process and be converted into plates for shipment were not ready and the first shipment of 25 tons was sent to Anaconda to be handled. The furnaces are expected to be ready for operation by Oct. 1. The entire plant will be in operation by Nov. 1.

Helena.

Many Montana pioneers will attend dedication of the monument which will mark the first discovery of gold in Montana at Gold Creek. It is expected that the monument will be in place about Oct. 20 and that the dedication exercises will be held Nov. 1. The marking of the spot will be in charge of the Montana Geographic society, although members of the Montana Society of Pioneers will take an active part. The monument will mark the exact spot at Gold Creek where Granville Stuart and his brother panned the first gold found in this state. It will be in view of both the Northern Pacific and Milwaukee railroad tracks and will be designated by Historian Frank D. Brown of the Montana Society of Pioneers, who has recently conferred with Granville Stuart, survivor of the discoverers. With Mr. Brown, President Jesse J. Rowe of the Montana Geographic Society and A. L. Stone of the University of Montana are in charge of arrangements for the dedication. Mr. Stuart will attend the dedication and it is very probable will make an address.

A custom mill to treat low-grade ores is to be rector here by the New York & Montana Testing & Engineering Co., it is announced. The plant will cost \$30,000. It will aim especially to treat large bodies of low-grade ore in this mining district.

Drift 90 ft. east on the 500 level of the Scratch Gravel Gold Co. has opened 2 ft. of gold ore which assays from \$100 to \$200. The shaft is sunk on an incline and the 500 level is at a vertical depth from the surface of 300 ft. A stringer of ore 8 ins. wide was encountered 30 ft. from the shaft which has widened as the drift progressed eastward. Ore was found fairly continuous on the hanging wall of the shaft while it was being sunk. The values occur in a reddish iron gangue through which considerable sulphide is found in the character of iron pyrite. The picking up of ore east of the shaft is regarded as significant and as determining the dip of the ore shoot. In this direction the company has about half a mile on strike. On the upper levels the greater part of the higher grade ore mined has been found on the 200 level west of the shaft in the direction of the Franklin prop-

erty, the shaft of which is 1200 ft. westerly. Four cars of ore were shipped to the East Helena smelter during August and yielded \$14,000, which netted \$7000 on the month's operations. This ore was hoisted through a winze. From 15 to 20 more men will be placed at work Oct. 1 stoping, and upon the showing made in an upraise which it is proposed to drive from the 500 level will hinge the decision as to development on the 400 level, which has not been opened. Drifting will be continued indefinitely on the 500.

NEVADA.

Tonopah.

The Tonopah Western Con. Mining Co. has been formed with 1,000,000 shares to operate on 700 acres of ground lying between the Great Western and Tonopah Bonanza mines, and immediately to the east. The consolidation includes the Golden Gate, Desert King, Silver Queen, Comstock, Table Mountain and several fractional properties. The company has also arranged with the Greenwater Copper Mines & Smelter Co. for development of all the ground lying between the Great Western and Tonopah Bonanza shafts, which will mean exploration of nearly 1200 acres by the two corporations. The Great Western shaft will be deepened 300 ft. and crosscuts driven to connect with the Tonopah Bonanza workings a distance of 6000 ft. By this means much promising ground about 2 miles west of the Victor mine of the Tonopah Extension will be thoroughly explored. Boston and Montana people are heavily interested in the new company, including several officials of the East Butte Copper Co. The deal was consummated by Oscar A. Daube of New York. Robert H. Gross of Boston is president; F. W. Paine of Boston, vice-president; Oscar Rohn of Butte, secretary; W. Rooney of Boston, treasurer. Other directors are Oscar A. Daube of New York, Bryce W. Turner of Los Angeles, Frank Price and William Everts of Boston.

The Tonopah Extension is sinking the Victor shaft to a depth of 1800 ft. As soon as the level is gained a station will be cut and crosscuts extended to pick up the extensions of the Murray and other veins. Ore indications are becoming more encouraging in the eastern end of the 1260 and 1350 levels, where the drifts are seeking the eastern extension of the Murray vein, cut off by the Extension fault. From the main workings a heavy output is maintained and the mill is treating 2200 tons weekly.

Uncovering of high-grade silver ore in the Midway is claiming keen interest. The west drift that has been following the big ledge south of the new shaft has intersected a vein about 4 ft. wide, of which fully 2 ft. carries rich silver ore. Much of this is in the form of ruby silver and of beautiful character. The drift is being forced ahead to determine the extent of the discovery and the crosscut from the 1100 level is to be extended in hopes of picking up the shoot. The work is being done in virgin territory and promises to have an important bearing on the future of the district.

Rochester.

Connections between the Codd winze and the Friedman tunnel of the Rochester Mines will probably be made within 10 days. As soon as possible ore from the upper workings will be turned by means of chutes into the tunnel and from this point sent to the mill. The ore body above the Codd winze is being worked by the glory-hole method. It is 9 ft. wide and has been opened for 900 ft. In the Four J workings the vein shows 4 to 5 ft. of excellent ore.

The contact vein in Nevada Packard is developing well and a heavy tonnage is going to the mill. The ledge is stated to range from 20 to 30 ft. wide and averages around \$10, silver predominating. The mill is crushing 110 to 130 tons of ore daily, depending on hardness of material treated. J. W. Wilkey is superintendent.

Mina.

An examination of the Blue Light copper mine has been made by L. N. Ford of Washington, D. C., T. H. Flood of Tonopah and Prof. Jones of the University of Nevada, with a view to the feasibility of installing a 100-ton leaching plant.

The mine contains considerable ore and is owned by residents of Indianapolis.

Machinery for the mill on the Royal George mine, 20 miles east of Mina, has been received, and the plant is being rushed to completion. A large tonnage of good ore is exposed underground and on the dumps. San Francisco capital is interested. Fred J. Siebert is manager.

Battle Mountain.

The Goodwin-Plumas mine, 12 miles south of Battle Mountain, has been sold to E. N. Breitung & Co. of New York. The ore contains silver and some gold and an immense tonnage is stated to be exposed. A small force of miners has been put to work repairing the workings and getting things in shape for production. It is reported the company plans the erection of a mill with a capacity of 200 to 300 tons daily, and to operate the plant by electricity generated at Battle Mountain. H. B. Barling will be consulting engineer.

NEW MEXICO.

Silver City.

A. T. McGee Co., geologists, Ardmore, Okla., has taken an option on 50,000 acres of land in the Animas valley, southern Grant county, and are preparing to prospect for oil. They will also option a tract of land which is said to be rich in lead and zinc.

Fierro.

John Brockman, Los Angeles, and J. W. Brock, a capitalist of Philadelphia, owners of the iron mines at Fierro, announce that a mill of 400 tons capacity will be built at once for the purpose of handling the copper-iron deposits of the district. The preliminary work has been started under Superintendent B. E. McKechnier and it is expected the mill will be built with as little delay as possible. Fierro has been known as an iron camp, but certain of these ores contain copper which makes their treatment for the extraction of that metal an attractive proposition, when a complete saving of the iron content can be made. While the mill will be of 400 tons capacity to start it is to be constructed so that the capacity can be increased.

Mogollon.

High-grade ore was discovered last week in face of No. 3 tunnel on the Eureka claim. The owner, D. E. Bearup, has already shipped a considerable tonnage from upper workings and this new strike adds materially to ore reserves. First-grade is being sacked for consignment to El Paso smelter direct, while second-class will be treated in local custom works.

Mogollon Mines Co. output for first half of September was 1300 lbs gold and silver bullion and 3 tons high-grade concentrates, from a reduction of 2025 tons of ore. Station at 900 level in new shaft is being cut and will be finished this week, when sinking will be continued.

At Pacific mine a large crew of carpenters are rushing work on loading station and terminal for aerial wire rope tramway to plant of Socorro Mining & Milling Co., at which latter point the terminal is practically completed. Mine development is being pushed night and day and the property will be in shape for supplying tramway with a regular tonnage for a long period.

The Eberle mine has been explored with a total of 600 ft. of sinking and raising and 1450 ft. of drifting. Both Queen and Deep Down veins run lengthwise through property, the Queen with a width of 4 to 18 ft. The Oaks Co.'s operations have been confined largely to latter vein and a good tonnage of mill ore is opened up. Ore was shipped by this company during development period, with a value exceeding \$2000 per ton. No stoping has been done in the mine.

A 1% dividend was paid Sept. 1 by Socorro Mining & Milling Co., the fifth of like amount this year.

Steeplerock.

A second payment, \$40,000, has been made on the Carlisle mine, sold some months ago by George H. Utter, Silver City, to eastern capitalists. This is the second payment made, the total purchase price having been approximately \$300,000.

OREGON.

Granite.

The United Gold Mining Co. has about 20 men on its pay roll, and when in full operation this number will be more than doubled.

Sumpter.

Otto L. Simons has brought suit against C. L. Arzeno to recover the sum of \$1225 with interest on portions of it from varying dates, on which payments were alleged to have been made under an agreement between them, and the further sum of \$1250. The complaint alleges that the plaintiff transferred his lease on the Imperial mine to the defendant under an agreement, terms of which have not been fulfilled by the defendant.

SOUTH DAKOTA.

Deadwood.

The Slavonian mine is shipping at the rate of 75 tons per day to the Deadwood-Standard mill and it is rumored this amount will be increased to the mill's capacity of between 200 and 300 tons. When the Deadwood-Standard plant was in operation, there was some trouble in the winter in keeping up its efficiency, and freeze-ups were frequent, owing to the construction of the housing. The present lessees of the plant propose to remedy this defect and a force of carpenters are now engaged in making improvements on the building. From this work it is evident that it is the intention of the lessees of the Slavonian ground to continue operations during the winter months. It is also rumored that custom ores may be treated at the mill later.

Custer City.

Good ore has been encountered at the Monarch mine. In one of the drifts from the main tunnel a shoot carrying free gold has been struck. This streak is not very extensive, so the rich stuff is separated and will be sacked. They have about ½ ton of this ore sacked, while on the dump is from 10 to 15 tons of material which will assay high, and which will be shipped soon for treatment. The shoot which has been opened up in one of the old drifts, a considerable distance in from the portal of the main tunnel, is said to be extensive and easily mined, and will average better than \$20. It is expected that a carload of ore will be sent away to a treatment plant by Oct. 2.

Keystone.

The Holy-Terror-Keystone-Bullion deal is progressing favorably, L. D. Huntoon of New York, in charge here, represents the Sheldon-Morgan interests, who are back of the undertaking. A most thorough sampling of the Bullion ore bodies are now under way, 14 men are employed and will be kept at work extending drifts and crosscuts on the ore body, that a complete knowledge of the estimated values may be had. The accurate and exhaustive system employed in sampling are in keeping with the magnitude and fully equal to requirements to those familiar with production and values of the Bullion in the past. The outcome is awaited with interest and confidence expressed that the dependable methods in operation will produce reliable and satisfactory results.

Continued development of the Columbia ledge on the 200 level gives proof of its extent and richness. Specimen ore is of common occurrence. Quite recently in the progress of the work ore rich in free gold was uncovered, and results so far have confirmed expectations in the permanency of the ledge and its high-grade values. Preparations are complete, and it is expected that development will continue with the sinking of the shaft to the 300; the ledge opened up there, its extent and value determined, after which it is considered likely that measures will be taken to adapt methods and processes for the handling and treatment of the ore and placing the property in line as a steady and paying producer.

One of the most promising properties here is about to come into its own. Some time ago Denver people formed the Good Hope Mining Co., taking over the Liston-Tenny

ground. The management, composed of practical mining men, were impressed with the showing disclosed by work of the former owners and set about to extend development and verify values. After months of systematic work results have justified the effort in a most gratifying way. A shaft already started on the outcrop of a gold-bearing ledge was continued on down, finding the ore in place and averaging a high grade. A mill had previously been erected on the property and a run was made on the ore mined in developing. The mill run was in the nature of a "tryout" by the management, and the result is best gauged by the cleanup made from the mixed unsorted rock ran through. Extensive preparations are now being made to install necessary and up to date equipment on mine and in mill. A force of men will be added, a road graded to top of the hill, where the shaft is situated; a steam hoist will be set up, the efficiency of the mill increased by addition of concentrators, a new air compressor installed, sinking the shaft will be resumed, and from time to time mill runs will be made on the ore encountered, in that way helping to defray expenses and enabling the management to experiment and apply correct methods of treatment, when contemplated development has reached a stage that will determine the erection of a suitable and permanent plant for reduction of the ore.

The Cuyahoga Mining camp presents a busy scene these days, a new "dry" and storehouse, together with a finely equipped blacksmith and machine shop is nearing completion, two new boilers lately received are being moved and will be added to the equipment at the mine where 40 men are kept busy pushing work. The raise from the shaft at tunnel level, through to the surface has been finished, a road graded for the ore teams, and shipments of the sulphide ore found in sinking will be resumed. A trial carload shipment sent forward some time ago brought satisfactory returns, and an insistent demand for the product, of which the mine appears to have an immense quantity.

The old Spokane mine will again come to the front as a producer, a company known as the Keystone Gold & Lead Mining Co., having bought the property, and are busy getting things in shape to work the mine, fitting up with sufficient boiler power, a hoist and air compressor. Shipments of the high grade gold, silver, lead and zinc ores will be loaded on cars here and sent to outside smelters for treatment, while the company are arranging to build a suitable plant at the mine for treatment of the mine run ores.

The Dr. Herman Rienbold's properties continue to be worked for amblygonite, mica, and the various rare minerals encountered as work proceeds. Eight men are engaged mining, saving, sorting and preparing the product for shipment.

Pat O'Keefe employs 3 men and with a horse whim in operation has kept steadily at work since early in the season, developing the ore body in the N. Pope mine, one of the claims composing the well known Egyptian group.

UTAH.

Cottonwood.

No. 4 drill hole at the Emma now shows 21 ft. of ore and in reviewing operations Geologist Beeson reported: "We have encountered high-grade silver-bearing lead ore in hole No. 4 at a depth of slightly over 210 ft. below the Bay City tunnel level, at a point about 140 ft. northeast of the Montezuma fault. In three previous holes at a depth of 180 ft. we encountered favorable conditions. In hole No. 2, for instance, a ½-in. streak of galena and quartz was cut below a brecciated zone, and where we have the ore is on a line with this horizon, the additional depth apparently being due to the inclination of the strata. The holes so far put down are arranged radially with No. 4, or the last one as a center. No. 1 is situated 80 ft. to the southwest. No. 2 is 80 ft. to the south, and No. 3 80 ft. to the southeast. I am satisfied that the ore encountered is a continuation of the famous Old Emma ore body. This is borne out by the fact that in each of the holes at this same horizon favorable indications have been met with, and, further, because hole No. 3

showed conditions almost identical with those seen in the limestone exposures just south of the Old Emma stope near the surface. In further explanation, it may be said that at the surface there are certain distinctive geological characteristics in the way of mineralization and texture of the limestone beds lying adjacent to the ore bodies in the foot-wall side of the fault that we find duplicated in the faulted portion of the limestone below the Bay City tunnel level on the hanging wall side of the fault. This increased our confidence in the successful outcome of the operations which we were carrying out. The ore encountered in the drill hole is somewhat different in character to that which was mined in the Old Emma stope, because, in the upper workings, the ore was almost completely oxidized, while the ore cut in the drill hole shows no oxidation or alteration whatsoever. Further, it is much more silicious. The core shows galena and pyrite disseminated through a compact mass of quartz, with here and there small cavities lined with well formed crystals of quartz and galena. Argentine, the sulphide of silver, is also present. This is further evidenced by the high silver values contained in the first part of the core which was sent to be assayed. The unoxidized nature of the ore and the apparent absence of secondary minerals and the large amount of quartz in the gangue, leads to the conclusion that the high-grade ore encountered will persist to depth. The character of the quartz as shown in the core indicates that the mineralization has been affected by deep-seated solutions coming up through fissures in the rocks and replacing the limestone. It could not possibly have come from waters infiltrating from the surface. In hole No. 2, 80 ft. away, the ½ in. of galena is evidently connected with the body cut in hole No. 4, as was intimated at the time hole No. 2 was put down."

American Fork.

In speaking of this camp J. D. Blue says: "This is the busiest camp I have seen. At the Pacific a rich mine is being opened up and ore is being shipped. At the Dutchman flat this same property is building a 65-ton mill which will be ready in a short time. At the Bay State conditions are looking good for the opening of the ore body in the lower level which may take place at any time. The Whirlwind is doing some quick work in driving its tunnel but as yet there has been nothing of interest developed. The Dutchman is going ahead on its development of the old property. The tunnel has been cleaned out and the old workings are being put in shape. In Mary Elle Gulch there is considerable effective work being carried on. The Belerophan property is taking out lead-silver ore from what was believed to be a bedding plane 40 ft. above the tunnel level. This is apparently a cross fissure and is showing considerable high grade ore that is being mined. Further up the canyon on the Live Yankee grounds is the Green Leasing Co., belonging to Herman H. Green, city commissioner and associates. Here they have about 12 tons of ore on the dump. Over the hill from this is the Earl Eagle ground. It has the only power equipment in the camp. All the other properties are working by hand. Although the property is still in the prospect stage it is the most likely ground in the camp. The lime bed is the thickest I found there and this is cut by a series of fissures that but a few thousand feet away made ore and why they should not make ore again in the lime I do not know. The tunnel is now in something like 400 ft. and already has cut one small porphyry fissure. This is encountered at right angles and carries out the idea of what these parallel fissures would do. Within the next few hundred feet it is expected that the Miller fissure will be encountered which should show an ore body."

Bingham.

With all of its lead product contracted for at 7½ cts. into November the Utah Metal & Tunnel Co. is continuing to develop more ground. A crosscut from the big tunnel is now within 700 to 800 ft. of the Last Chance line. It has encountered many fissures, and is directly through the region where the strongest fissures of Bingham region, as Nast, Burning Moscow and others, outcrop on the surface. This development is only a small part of what is being carried on in other sections of the Utah Metal and Bingham-New Haven which has crosscut under the Malloy Bedding.

From this place a large part of its product in years past has been derived, 300 ft. below present workings, giving that quantity of backs for future work; and similar development under the Stoddard Bedding gives 500 feet of backs for that ground. The two properties have been for a long time connected with the tunnel for transportation at the 4th level of the New Haven, and at the $7\frac{1}{2}$ level, 300 ft. below, a drift which was begun some months ago, to get under the large bodies uncovered last year, has reached this region and is in richly mineralized ground; and raising to the location of these bodies. Crosscutting to the south is also well under way and being pushed with results. The drift at the $7\frac{1}{2}$ level is also being extended to get under the big iron cap which is supposed to cover a large copper deposit and which was developed in boring the Jeff Davis tunnel. The old 102 drift, which was 75 ft. above the big tunnel in the Utah Metal, has over 10 large stopes from which both mill and shipping ore is being taken out.

The capacity of the mill is at present 225 tons. It is announced that the flotation process will be completed and in operation immediately following Sept. 20 and should result in saving not less than \$6,000 per month. The outstanding bonds of the company are now about \$230,000 and there is no other indebtedness. The cash position of the company is still strong and its cash accumulation is increasing.

Eureka.

Allen and Duncan have received the contract for sinking the Sioux Con. shaft. They are retimbering a part of the shaft, which is down 600 ft. and getting things in readiness for sinking. Under their contract the shaft will be sent down to the 1000 ft. level and it is barely possible that sinking will not stop short of the 1200. Work is to be continued in the winze which is being sent down in an effort to locate the extension of the Iron Blossom's deposit. This winze is located on the 600 level and it is not more than a few hundred feet from that part of the Iron Blossom in which the copper ore was recently discovered. Three shifts will be used in the shaft and work in the winze will also be carried along without interruption as soon as a small electric hoisting plant can be installed.

Electrification at the Grand Central mine is being contemplated. Equipment similar to that in use at the Eagle & Blue Bell will probably be secured. The electrification of the hoisting engine should be simple, but the present compressor will no doubt have to be replaced by a more modern machine. A compressor with a capacity of 1000 ft. of free air per minute would be about right to meet the mine's present needs and by putting in a second unit of about the same size the compressor capacity could quite easily be brought up to the proper point in the event a mill is constructed for the treatment of the mine's low grade ores. At present there seems to be a likelihood of such a plant being built. Where electricity has replaced the steam power expenses of hoisting and the operation of machine drills have been cut in two in some cases. Shipments are heavier than they have been in many months. The present output amount to about 2 carloads, or 100 tons, daily.

WASHINGTON.

Republic.

The highly siliceous ores of this district are in great demand now by the smelters at British Columbia points. That statement is made by Manager Richardson of the Knob Hill mine, who further says: "The Grand Forks and Trail smelters are the principal consumers right now, though earlier in the season the Greenwood plant took a lot of our ore and the Northport smelter has recently taken the entire output of the Lone Pine-Surprise group, which it now owns and operates. The reason that the Granby plant is taking so much siliceous ore of late is that the Anyox smelter of that company is shipping its matte to the Grand Forks plant to be converted into blister copper. The Knob Hill mine sent 14 cars to Grand Forks and 2 to Trail in August. So far this month we have marketed 6 cars at Grand Forks and 2 at Trail and

shall send the most of our output for the balance of this month to the latter plant. The Moye Leasing Co., operating the Hope Co.'s Blacktail mine since last June, of which I am also manager, has shipped 33 cars to date. Twenty of them went to Greenwood, but the present output, at the rate of 10 cars monthly, is going to Grand Forks. The old Republic mine has resumed operations of late and is shipping a few cars from time to time."

Omak.

The silver-lead strike on Pogue mountain made by E. C. Sherman, Republic, and A. J. Krejberg, Omak, is attracting much attention. Rich surface ore is being taken from the ledge. Only a few feet of depth has been attained, but the owners have almost enough sorted ore to make a carload.

According to President Bilrowe of the Bilrowe Alloys Co., Tacoma, his firm will start to construct a mill at its manganese mine by Oct. 15. The property has been making regular shipments of 2 cars a week for some time and the mill will give facilities for handling the low-grade rock that is now unprofitable.

Northport.

Samuel James, manager of the Northport smelter, says: "Two more furnaces, which will double our capacity, will be blown in at the smelter by Oct. 2. After they get in operation we will be able to make such an output that they will not so easily swamp us with ore as they have been doing of late. All the problems of treatment and supply have now been worked out and a crew broken in, so it will be plain sailing from now on. Ores and fluxes of all kinds are being furnished in ample quantities. The only material wanted now is coke. Our supply comes normally from the Crow's Nest Pass field, but labor troubles in that section have compelled us to draw our supplies of fuel from the east temporarily. We understand the British Columbia mines are now in position to furnish us with coke regularly and in ample quantities."

WISCONSIN-ILLINOIS.

Highland.

Shipments from this district last week came exclusively from the mines of the New Jersey Zinc Co., 8 cars of carbonate zinc ore, 225 tons, delivered to the furnaces of the company at Mineral Point. Operations were resumed this week at the Red Jacket mine. Saxe-Lampe Mining Co. is opening up new ground and reports a fine showing.

Benton.

The Frontier Mining Co. is employing 400 men. Regular monthly dividends of 2% are paid, the last being Sept. 1. In addition to the Bull Moose, Hird & Calvert zinc are producers, another mine has been developed on the south side of the Grotkin lease, on which is located the Bull Moose. A new 200-ton equipment is being provided, the main power and milling plant being already under roof. Drills are constantly engaged and with good results, a fair showing being reported on the James Calvert allotment; a fair-sized deposit has been drilled out on the Schultz land; on the W. Calvert tract, checking on the range has been completed, and extensions are shown on the west side of the lease; on the Hughlett, nearer to Galena, two out of three borings have resulted successfully. The Calvert mine has an output of 200 tons of concentrates weekly. The new deposits here proven have been connected with the old Calvert mine. General Manager J. H. Billingsley anticipates this range extending into the Robson farm north of the old Frontier mine, about 800 ft., and towards Swindler's ridge, making the fourth basin found in close proximity to the original deposit on the Frontier mine, and from which dividends have been paid for the past 8 years. The Bull Moose is making 200 tons of 42% weekly. The range trending southeast is very strong, and a new power and concentrating plant is going in here. The mill is 1000 ft. southeast of the Bull Moose plant. On the Hird mine two big runs of sphalerite have been proven. Cuttings from drill run 12 to 15% mill ore in the rock, and unusually high grade. Efforts have been made to connect up with the pres-

ent mine, and officials declare they have the task covered. This means a long run for the Hird of good grade.

The Burr Mining Co., operating the Treganza mine, is making 160 tons weekly of 45% concentrates. The main owners are officials of the Frontier Mining Co. The lease has not been fully explored as yet, except sufficiently to warrant a year's high run.

Shipments of zinc ore for week of 23rd aggregated 73 cars, 2967 tons. The Benton Roasters shipped 6 cars in addition to fine separator pyrites, 264 tons. Vinegar Hill Co. led the way with 15 cars to Cuba; New Jersey Zinc Co., 12 cars to Mineral Point for refining; Frontier Mining Co. to Grasselli Chemical Co., 7 cars, 290 tons; Fields Mining & Milling Co. to Grassellis, 5 cars, 205 tons; to Galena Refining Co., 3 cars, 104 tons; Champion mine to separators 12 cars, 490 tons; Grand View to Cuba, 37 tons; Sally Mining Co. to Galena, 86 tons; Benton Roasters, to La Salle, 40 tons, and to Collinsville, 4 cars, 160 tons; Wisconsin Zinc Co. to LaSalle, 40 tons; American Zinc Co., 4 cars, 160 tons; to Collinsville (Eagle-Picher) 6 cars, 380 tons.

Miffin.

Improvement is shown here recently in the marketing of ore, the Coker mines shipping 9 cars to Mineral Point, 363 tons; Lucky Six to Grasselli Chemical Co. under a new contract agreement, 3 cars, 129 tons; Biddick mine to Benton Roasters, 2 cars, 81 tons; Peacock Mining Co. to American Metals Co. under contract, 2 cars, 87 tons. A new producer has been set in motion on the Big Tom mine for the M. & A. Mining Co. Mill building is progressing rapidly for the Vinegar Hill Zinc Co. on the Yewdall lease. Mineral Point locals delivered small lots to furnace, 24 tons in all.

Platteville.

Reports from all districts for week ending 23rd continue activity shown for weeks, 167 cars of zinc ore going to track, 6774 tons; 4 cars of lead ore cleared, 174 tons. Shipments of pyrites were 1283 tons. The gross recovery mine-run stuff for the week exceeded 11,000,000 lbs., while net deliveries to smelter aggregated 6,582,000, nearly all high-grade refinery ore.

A gain of \$2 was made during the week on the price of the standard and top grades of zinc ore, the base ruling at \$58, ranging down to \$50 for medium grades. Low grade ores, however, were in poor demand, and the reserve in the field is held at 7000 tons.

Cuba City.

National Separating Co. is again receiving ore from Vinegar Hill mines, last week up to 18 cars, 752 tons. Shipments of finished product were evenly divided between Illinois Zinc Co. and Granby Com., 4 cars each. Utt-Thorne Co. shipped one car to Benton for treatment. This company will build a new plant to replace the one destroyed by fire recently.

Mineral Point.

Receipts of ore at the refineries of the Mineral Point Zinc Co. continue heavy, last week 39 cars being received, 1412 tons. With the exception of 3 cars this ore all came from company mines in the field. Shipment was made to DePue of high-grade finished product, 19 cars, 735 tons. Shipment was made also of 304 tons of iron pyrites to Prime Western Smelting Co. National Separators at Cuba shipped 193 tons; Federal Lead Co. secured 1 car of lead ore from each of the following mines: Rodhams, Cleveland, Utt-Thorne and Blackstone. Bids ran up \$70 and better.

Hazel Green.

The Kennedy mine holds its reputation as a zinc ore producer, again reporting out 4 cars to Mineral Point, 121 tons; Cleveland mine shipped 3 cars to Grassellis, 120 tons and 1 to Linden Zinc Co., 40 tons; Lawrence mine of the Cleveland combination to Wisconsin Zinc Co. at Galena for separator treatment, 5 cars, 210 tons.

Galena.

Continued improvement in the volume of ore marketed from this district is being shown. Black-Jack mine, 4 cars to Mineral Point, 124 tons Galena; Refinery Co. to Lanyon Zinc Co., 42 tons, and to Edgar Zinc Co., 48 tons; Federal mine, Wm. F. Weber, Jr., in charge, to Wisconsin Zinc Co., 4 cars, 163 tons; Little Corporal to Mineral Point, 45 tons; Graham to Cuba, 43 tons; North Unity, 87 tons; Wisconsin

Zinc Co. to M. & H. Zinc Co., at La Salle, 4 cars premium-grade jack, 160 tons. The Joplin Separators of the Wisconsin Zinc Co. shipped 437 tons of pyrites to Grasselli Chemical Co.

Potosi.

Wilson Mining Co. shipped 1 car high-grade concentrates last week to La Salle, 45 tons. Tiffany Zinc Co. filed articles of incorporation with the Secretary of State on the 19th; capital stock 500 shares of the par value of \$100 and held principally by E. W. Wagner of 208 W. Van Buren St., Chicago; \$25,000 has been paid in for development and equipment. Supt. Patterson is in charge of the local office.

WYOMING.

Rawlins.

Among the fields in which drilling now is in progress, and in some of which hundreds of wells have been put down, are the Little Horse Creek, Brenning Basin, Big Muddy, Salt Creek, Lost Soldier, Big Piney, Pilot Butte, Sage Creek, Grass Creek, Basin, Torchlight, Thermopolis, Greybull, Cody, Elk Basin, Lovell, Frannie, Dutton Basin, Sundance, Lost Cabin, Ervay, Sheridan, Little Buffalo Basin, Wheatland and Alkali Butte. It is estimated that the production for 1916 will exceed 7,000,000 bbls.

James Brunton, Los Angeles, Los Angeles, Calif., states that oil has been found in this vicinity. The oil is similar to that found at Greybull about 160 miles north—a paraffin base light greenish oil, testing about 50 gravity. The strike made is at a depth of between 500 and 600 ft. I have obtained land and installed one rig for a test well. Rawlins is on the main line of the Union Pacific, about 75 miles southwest of Casper. The wells I drilled at Greybull which came in good for several hundred barrels daily have fallen off to about 10 barrels, but the value of the oil renders this rate of production still profitable.

CANADA.

BRITISH COLUMBIA.

The Granby Con. Mining, Smelting & Power Co. on Nov. 1 will pay the regular quarterly dividend of \$2 a share, or \$299,970 to stockholders of record Oct. 14. This will make the payments for the current year \$1,049,894 and will increase the grand total to \$6,776,817. The Granby Co. now is producing about 4,000,000 lbs. of blister copper monthly at its two smelters, and information received from sources closely in touch with the management states that there is on hand in New York enough unsold copper and gold to retire the corporation's outstanding bonds, besides retiring all other claims.

W. P. Hopstetter has been appointed manager of the Pathfinder mine and will start development at once. Bins will be built at the mine and also at the K. V. R. tracks. The roads will be improved and it is expected that the Pathfinder will be shipping about 30 tons daily to Granby smelter soon. The ore runs about 2% copper and \$2 in gold.

Windermere.

By extending the Kootenay Central branch of the C. P. railroad to this district some of the old mines such as the Silver Belt and Nettie M., will start shipping. The Paradise mine, which was abandoned some 10 years ago on this account, made its first shipment Sept. 5 to the smelter at Trail. Eight heavy teams are engaged in hauling from the mine to the railway and this number will be increased. The mine is employing 21 men and arrangements are being completed to increase this number to 30 for the winter. A short aerial tramway is being constructed to carry the ore from the mine to storage bins which have been built. Suitable shipping facilities are being arranged for on the line of the Kootenay Central. The property is owned by the estate of the late Herbert Carlyle Hammond. The ore is silver-lead and will be shipped continuously all winter. This property

in old days shipped 2000 tons to Trail. At that time the ore had to be brought to the water's edge and shipped down the Columbia river by boat to Golden, where it was transferred by team to rail; thence by rail to Revelstoke and Arrowhead, where it was transferred to boat and taken to West Robson, when it again had to be transferred to rail and shipped to Trail. It was this high cost of transportation which caused the owners to stop operations.

Kaslo.

Middlings from the Lucky Jim are now being treated here and an additional \$5000 of the mortgage on the Lucky Jim mine, held by Lendrum McMeans, Winnipeg, has been paid by A. G. Larson, receiver. The total paid since the court placed the mine in Mr. Larson's hands is now \$32,500 and \$10,000 more remains to be paid. In August 150 tons of zinc concentrates and 75 tons of silver-lead ore were shipped. The estimated value was \$8646.35. In addition 80 tons of zinc concentrates were produced but were not sent to the smelter on account of an embargo placed on zinc ore shipments by American smelters. The Kaslo zinc treatment is now in operation as far as the magnetic separator goes and good results are being attained by the treatment of Lucky Jim middlings from the Rosebery mill. On account of their high iron contents these middlings could not be shipped profitably to United States smelters and about 1000 tons have been stacked up at Rosebery, awaiting completion of the Kaslo plant. The concentrator portion of the plant is expected to be in operation soon. The mill will have a capacity of about 500 tons of concentrates a month. During August a cross-cut was driven and a raise put through at the Lucky Jim to connect with the main working stopes and this has facilitated the handling of ore. Total expenditures in the month were \$7634.94.

Ainsworth.

The crosscut at the Coffee mine has been driven in about 130 ft. It is estimated that it must be driven a total length of 300 to 400 ft. before it hits the vein at a depth of probably 400 ft. Twelve men are employed. W. Yolen Williams is consulting engineer for the property.

Hedley.

On Sept. 13 the directors of the Hedley Gold Mining Co. at a meeting in New York declared the regular quarterly dividend of 3%, or \$36,000, and a special dividend of 2%, or \$24,000, payable Sept. 30 to stockholders of record Sept. 23. This will make the total disbursement \$60,000, or 5% of the issued capitalization of 120,000 shares at \$10 each, and will make \$180,000 distributed to stockholders in 1916, increasing the grand total to \$2,003,520. The Hedley Co.'s authorized capitalization is 150,000 shares at \$10 each, but 30,000 shares still are in the treasury. The corporation is organized under the laws of Delaware, but the principal offices are maintained at 42 Broadway, New York. The holdings comprise several groups near Hedley, but the only producing property is the Nickel Plate mine. The product is chiefly gold, although the ore carries a small amount of silver. The net earnings in 1915 were \$374,745, and the surplus on Jan. 1, 1916, was \$435,070, of which \$360,325 was carried over from 1914. The output of the property in 1915 was 74,265 tons, all of which was milled, and the total recovery was \$796,592. Operating expenses were \$421,846, including \$38,938 expended perfecting the new hydro-electric plant and in betterments to other equipment and the camp buildings. The hydro-electric station, commissioned Jan. 2, 1915, at a cost of \$192,000, or \$8000 less than the estimated price, is on the Similkameen river, just below the mouth of Twenty-Mile creek, and furnishes power to operate the 40-stamp mill and the mine machinery, as well as current to illuminate the camp and the undergrounds. Development has indicated that the general average value of the ore will be \$10 to \$11, according to a recent report from President I. L. Merrill. The increasing baseness of the product with depth, which increases the concentrates tonnage and reduces the grade, has necessitated a change in the treatment system, and a straight cyanidation system is being installed. The ore reserve is estimated at 423,522 tons, averaging \$10.39. Of this 35,025 tons, rated at \$8.52, are in the old workings above the No. 4 tunnel, and below that are 388,527 tons averaging \$10.55, including 75,000 tons of \$11 ore below the 800 level.

ONTARIO.

Cobalt.

Test pits are being excavated on the Hanson vein at the Newray mine and one is now down 50 ft. which shows good ore. Another one of similar depth will be started on the same vein at another point some distance away. The results of the work on this vein are encouraging. In the process of sinking a considerable body of ore was put in sight showing free gold. The shafts being put down, however, are only for testing. If the work proves up a large body, as present indications appear to indicate, development will be continued from one of the lower levels. The present plan is to continue surface work until the winter and then crosscut. This will give access to a number of parallel veins, the farthest of which is not more than 700 ft. from the shaft. The shaft is down 425 ft. and is well timbered, and provided with stations at 200, 300 and 400 ft. The company is diamond drilling with a view of picking up the original vein lost in faulting.

At the Gifford the shaft is down 288 ft. and the contact vein left the shaft at a depth of 65 ft. in the winze from the 200 level. Sinking will be continued to the contact and the vein will be picked up again by crosscutting. A mud vein and also a calcite stringer cut through the shaft in the progress of sinking. The mud vein is an entirely new one and is about 3 ft. wide.

Beaver Con. in its report for the quarter ended Sept. 1 says: "A great deal of general work has been done on the upper levels, from all of which we have been recovering ore. On the 400 and 460 we have made one or two discoveries of high-grade. We have demonstrated that we have reached the lower contact, and it now remains to thoroughly prospect this ground to determine the values. The cage is dropping to the 1600 level and all operations organized for the development of the lower contact. Up to the present time we have done 96 ft. of crosscutting east of the station, encountering two stringers. These are similar in character to those cut above the diabase sill. One hundred and forty-six feet of crosscutting has been accomplished west of the station. Our experiments with the oil flotation process have not reached the point where we consider it advisable to install a plant. While we have 360 acres under option from the Kirkland Gold Mining Co., all our work has been confined to what is known as the McKane claim. The shaft has reached a depth of 288 ft. On the 100 level, 191 ft. of drifting has been done on a vein 4 ft. wide, which gave us an average value of \$15. Four hundred and ten feet of drifting and crosscutting was done on the 200 level, but the results were not satisfactory, consequently the shaft was continued to the present depth, the station cut, and 19 ft. south of the station we encountered a vein about 5 ft. wide, channel assays from which average \$11. Continuing the crosscut, we went through 10 ft. of porphyry, assays from which average \$7, and encountered another vein running parallel with the first vein. The second vein is 12 ft. wide, channel assays from which give an average of \$12.80. Visible gold shows all through this second vein. This is an important discovery, and we shall immediately sink the shaft to the 400 level to ascertain if these values continue."

Timmins.

The concrete foundations for the new Hollinger mill, which will have a 1600-ton capacity, are nearly completed. The superstructure will be built this coming winter and the machinery, which will include 100 stamps and 10 tube mills, will then be installed. It is expected that the new addition will be running by June, 1917. The new central shaft plant, with its 5000-ton crusher, will be completed by March 1, 1917. This latter plant will represent an investment of about \$750,000. Underground the company is connecting up all the workings of the Consolidated properties on the 425 level. One connection to the workings near the Vipond is 2600 ft. long. The present mill is handling about 1900 tons a day, 40% of which is coming from the Acme. It is calculated that even with the new mill bringing the total milling capacity up to 3500 tons it will be 2 years before all the ore is broken down and milled above the 425 level and 7 years before the Hollinger begins taking ore from the 1250 level, according to estimates.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Knopf, Adolph.—*Tin Ore in Northern Lander County, Nevada*. [The district is virgin and the mineralogy, geology and genesis of the ores are described].—U. S. G. S. Bull. 640-G; pp 14*.

Krebs, Charles E.; Teets, D. D., Jr.; White, I. C.—*County Reports of Raleigh and the Western Portions of Mercer and Summers Counties, West Virginia*. [An account of the geology, mineral deposits and operations].—W. Va. Geol. Surv. Report; pp 778*.

Mansfield, G. R.; Roundy, P. V.—*Revision of the Beckwith and Bear River Formations of Southeastern Idaho*. [On the stratigraphy of these formations].—U. S. G. S. Prof. Paper 89; pp 10*.

McLaughlin, R. P.; Bradley, Walter C.; Brown, G. Chester; Lowell, F. L.—*Mines and Mineral Resources of Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus Counties, California*. [Operations are included in separately describing mines, plants and unworked deposits].—Calif. Mg. Bur.; pp 220*.

Merrill, Frederick J. H.—*Geology and Mineral Resources of San Diego and Imperial Counties*. [Though gold is the principal metal mined considerable is done in the non-metallic industry].—Calif. Mg. Bur.; pp 113*.

Miller, Benjamin L.; Singewald, Joseph T., Jr.—*The Patino Tin Mines, Bolivia*. [A description of the properties owned by Patino in Bolivia, including the mode of occurrence, methods of operation and geology of the formation].—E. & M. J. Sept. 9 1916; p 451; pp 4¼*; 25c.

Ries, Heinrich.—*Economic Geology*. [A brief review is made regarding the industry and occurrence of each mineral, including metals and non-metals].—John Wiley & Son; book; pp 856*; \$4.

Tucker, W. B.—*Mines and Mineral Resources of Amador, Calaveras, Tuolumne*. [Economic mineral products are reviewed by separate descriptions of deposits and mines, with some information on the con-

dition of the country].—Calif. Mg. Bur.; pp 180*.

—*Relation of the Wissahickon Mica Gneiss to the Shenandoah Limestone and Octoraro Schist of the Doe Run and Avondale Region, Chester County, Pennsylvania*.—U. S. G. S. Prof. Paper; pp 26*.

Ore Genesis

Knopf, Adolph.—*Tin Ore in Northern Lander County, Nevada*. [The district is virgin and the mineralogy, geology and genesis of the ores are described].—U. S. G. S. Bull. 640-G; pp 14*.

II. ORES AND METALS

(I) METALS AND ORES

Alloys

Cubillo, Leandro.—*La Industria Siderurgica Espanola*. [On the metallurgical industry of Spain, with particular reference to the steel, iron and alloy industries].—Revista Minera Aug. 1 1916; p 365; pp 3; Aug. 8; p 377; pp 3¼; 70c.

Aluminum

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Lowell, F. L.—*Mines and Mineral Resources of Del Norte, Humboldt and Mendocino Counties, California*. [Reviews operations in detail, locates separate deposits and describes them].—Calif. Mg. Bur.; pp 59*.

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Gold Milling, Metallurgy, Etc.

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Iron and Steel

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Leslie, E. H.—*Tungsten in the Boulder District, Colorado*. [Speaks considerable of milling practice].—M. & S. P. Sept. 2 1916; p 353; pp 3*; 20c.

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(A) FUELS

Coal Fields and Mining

Lowell, F. L.—*Mines and Mineral Resources of Del Norte, Humboldt and Mendocino Counties, California*. [Reviews operations in detail, locates separate deposits and describes them].—Calif. Mg. Bur.; pp 59*.

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Fluorspar

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Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*.—S. Afr. Mg. Jnl. July 1 1916; p 311; pp 1; 35c.

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— *Formation of Nitrate Deposits, Chile*.—M. & S. P. Aug. 26 1916; p 314; pp 1*; 20c.

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Katz, Frank J.—*Silica in 1915*. [Takes up the uses of silica, its production in general and by states, with briefs on other important siliceous materials].—Min. Res. of U. S. II:8; pp 6.

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Prospecting

Platts, John B.—*Pocket-Hunting Applied to Prospecting*. [Refers to the locating of rich gold pockets].—M. & S. P. Aug. 26 1916; p 306; pp 1; 20c.

Young, George J.—*Elements of Mining*. [In an elementary way each different operation and department of mining is taken up, such as haulage, prospecting, blasting, drilling, etc.].—McGraw-Hill; book; pp 628*; \$5.

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Young, George J.—*Elements of Mining*. [In an elementary way each different operation and department of mining is taken up, such as haulage, prospecting, blasting, drilling, etc.].—McGraw-Hill; book; pp 628*; \$5.

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Young, George J.—*Elements of Mining*.

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Ventilation

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Young, George J.—*Elements of Mining*. [In an elementary way each different operation and department of mining is taken up, such as haulage, prospecting, blasting, drilling, etc.].—McGraw-Hill; book; pp 628*; \$5.

Supports: Timbers, Props, Stowing

Tallant, J. D.—*Pillar Caving at the Braden Mine*. [Peculiarities of the method and its operation in this particular ground].—Teniente Topics June 1916; p 1; pp 6*; 35c.

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Shafts and Shaft Sinking

Sayre, Edward A.—*Shaft Sinking Through Soft Material*. [Costs and methods of operation at an Iowa coal mine].—Bull. A. I. M. E. Sept. 1916; p 1523; pp 8*; 35c.

Mine Sampling

Heidelberg, Fred M.—*A Portable Water Sampler*. [A device for sampling underground waters at the Copper Queen].—E. & M. J. Aug. 19 1916; p 343; pp 1¼*; 25c.

Lighting

Gawthrop, L. B.—*Scientific Headlighting*. [On headlights for haulage motors].—Coal Age Sept. 2 1916; p 382; pp 1¼; 20c.

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Telephones and Signalling

Davis, W. H.—*Hoisting-Engine Signals*. [A paper read before the North of England Inst. of Mg. and Mech. Eng.].—Coal Age Aug. 26 1916; p 336; pp 1*; 20c.

Hydraulicking

Brown, G. Chester.—*Mines and Mineral Resources of Shasta, Siskiyou and Trinity Counties, California*. [Copper and gold are the principal minerals, though many others occur in the district].—Calif. Mg. Bur.; pp 192*.

Eakin, H. M.; Mertie, J. B.; Harrington, G. L.—*The Cosna-Nowitna and Ruby-Kuskokwim Regions, Alaska*. [The geology, geography and mineral resources of the country are first reviewed and followed by separate descriptions of the districts].—U. S. G. S. Bull. 642-H; pp 56*.

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Zimmer, G. F.—*The Mechanical Handling and Storage of Materials*. [The correct design of conveyor belts and systems is spoken of, with information on storage bins].—Crosby, Lockwood & Son, London; book; pp 752*; \$12.

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Hagemann, Ing.—*Beiträge zum Bergmännischen Rettungswesen*. [On safety and rescue work of mines and plants in Germany].—Zts. Berg., Hütten & Salinenw. Vol. 62 Ser. 3; p 222; pp 93½; \$15.0.

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Brett, A. J.—*The Encouragement of First Aid Work on the Mines: Some Suggestions Based on Experience at the Crown Mines, South Africa*.—Jnl. Chem. Met. & Mg. Soc. S. Afr. June 1916; p 249; pp 6½; 85c.

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McDonald, P. B.—*Two Great Copper Mines Compared*. [Compares operations, production, etc., of the Calumet and Hecla and Nevada Con. Co.].—M. & S. P. Sept. 9 1916; p. 391; pp 1½; 20c.

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Mining Costs

Bacon, Raymond F.; Hamor, William A.—*The American Petroleum Industry*. [In Vol. I the history and geology, etc.,

regarding oil wells is taken up, while Vol. II is on refining of oil].—McGraw-Hill Co.; books; Vol. 1 pp 446*; Vol. II pp 517*; \$5 each.

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Accounts and Bookkeeping

Hauc, A. J.—*Cost Accounting for the Clay Plant*. [Accounting forms are reproduced and description of systems using the same are given].—B. & C. Rec. Sept. 5 1916; p. 417; pp 2½; 35c.

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McHenry, W. E.—*Is Your Cost System Scientific?* [A discussion of the subject and description of systems].—Engg. Mag. Aug. 1916; p 678; pp 9*; 35c.

MILL AND MILLING

Cyaniding

Thomson, Herbert G.—*Construction and Operation of the Nevada Packard Mill*. [A cyanide plant treating ore in which the principal mineral is cerargyrite].—M. & S. P. Sept. 9 1916; p 377; pp 8*; 20c.

Chlorination

Addicks, Lawrence.—*Possibilities in the Wet Treatment of Copper Concentrates*. [The method tested and described here consists of roasting and then leaching].—Bull. A. I. M. E. Sept. 1916; p 1565; pp 9*; 35c.

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Matheson, A. M.—*Notes on the Chemical Assay of Tin Ores*. [From the proceedings of the Australian Inst. of Mg. Eng. Specific data and a description of the method of assay are given].—Mg. World Sept. 9 1916; p. 451; pp 2¼; 10c.

Analysis

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METALLURGY

Thermic Metallurgy

Gadd, C. J.—*The Use of Powdered Coal in Metallurgical Processes: A Discussion of the Principals Involved*. [A paper read before the Mining and Metallurgical Section].—Jnl. of Franklin Inst. Sept. 1916; p 323; pp 39*; 60c.

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—*French Electrolytic Process*.—Mg. World Sept. 9 1916; p 450; pp ¾; 10c.

Hydro-Metallurgy

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Hydroelectric

Chapin, Theodore; Canfield, George H.—*Mining Developments and Water-Power Investigation in Southeastern Alaska*. [The gold and copper mines are described by districts in which they are located and reviews are made of sources of water power].—U. S. G. S. Bull. 642-B; pp 55*.

—*Braden Copper Co.'s Hydroelectric Installation in 1909*. [Translated from Estadística Minera de Chile].—Teniente Topics June 1916; p 7; pp 4*; 35c.

IV. MISCELLANEOUS

Law, Legislation, Taxation

Brooks, Alfred H.—*Mineral Resources of Alaska*. [Descriptions of mines and deposits reviewing their production, geology and geography. The coal mining lease laws are also spoken of].—U. S. G. S. Bull. 642; pp 279*.

Gardner, E. D.—*The Antecedent Mineral Discovery Requirement*. [Discusses laws regarding mineral land location].—Bull. A. I. M. E. Sept. 1916; p 1693; pp 15; 35c.

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—*American Ceramic Society*. [Meeting at St. Louis, Mo., Aug. 23 1916].—B. & C. Rec. Sept. 5 1916; p 396; pp 7*; 35c.

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Financial

—*Baku Russian Petroleum*. [A review of operations and production in the district].—Petro. World Sept. 1916; p 426; pp 3; 35c.

—*Graphic Method for Estimating Claim Area*. [The curves have been made from considerable data. Capital, costs, tons milled, etc., the area required for profitable operations can be obtained from this curve].—S. Afr. Mg. Jnl. Aug. 5 1916; p. 422; pp 1*; 35c.

—*Russian Petroleum Company*. [Discusses operations for part of 1916, including profits, production and deep drilling].—Petro. World Sept. 1916; p 431; pp 3; 35c.

General Miscellany

Bain, H. Foster.—*An American's Impression of South Africa*. [A general description of the country, its people and customs].—M. & S. P. Aug. 26 1916; p 301; pp 5*; 20c.

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Ore and Metal Markets; Prices-Current

New York, Sept. 28, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Sept. 27 were as follows:

		New York. Cents.	London. Pence.
Sept. 21.....	68 7/8	32 3/4	
22.....	68 7/8	32 3/4	
23.....	68 7/8	32 3/4	
25.....	69 1/4	32 15/16	
26.....	69 1/4	32 15/16	
27.....	69 1/4	32 15/16	

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London Standard Oz.	
	1916 High.	1916 Low.	1915 Avg.	1916 Avg.	1915 Avg.
January	67 7/8	55 1/2	66.776	48.890	26.875
February	67	56 1/2	66.765	48.477	27.000
March	60 3/4	66 1/2	67.935	49.926	27.080
April	73 1/2	60 3/4	64.416	50.034	31.376
May	77 1/4	68 3/4	74.27	49.916	34.182
June	68 3/4	62 3/4	65.02	49.072	31.038
July	65	60	62.94	47.519	29.870
August	67	25	64	47.178	31.25
September .....	.....	.....	.....	48.68	.....
October .....	.....	.....	.....	49.385	.....
November .....	.....	.....	.....	51.713	.....
December .....	.....	.....	.....	55.038	.....
Year .....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—The largest single order for copper ever placed in the history of the industry has been written into the books of American copper producers. As stated in the Mining and Engineering World last week the order would be officially booked as the issue was being printed. The option taken by the allies was to expire Thursday night. On Saturday morning one of the leading figures in the copper trade issued an official announcement stating that the order had been placed. It calls for 200,000 tons of copper to be delivered in the first half of next year. The booking of this order has created a condition without parallel in the industry. The price obtained by the producers was 26 3/4 cts. per lb., making the total value of the transaction about \$125,000,000. Every producer who desired to partake in the business secured a share. Some producers did not avail themselves of this opportunity, feeling that a higher price will be obtained later on from general buying. The amount of 448,000,000 lbs. is slightly under half of what the total refinery yield will be in the first half of next year. After negotiations lasting 5 weeks the order is now closed. The price paid is 1 ct. higher per pound than the producers asked when dealings were first opened. As pointed out in these reports the allies had to buy copper and their orders had to come to this country. Producers showed their control of the situation by waiting until the allies met their terms. Buying of copper by England and France has not, however, been completed. There is now in the market an inquiry for 200,000,000 lbs. copper, also for the first half of next year, and this additional business may be closed before the end of the month.

Domestic business was also very large last week and following the placing of the big allied order domestic demand increased twofold this week. Producers reported that orders for 150,000,000 lbs. were taken last week, the bulk of this tonnage being for delivery next year. Naturally prices were advanced after the foreign business had been booked and domestic consumers who were credulous as to the foreign business had the combined incentive of higher prices and depletion of supplies for next year to compel them to cover requirements. Thus electrolytic for December advanced to 28 1/2 cts., while for the first quarter of next year sellers took business at 27 1/2 @ 27 3/4 cts., with business for the second quarter closed at 27 cts. These prices represent an advance of a half cent.

The situation in copper reflects no development indicative of an easing up in the restraint on producers. Conditions are

not favoring increased refinery yield and hopes for expansion in output are not so strong. "Tight as a drum" expresses the copper situation adequately. Demand for the fourth quarter is in itself very large, although producers are only able to take orders for December delivery. Spot and October electrolytic has advanced to 29 cts., while for November dealers took business at 28 3/4 cts. Spot casting copper has advanced to 26 3/4 cts., with some producers asking 27 cts. Casting copper for November and December is held at 26 3/4 cts.

At this writing 70% of the output for the first half of next year has been sold. A good portion of the copper to be produced in the second half of next year has been taken by domestic users, the price being left open. This all means that a 2,000,000,000-lb. output in 1917 need not cause concern as to whether the world can absorb this metal, with Germany out of the running. The situation is quite the reverse. Even a production of 2,000,000,000 lbs. will not be sufficient to meet the demand. Copper has finally reached a stage where pessimists have absolutely no firm ground on which to base their views. The market has been solidified.

It is needless to enlarge upon what has been said above. To be verbose in describing the situation does not add to its strength. Nor for that matter detract. The laconic assertions of four of the leading producers are, however, interesting, these statements being made after the receipt of the allied order. Said one, "Earnings, production and consumption will be record-breaking in 1917." Another, "The situation lacks precedent." The third, "It proves we were right in June when a reaction was looked for." And the fourth, "War or no war, it means at least three years more of prosperity for copper."

The London market has been strong since our last report, although as yet it has not shown any response to the immense business done here. This is not necessary, but copper factors like to see all things co-ordinate. Last week electrolytic at London advanced £2.

Exports of copper reported since the first of the month total 20,479 tons and indications are that the complete exports will come close to 30,000 tons. Imports of copper in July totaled 18,000 tons, making the seven months' imports 121,500 tons, as contrasted with 72,500 tons in the same period of 1915.

Quotations for copper per pound at New York for the week ended Sept. 27 were as follows:

(For Fourth Quarter Delivery.)					
		Lake.	Electrolytic.	Casting.	
Sept. 21.....	28	@ 25 1/4 c	28	@ 28 1/4 c	26 1/4 @ 26 1/4 c
22.....	28	@ 28 1/4 c	28	@ 28 1/4 c	26 1/4 @ 26 1/4 c
23.....	28 1/2	@ 29 c	28 1/2	@ 29 c	26 1/4 @ 26 1/4 c
25.....	28 1/2	@ 29 c	28 1/2	@ 29 c	26 1/4 @ 26 1/4 c
26.....	28 1/2	@ 29 c	28 1/2	@ 29 c	26 1/4 @ 26 1/4 c
27.....	28 1/2	@ 29 c	28 1/2	@ 29 c	26 1/4 @ 26 1/4 c

Quotations for copper per ton at London for the week ended Sept. 27 were as follows:

		Standard		Electrolytic.
		Spot.	Futures.	
Sept.	21.....	£116 10 0	£113 0 0	£136 10 0
	22.....	116 0 0	113 0 0	136 10 0
	23.....	116 0 0	113 0 0	136 10 0
	25.....	116 0 0	113 0 0	136 10 0
	26.....	116 0 0	113 0 0	138 0 0
	27.....	116 10 0	113 10 0	139 0 0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915. Average.
	1916 High.	1916 Low.	Average.	
January	25.50	23.00	24.101	13.891
February	28.50	26.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September .....	.....	.....	.....	17.768
October .....	.....	.....	.....	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September .....	.....	.....	.....	17.705
October .....	.....	.....	.....	17.859
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348

Year

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.35	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September .....	.....	.....	.....	.....	68.660
October .....	.....	.....	.....	.....	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400

Year

Tin.—The market has been generally firm in the past week, with a fair amount of business done. Consumers who have been waiting for tin to decline below 38 cts. abandoned this attitude and bought freely for November, December and January arrivals, sellers reporting that incoming business was the best in several weeks. Prices responded to the improved demand by advancing about a half cent.

Spot Straits tin fluctuated between 38½ and 38¾ cts., being at the outside price at this writing. Spot Banka is quoted at 37¾ cts., while spot No. 1 Chinese is quoted at 37 cts. Straits tin for October delivery is quoted at 38½ cts. and for November and December arrival at 38¾ cts. For January, February and March arrivals sellers asked 38¾ cts.

Last week London quotations advanced £2 to £3 10s, but the decline on Friday almost completely eliminated these gains. Singapore closed the week £1 5s above the opening at £175.

Quotations for tin per pound at New York and per ton at London and Singapore were as follows:

Sept. 21.....	New York		Sept. 21.....	London.		Sept. 21.....	Singapore.	
	Spot.	Sept.		Straits, spot.	Shipments.		Shipments.	Shipments.
22.....	38¾c	38¾c	22.....	£173 2 6	£175 0 0	22.....	£175 0 0	£175 0 0
23.....	38¾c	38¾c	23.....	171 7 6	175 0 0	23.....	175 0 0	175 0 0
25.....	38¾c	38¾c	25.....	171 7 6	175 0 0	25.....	175 0 0	175 0 0
26.....	38¾c	38¾c	26.....	172 5 0	174 5 0	26.....	175 0 0	175 0 0
27.....	38¾c	38¾c	27.....	172 0 0	175 0 0	27.....	175 0 0	175 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.33
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.493
August	39.50	37.75	38.53	34.386
September .....	.....	.....	.....	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755

Year

Lead.—Canada and England have been the principal buyers of lead, although domestic business was not of small account. Producers are growing less inclined to part with forward production, but buyers are insistent and are ferreting out metal in face of the objections of sellers. Indications point to another advance by the A. S. & R. Co., but this probably may not come until next week and possibly not until the new month. The market has been less inclined towards premiums, but the situation reflects strength. Spot and October metal is extremely scarce, but fortunately for consumers, they are well covered for this period.

For November delivery there has been a very active demand, with business done at 7 cts. New York and 6.85 cts.

St. Louis, these being prices secured by independents. Incidentally it is reported that the leading interest has taken some large lines for October delivery at open prices and has also done a considerable business for November.

Canadian ammunition makers have taken over 3000 tons in the past week and are now in the market for 2500 tons. An English inquiry calls for 3000 tons. Japan and Russia are expected in the market very shortly. Spot is quoted nominally at 7 cts. New York and 6.90 cts. St. Louis, but it would be difficult to obtain standard brands at these prices. For October delivery sellers who are dealers offer at 7 cts. New York and 6.85 cts. St. Louis.

The London market has advanced in response to the strength on this side. Last week lead went up 5s in spot and 10s in futures, with further gains this week.

Quotations for lead per pound at New York and per ton at London for the week ended Sept. 27 were as follows:

Month.	New York			London	
	Indpts.	A. S. & R. Co.	Avg.	Spot.	Futures.
Sept. 21.....	7.00c	7.00c	7.00c	£30 15 0	£29 10 0
22.....	7.00c	7.00c	7.00c	30 15 0	29 10 0
23.....	7.00c	7.00c	7.00c	30 15 0	29 10 0
25.....	7.00c	7.00c	7.00c	31 5 0	30 0 0
26.....	7.15c	7.00c	7.00c	31 10 0	30 0 0
27.....	7.25c	7.00c	7.00c	31 10 0	30 0 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	High.	Low.	Avg.	1915.	1916.
January	6.20	5.50	5.926	6.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.60	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August	6.70	6.95	6.32	4.750	30.260
September .....	.....	.....	.....	4.627	.....
October .....	.....	.....	.....	4.612	.....
November .....	.....	.....	.....	5.152	.....
December .....	.....	.....	.....	5.346	.....
Year .....	.....	.....	.....	4.675	.....
					23.099

Year

Lead Ore.—Though blende remains at a low price in the Missouri-Kansas-Oklahoma district, the lead-ore market made another jump during the week ended Sept. 23, as during the previous week, and the general run of sales were up \$5 to \$75 per ton, though some few lots brought \$78. The production of 1,499,300 lbs. was nearly 50% lower than the previous week's production. The total for the year was 76,272,262 lbs., valued at \$3,187,011, while the week's production was valued at \$52,550.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.00	106.20	50.50
May	87.00	92.00	94.75	50.50
June	82.50	75.00	76.85	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September .....	.....	.....	.....	48.25
October .....	.....	.....	.....	61.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375

Year

Zinc Ore.—In the Missouri-Kansas-Oklahoma district all was at a standstill so far as the zinc-ore market was concerned. Prices still remained at \$65 to \$45, as during the other weeks of the month. Production for the week ended Sept. 23 was about as during the previous week, 13,071,190 lbs. This brought the total for the year to date at 478,287,120 lbs. The week's production was valued at \$365,981 and the year's, \$20,808,802.

Calamine.—Prices were up \$5 to \$35 and \$45 per ton. The production for the week was 1,285,325 lbs., valued at \$28,902. The year's production to date is 22,334,235 lbs., valued at \$74,680.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	84.437
March	116.00	80.00	100.60	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00

July	80.00	50.00	65.00	111.00
August	70.00	50.00	58.75	60.25
September .....	.....	.....	.....	76.76
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.96

Spelter.—Demand for spelter subsided rather suddenly last week and prices as a result gave way. The developments in spelter and their failure to co-ordinate with copper are explained as follows: Consumers feared copper, but have no fear of spelter. Spelter need not be purchased well ahead, as production is ample to meet the demand. Therefore, while consumers have purchased copper for delivery 6 to 9 months hence, they have limited their spelter operations to the rest of this year except in a few cases where metal has been taken for the first quarter. The extent of the recession has been about ¾ ct. in spot and futures. Dealers who loaded up spelter in hopes of a very active market are now seeking to liquidate, which serves to accentuate the reaction. Spot has moved off to 9 cts. New York and 8½ cts. St. Louis, while for the fourth quarter sellers are offering at 8½ cts. St. Louis. There is considerable buying of spelter to be done for the first quarter of next year, but this business may not come out until late in November, unless prices become very attractive. London also contributed to the easier tone with several declines, amounting to £2 in spot and futures last week, while at the opening of the current week spot moved off £2 and futures £1.

Quotations for spelter per pound at New York and per ton at London for the week ended Sept. 27 were as follows:

		New York.	London.	
		Spot.	Spot.	Futures.
Sept. 21.....	9½c	£55 0 0	£48 0 0	
22.....	9½c	54 0 0	47 0 0	
23.....	9½c	54 0 0	47 0 0	
25.....	9.00c	52 0 0	46 0 0	
26.....	9.00c	52 0 0	46 0 0	
27.....	9.25c	52 0 0	46 0 0	

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1915		1916	1915	
Jan.	19.42½	17.30	18.801	6.519	39.840	30.819
Feb.	21.17½	18.67½	20.094	8.866	37.840	39.437
Mar.	20.60	16.60	18.40	10.125	100.720	44.278
Apr.	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.60	13.75	15.98	16.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July	10.75	8.75	9.80	20.803	53.00	98.160
Aug.	9.75	8.37½	9.11½	16.110	56.00	68.250
Sept.	.....	.....	.....	14.493	.....	64.400
Oct.	.....	.....	.....	14.196	.....	64.196
Nov.	.....	.....	.....	16.876	.....	88.240
Dec.	.....	.....	.....	16.675	.....	89.163
Year	.....	.....	.....	13.914*	.....	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Business has been of fair volume, with the tone of the market steady. Sellers continue to take orders at \$75 per flask for spot virgin. Imports from Mexico and Europe have been fairly large, while good receipts from the Pacific coast are noted. Generally the situation in quicksilver contains nothing that would indicate an early advance, although some sellers are disposed to see a recession due to increasing supplies.

Platinum.—There has been no change in the situation respecting platinum. Leading refiners quote hard metal at \$85 per ounce and soft metal at \$91 per ounce.

Antimony.—Demand for antimony has been very slack and sellers are openly offering at concessions. Some Chinese interests offered spot at 11 cts. and November arrival at 10 cts. duty paid. Consumers appear to be well supplied.

Nickel.—Business continues normal with prices repeated. Ordinary forms are held at 45@50 cts. per pound in ton lots, while electrolytic commands the usual 5 cts. advance.

Aluminum.—Some consumers have been in the market for 1917 requirements, but otherwise business has lacked

any new features. Spot No. 1 virgin ingots are quoted at 61@63 cts. per pound in ton lots.

Ferromanganese.—English makers are waging a determined fight to retain their trade in this alloy, but domestic producers are constantly securing business. Some consumers have been greatly pleased with domestic ferromanganese, it being stated that the phosphorus contents ran as low as 11%, whereas the English seldom drops below 25%. Sales of about 2500 tons were reported last week at \$165 furnace, with English makers quoting \$164 seaboard for 80%.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.07½	to	.08½
Nitric, 40 deg.....	.09	to	.09½
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured 183 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.72
Alum—Powdered, lb.....	4.60	to	4.65
Lump, lb.....	.04	to	.06
Ground, lbs.....	4.10	to	4.12½
Ammonia—			
Muriate, white grain, lb.....	.10	to	.10½
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06	to	.06½
Red, lb.....	.60	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.14	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	2.75	to	2.80
Foundry.....	3.00	to	3.50
Copperas—Spot, lb.....	1.50	to	2.00
Ferromanganese.....	165.00	to	.....
Ferrosilicon, 60%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glauber's Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.65
White crystals.....	.15½	to	.15½
Broken, cakes.....	.14½	to	.15
Powdered.....	.17	to	.17½
Lead—Granulated, lb.....	.14½	to	.15½
Brown sugar.....	.11½	to	.12
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.16	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	85.00	to	91.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.39	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.36
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.45	to	.50
Prussiate, yellow.....	.62½	to	.65
Prussiate, red.....	1.75	to	1.80
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.25½	to	.26
Soda—Ash, 48% (43% basis), bbl.....	3.12½	to	3.65
Strontia Nitrate, casks, lb.....	.31	to	.35
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.29½	to	.30
Oxide, lb.....	.43	to	.45
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest Date	Amt.					Paid in 1916	Total to date	Latest Date	Amt.
Acacia, c.....	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.....	Colo.	480,915	\$1	\$.....	\$98,916	Sept. '10	\$0.01
Adams, e. l. c.....	Colo.	80,000	10	.....	775,000	Dec. 15, '09	.04	Golden Star, g.....	Ariz.	400,000	6	.....	120,000	Mar. 15, '10	.06
Adventure, c.....	Mich.	100,000	25	50,000	50,000	July 20, '16	.50	Gold Com. Fra., g.....	Nev..	922,000	1	.....	92,111	Oct. 15, '09	.10
Abmeek, c.....	Mich.	200,000	25	1,200,000	5,250,000	July 10, '16	3.00	Goldfield Con.....	Nev..	3,559,148	10	.....	28,999,831	Oct. 31, '15	.10
Alaska Goldfields.....	Alaska	250,000	5	.....	403,250	Jan. 10, '15	.16	Good Hope, g. s.....	Colo..	500	100	.....	941,250	Jan. '03	.25
Alaska Mexican, g.....	Alaska	180,000	5	.....	3,607,381	Nov. 23, '15	.10	Good Sp. Anchor, z. s.	Nev..	550,000	1	33,000	119,765	June 15, '16	.01
Alaska Mines Sec.....	U. S.	500,000	5	.....	90,000	Nov. 1, '06	.....	Grand Central, g.....	Utah	500,000	1	.....	1,645,200	Dec. 23, '15	.02½
Alaska Treadwell, g.....	Alaska	200,000	25	250,060	15,780,000	May 23, '16	.50	Grand Gulch, c. s.....	Nev..	239,545	2,50	3,894	11,992	June 1, '18	.03
Alaska United, g.....	Alaska	150,200	5	54,060	2,045,730	Feb. 2, '16	.30	Granite, g.....	Alaska	430,000	1	17,200	17,200	May 10, '16	.02
Allouez.....	Mont.	100,000	25	450,000	950,000	July 15, '16	2.00	Grim, g.....	Cal.	100,000	10	.....	481,500	Feb. '06	.25
Almaguast, c.....	Mont.	1,538,829	100	.....	103,444,953	Aug. 30, '15	3.77	Hecla, g. l.....	Idaho	1,000,000	0.25	950,000	4,705,000	Aug. 25, '16	.15
Am. Sm. & R., com	U. S.	600,000	100	1,600,000	30,533,333	June 1, '16	1.60	Hercules.....	Idaho	1,000,000	1	1,850,000	12,600,000	Aug. 16, '16	.20
Am. Sm. & R., pf.	U. S.	600,000	100	1,750,000	56,446,386	June 1, '16	1.75	Hidden Treasure, g.	Cal.	30,000	10	.....	457,452	Sept. '00	.10
Am. Sm. Sec. A. pf.	U. S.	170,000	100	765,000	11,465,000	July 1, '16	1.60	Holy Terror, g.....	S. D.	600,000	1	.....	172,000	Jan. '00	.01
Am. Sm. Sec. B. pf.	U. S.	300,000	100	1,125,000	16,635,000	July 3, '16	1.25	Homestake, g.....	S. D.	251,160	100	1,306,032	37,011,740	Aug. 25, '16	.65
Am. Zinc, l. & S.	Mo.	193,120	25	2,768,130	3,805,000	Aug. 1, '16	1.50	Hope Dev.....	Cal.	600,000	1	.....	1,500,000	Dec. 31, '15	.01
Anaconda, c.....	Mont.	2,331,250	50	11,656,250	175,914,271	Aug. 28, '16	2.00	Horn Silver, l. s. z.	Utah	400,000	1	40,000	5,132,000	June 30, '16	.06
Annie Laurie, g.....	Utah	25,000	100	.....	439,561	Apr. 22, '05	.50	Imperial, c.....	Ariz.	600,000	10	.....	300,000	June 24, '07	.20
Argonaut, g.....	Cal.	200,000	6	40,000	1,680,000	June 27, '16	.10	Inspiration Con.....	Ariz.	920,687	20	3,091,233	3,091,233	July 31, '16	2.00
Arizona, c.....	Ariz.	.....	.....	621,164	20,212,164	Apr. 1, '16	.....	Inter'l Nickel, com.	U. S.	1,673,384	25	5,438,498	30,941,333	June 1, '16	2.00
Atlantic, c.....	Mich.	100,000	25	.....	990,000	Feb. 21, '06	.50	Inter'l Nickel, pf.	U. S.	69,125	100	401,067	5,748,513	Aug. 1, '16	1.50
Bagdad-Chase, g. pf.	Cal.	84,819	1	.....	872,384	Jan. 1, '06	.10	Intern'l Sm. & Ref.	U. S.	100,000	100	.....	4,100,000	May 2, '14	2.00
Bald Butte, g. s.....	Mich.	250,000	1	.....	1,354,848	Nov. 1, '07	2.00	Intergate (Callahan)	Idaho	464,990	10	1,894,970	3,824,990	June 30, '16	1.60
Baldie, c.....	Mont.	100,000	25	.....	7,950,000	Dec. 31, '13	2.00	Iowa, g. s. l.....	Colo..	1,066,667	1	.....	270,167	Jan. 31, '15	.50
Barnes-Kling, c.....	Utah	40,000	5	60,000	60,000	June 1, '16	.07½	Iowa Tiger, g. s. l.	Colo..	3,000	1	.....	25,179	Jan. 15, '16	.50
Beck Tunnel Con.....	Utah	1,000,000	0.10	80,000	940,000	Nov. 15, '02	.02	Iron Blossom, l. s. g.	Utah	1,000,000	1	260,000	2,750,000	July 20, '16	.10
Big Four Expl.....	Utah	400,000	1	80,000	90,000	Aug. 15, '16	.05	Iron Cap pf. c.....	Ariz.	33,481	10	6,422	29,803	July 1, '15	.35
Board of Trade, z.....	Wis.	120,000	1	.....	78,000	Jan. 15, '11	.06	Iron Clad, g.....	Colo..	1,000,000	1	.....	50,000	Nov. '06	.05
Bonanza Dev.....	Colo.	300,000	1	1,425,000	1,425,000	Oct. 25, '11	.20	Iron Silver.....	Colo..	500,000	20	.....	5,050,000	Dec. 31, '16	.10
Booth (Reorganized)	Nev..	998,295	6	349,949	349,949	June 25, '16	.05	Isabella, g.....	Colo..	2,250,000	1	.....	742,500	Mar. '01	.01
Boss, g.....	Nev..	408,500	1	.....	40,850	Dec. 10, '14	.10	Isle Royale, c.....	Mich.	160,000	25	150,000	300,000	July 31, '16	1.00
Boston & Colo. Bm.	Colo.	15,000	10	.....	402,350	Oct. '02	.75	Jamison, g.....	Cal.	390,000	10	.....	378,300	Jan. '11	.02
Bot. & Mont. Con.	Mont.	100,000	25	63,225,000	May 16, '11	4.00	Jerry Johnson, g.....	Colo..	2,600,000	10	.....	187,600	Nov. 5, '14	.00½	
Breeca, l. s.....	Colo.	200,000	25	220,000	Dec. 16, '12	.10	Jim Butler.....	Nev..	1,718,020	1	343,604	515,406	Aug. 1, '16	.10	
Brunswick Con., g.	Cal.	300,000	1	223,315	Sept. 15, '15	.06	Joplin Ore & Selter	Mo.	52,000	5	62,000	92,000	July 22, '16	.04½	
Bullion-B & Champ	Utah	100,000	1	2,768,400	July 11, '08	.10	Jumbo Ez. l. s.....	Nev..	1,550,000	1	194,000	634,998	June 30, '16	.30	
Bullwhacker, c.....	Cal.	450,000	1	10,000	10,000	July 1, '07	.01	Kendall, g.....	Mont.	500,000	6	60,000	1,655,000	Apr. 3, '16	.10
Bunker Hill Con., g.	Idaho	327,000	10	1,154,560	861,000	Aug. 4, '16	.40	Kennedick Zinc.....	Mo.	200,000	.....	60,000	60,000	June 2, '16	.10
Butte Alex Scott.....	Mont.	76,000	10	844,662	1,054,119	Aug. 10, '16	10.50	Kennecott.....	Alas.	258,000	10	7,000,000	12,000,000	June 30, '16	1.50
Butte-Balaklava, c.	Mont.	250,000	10	126,000	126,000	Aug. 1, '10	.50	Kennedy, g.....	Cal.	100,000	100	.....	1,901,001	June, '00	.06
Butte Coalition, c.	Mont.	1,000,000	16	4,700,000	4,700,000	Dec. 1, '11	.25	King of Arizona, g.	Ariz.	200,000	1	.....	396,000	Aug. 2, '09	.12
Butte & Superior, z.	Mont.	272,897	10	5,692,993	11,833,017	June 30, '16	10.75	Klar Piquette, z.....	Wis.	20,000	1	.....	157,600	Dec. 16, '12	.25
Caledonia, l. s. c.....	Idaho	2,605,000	1	625,200	1,507,931	Aug. 5, '16	.03	Knob Hill, g.....	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00½
Calumet & Ariz., c.	Ariz.	641,923	10	2,565,676	25,714,001	June 29, '16	2.00	La Fortuna, g.....	Ariz.	250,000	1	.....	1,200,600	Oct. '02	.01½
Calumet & Hecla, c.	Mich.	100,000	25	3,000,000	132,250,000	June 23, '16	15.00	Lake View.....	Utah	600,000	.05	60,000	114,600	June 12, '16	.02
Camp Bird, g.....	Colo.	1,750,000	25	113,584	10,243,564	Jan. 1, '16	.37½	Last Dollar, g.....	Colo..	1,600,000	1	.....	150,000	Feb. 23, '03	.02
Cardiff, l. s.....	Utah	500,000	1	126,000	220,000	June 1, '16	.25	Liberty Bell, g.....	Cal.	135,551	6	.....	1,752,795	Jan. 31, '16	.06
Carissa, g. s. c.....	Utah	600,000	1	.....	60,000	Dec. '05	.01	Lightner, g.....	Cal.	102,265	1	.....	331,179	Nov. '06	.06
Centennial, l. s.....	Utah	100,000	25	100,000	4,000,000	Aug. 25, '16	.10	Linden, z.....	Wis.	1,020	10	.....	11,200	Dec. 4, '14	.30
Center Creek, l. z.	Utah	100,000	10	55,000	650,000	Aug. 1, '16	.16	Little Bell, s. l.....	Utah	300,000	1	15,000	75,000	Apr. 21, '16	.06
Central Eureka, g.	Cal.	100,000	1	799,159	Mar. 5, '06	.06	Little Florence.....	Nev..	1,000,000	1	.....	430,000	Jan. '08	.03	
Century, g. s. l.....	Utah	1,000,000	1	44,000	392,087	Feb. 15, '16	.06	Lost Packer.....	Idaho	160,000	1	.....	37,500	Oct. 23, '13	.25
Champion, c.....	Mich.	100,000	25	5,000,000	15,000,000	Aug. 8, '16	6.40	Lower Mammoth.....	Utah	1,000,000	1	.....	67,000	Dec. 15, '15	.01
Chiel Con.....	Utah	882,960	1	132,323	493,360	Aug. 2, '16	.05	MacNamara, g. z.....	Nev..	734,678	1	.....	46,800	Apr. 23, '06	12.00
Chino Copper c.....	N. M.	869,390	5	3,041,930	9,742,925	June 30, '16	2.25	Magma, c.....	Ariz.	240,000	5.00	240,000	450,000	June 30, '16	.50
C. K. & N. g.....	Colo.	1,431,900	1	.....	171,829	Nov. '04	.01	Mammoth, g. s. c.	Utah	400,000	10	60,000	2,380,000	June 30, '16	.05
CHIF, g. s.....	Alaska	100,000	10	.....	115,000	Feb. 5, '14	.06	Manhattan-Big 4, g.	Nev..	762,400	1	.....	30,248	Aug. 15, '11	.02
CHIF, s. l.....	Utah	300,000	10	.....	90,000	Jan. 1, '13	.10	Mary McKinney, g.	Colo..	1,309,252	1	.....	1,169,306	July 23, '14	.02
Clinton, g. z.....	Colo.	1,000	100	100,000	60,000	Dec. '08	.30	Mary Murphy, g. s. l.	Mich.	370,000	5	25,067	83,106	May 1, '16	.07
Colo. G. Dredging.....	Colo.	200,000	10	100,000	425,000	Feb. 23, '16	1.00	Mass Con.....	Utah	800,000	0.25	100,000	100,000	Aug. 15, '16	1.00
Colorado, s. l.....	Utah	1,000,000	0.20	2,600,000	2,600,000	Mar. 16, '13	.03	May Day, g.....	Utah	500,000	0.25	40,000	22,000	May 25, '16	.12
Columbus Con. l. s. c.	Nev..	283,540													

Dividends of Mines and Works—Continued

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization			
					Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest	
							Date	Amt.								Date	Amt.
Petro, g. s.	Utah	600,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04	Success	Ida.	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03			
Pharmacist, g.	Colo.	1,500,000	1	91,500	Feb. 1, '10	.00%	Superior & Pitts, c	Ariz.	1,499,792	10	10,318,568	Dec. 21, '15	.38				
Phelps, Dodge & Co	U. S.	450,000	100	53,771,627	June 30, '16	6.00	Tamarack, c.	Mich.	60,000	25	9,420,000	July 23, '07	4.00				
Pioneer, g.	Alaska	6,000,000	1	2,041,626	Oct. 7, '11	.03	Tamarack-Custer	Idaho	2,000,000	1	106,675	Aug. 30, '16	.02				
Pittsburg, I. z.	Ida.	1,000,000	1	20,000	July 16, '07	.02	Tennessee, c.	Tenn	200,000	25	300,000	Apr. 15, '16	.75				
Pittsburg-Idaho, I.	Ida.	1,000,000	1	249,104	July 16, '13	.04	Tightner, g. s.	Cal	100	100	160,000	Jan. 3, '14					
Pitts Silver Peak	Nev.	2,790,000	1	840,600	Dec. 1, '14	.02	Tomboy, g. s.	Colo.	310,000	6	74,400	Jan. 6, '15	.24				
Platteville, I. z.	Wis.	600	60	179,500	June 15, '07	10.00	Tom Reed, g.	Ariz.	909,555	1	2,555,934	Sept. 5, '15	.01				
Plumas Eureka, g.	Cal.	150,625	10	2,831,294	Apr. 8, '01	.06	Ton. Belmont, g.	Nev.	1,600,000	1	662,500	July 1, '16	.12%				
Plymouth Con.	Cal.	240,000	6	289,300	Aug. 10, '16	.24	Ton. Extension, g. s.	Nev.	1,272,301	1	413,660	July 1, '16	.15				
Portland, g.	Colo.	3,000,000	1	10,447,080	July 20, '16	.23	Tonopah, g. s.	Nev.	1,000,000	1	450,000	July 21, '16	.16				
Prince Con., e. l.	Nev.	1,000,000	2	250,000	July 1, '16	.05	Tonopah Midway, g.	Nev.	1,000,000	1	250,000	Jan. 1, '07	.05%				
Quartette, g. s.	Nev.	100,000	10	375,000	July 31, '07	.20	Tremm, s.	Cal.	200,000	2.50	234,000	Apr. 28, '15	.02				
Quicksilver, pf.	Cal.	43,000	100	1,931,411	Apr. 8, '03	.50	Tri-Mountain, c.	Mich.	100,000	25	1,100,000	Oct. 30, '12	3.00				
Quip, g.	Wash.	1,600,000	1	67,000	Feb. 1, '12	.01	Tuolumne, c.	Mont.	800,000	1	496,625	Apr. 15, '13	.10				
Quincy, c.	Mich.	110,000	25	22,647,600	June 30, '16	4.00	Uncle Sam Con. s.	Utah	600,000	1	470,000	Sept. 20, '11	.05				
Ray Con., c.	Ariz.	1,671,279	10	1,571,273	June 30, '16	5.00	Union, g.	Colo.	1,250,000	1	444,241	Jan. 27, '03	.02				
Red Metal, c.	Mont.	100,000	10	1,200,000	Apr. 1, '07	.40	Union Basin, z.	Ariz.	835,350	1	167,070	Nov. 16, '15	.10				
Red Top, g.	Nev.	1,000,000	1	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	50,000	100	1,500,000	Apr. 15, '07	3.00				
Republic, g.	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	50,000	100	6,125,000	Aug. 6, '07	1.75				
Richmond, g. s. l.	Nev.	54,000	1	4,453,797	Dec. 23, '09	.01	United, z. l. pf.	Mo.	19,558	25	21,627	Oct. 15, '07	.30				
Rocco-Home, I. z.	Nev.	300,000	1	162,600	Dec. 22, '06	.02	United Copper, c. s.	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01				
Rochester Ld. & L.	Mo.	4,900	100	190,846	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1	440,435	Jan. 1, '10	.04				
Round Mountain, g.	Nev.	889,018	1	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	3,335,000	June 30, '16	18.00				
Sacramento, g.	Utah	1,000,000	6	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	50,000	100	11,000,000	Sept. 23, '10	6.00				
St. Joseph, I.	Mo.	1,464,798	10	10,972,831	June 20, '16	.25	United Verde, c.	Ariz.	300,000	10	38,272,000	Aug. 9, '16	.75				
St. Mary's M. L.	Mich.	160,000	25	6,880,000	Aug. 28, '16	2.60	United Verde Ext.	Ariz.	1,000,000	50	600,000	Aug. 1, '16	.50				
Schoenb'n-Wal'n, z. l	Mo.	10,000	10	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo.	69,188	100	414,078	Oct. 9, '03	1.00				
Scratch Gravel...	Cal.	1,000,000	1	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,458	100	1,775,936	Oct. 1, '07	1.60				
Seven Tro. Cn., g. s.	Nev.	1,443,077	1	36,076	262,532	Apr. 1, '16	.02%	U. S. R. & M. com.	USMx	351,116	60	965,566	July 15, '16	1.00			
Shannon, c.	Ariz.	300,000	10	760,000	Jan. 30, '13	.50	U. S. R. & M. pf.	USMx	485,350	60	1,288,668	July 15, '16	.87%				
Shattuck-Ariz., c.	Ariz.	350,000	10	4,200,000	July 20, '16	1.26	Utah, c.	Utah	1,634,680	10	8,394,686	June 30, '16	3.00				
Silver Hill, g. s.	Nev.	108,000	1	88,200	June 24, '07	.05	Utah Apex, s. l.	Utah	625,260	6	330,125	July 1, '16	.16				
*Silver King Coal'n	Utah	1,250,000	6	662,500	14,147,485	July 1, '16	.16	Utah Con., c.	Utah	300,000	6	9,600,000	June 28, '16	.75			
Silver King Con.	Utah	637,582	1	127,616	942,373	July 22, '15	.10	Utah M. & T. f.	Utah	750,000	1	325,000	Aug. 15, '16	.50			
Silver Mines Expl.	N. Y.	10,000	100	250,000	June 16, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	May 29, '16	1.00				
Sloux Cons., I. s. c.	Utah	745,389	1	872,105	June 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	207,500	Apr. 23, '10	.04				
Skidoo, g.	Cal.	1,000,000	6	365,000	Oct. 2, '14	.01	Vindicator Con., g.	Colo.	1,600,000	1	135,000	July 25, '16	.03				
Smuggler, s. l. z.	Colo.	1,000,000	1	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D.	600,000	1	100,000	May 16, '16	.02%				
Snowstorm, c.	Idaho	1,600,000	1	1,169,610	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,000,000	1	1,050,000	July 1, '16	.02				
Socorro, c.	N. M.	377,342	6	166,599	166,070	Aug. 1, '16	.05	West End Con.	Nev.	1,788,486	1	538,645	Jan. 15, '16	.06			
South Eureka, g.	Cal.	299,991	1	1,404,754	Aug. 16, '16	.17	West Hill, c.	Wis.	20,000	1	8,000	June 29, '16	.20				
South Hecla, g.	Ida.	500,000	1	39,450	Aug. 10, '16	.16	White Knob, g. pf.	Cal.	200,000	10	190,000	Aug. 25, '16	.10				
Sw. Swansea, g. s. l.	Utah	300,000	1	287,500	Apr. 3, '04	.01%	Wilbert, c.	Ida.	1,000,000	1	40,000	Aug. 15, '16	.01				
Spearfish, g.	S. D.	1,600,000	1	167,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	8,760,000	Apr. 1, '16	6.00				
Standard Con., g. s.	Cal.	178,394	10	6,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,674	16	58,408	Apr. 1, '16	.25				
Standard, c.	Ariz.	425,000	1	69,500	Sept. 3, '05	.60%	Work, g.	Colo.	1,500,000	1	1,697,685	Apr. 31, '12	.07				
Stewart, I. z.	Idaho	1,238,362	1	2,043,297	Dec. 31, '15	.06	Yak, g.	Colo.	1,000,000	1	120,000	June 30, '16	.02				
Stratton's Crip. Ck.	Colo.	2,000,000	1	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	167,500	Feb. 1, '13	.01				
Stratton's Ind.	Colo.	1,000,000	6	6,028,568	Dec. 23, '06	0.12	Yellow Aster, g.	Cal.	100,000	10	1,189,789	Aug. 1, '16	.02				
Str'n's Ind. (new) g.	Colo.	1,000,000	.30	691,250	Jan. 31, '16	.18	Yellow Pine, c.	Cal.	1,000,000	1	1,643,000	Aug. 15, '16	.15				
Strome, c.	Colo.	1,000,000	1	2,276,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	102,583	July 16, '14	.10				

Corrected to September 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675.000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization			
					Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest	
							Date	Amt.								Date	Amt.
Ajuchitlan,	Mex...	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25		Las Cabrillas,	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00	
Amistad y Concordia g s	Mex...	9,600	50		429,358	July 15, '08	1.28		Le Roi No. 2, g.	B. C.	120,000	25		1,627,320	Dec. 15, '16	\$0.24	
Amparo, s. g.	Mex...	2,000,000	10	300,000	2,232,176	Aug. 10, '16	.05		Lucky Tiger	Mex...	715,337	10	321,902	3,685,233	Aug. 20, '16	.08	
Bartolo, de Medina Mill	Mex...	2,000	25		103,691	Aug. 1, '07	.50		McKinley-Darragh-Sav.	Gnt.	2,247,692	1	202,293	4,510,061	July 1, '16	.03	
Batopilas, s.	Mex...	446,265	1		56,870	Dec. 31, '07	.12%		Mexican, I. pf.	Mex...	240,000	100		1,018,750	May 1, '16	.50	
Beaver Con., s.	Gnt.	2,000,000	20		710,000	Apr. 29, '16	.03		Mexico Mines of El Oro	Mex...	240,000	100		660,000	Mar. 10, '05	.25	
Bolao, g.	Mex...	120,000	20		721,871	May 5, '11	6.00		Minas Pedrazini,	Mex...	180,000	5		4,478,500	June 26, '14	.96	
British Columbia, c.	B. C.	591,709	6		615,399	Jan. 6, '13	.16		Mines Co. of Am.	Mex...	900,000	10		4,958,600	July 25, '13	.12%	
Buena Tierra.	Mex...	330,000	6		160,350	Jan. 30, '16	.24		Miner Corp. of Canada.	Can.	2,075,000	1	269,375	1,037,500	Mar. 30, '16	.12%	
Buffalo, Ont.	Gnt.	1,000,000	1		2,787,000	July 1, '14	.05		Montezuma, I. pf.	Mex...	5,000	100		402,500	Nov. 16, '12	3.50	
Canadian Goldfields.	Can.	600,000	0.10		237,099	July 15, '14	.01%		Montezuma M. & Sm.	Mex...	600,000	1		100,000	July 20, '09	.04	
Cananea Central, c.	Mex...	600,000	10		360,000	Mar. 1, '12	.50		Mother Lode.	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11	
Cariboo-Cobalt.	Gnt.	1,000,000	1		295,000	Sept. 1, '15	.09		Nalca, s. l.	Mex...	100,300	300		3,190,000	Oct. 11, '09	\$23	
Cariboo-McKinney, g.	B. C.	1,250,000	1		56,250	Dec. 1, '09	.00%		N. Y. & Hond. Rosario.	C. A.	200,000	10	220,000	3,970,000	July 25, '16	.50	
City of Cobalt.	Ont.	600,000	1		138,375	May 15, '09	.01		Nipissing, s.	Gnt.	1,200,000	6	900,000	14,340,000	July 20, '16	.25	
Cobalt Central, s.	Ont.	4,761,500	1		192,845	Aug. 24, '09	.01		North Star, s. l.	B. C.	1,300,000	1		533,000	Feb. 1, '10	.02	
Cobalt Lake, s.	Ont.	3,000,000	1		465,000	May 29, '14	.02%		Paloma, g.	Mex...	5,000	100		82,600	Jan. 1, '09	5.00	
Cobalt Silver Queen	Ont.	1,500,000	1		315,000	Dec. 1, '08	.03		Panuco, s. g.	Mex...	120,000	20		7,465,000	Nov. 1, '12	5.00	
Cobalt Townsite, s.	Gnt.	198,252	6	400,000	1,042,259	Aug. 20, '14	.24		Perezgins, s. g.	Mex...	10,000	100		6,451,657	Sept. 30, '13	1.25	
Conlagas, s.	Ont.	800,000	6	400,000	8,240,000	Aug. 5, '16	.25		Pinguicula, pf.	Mex...	20,000	100		328,556	Sept. 1, 10	3.50	
Con. M. & Sm. g. s. c.	B. C.	65,050	100	420,617	2,740,654	July 1, '16	2.60		Porcupine Crown.	Gnt.	2,000,000	1	150,000	700,000	Apr. 15, '13	3.00	
Crown Reserve, s.	Ont.	1,999,557	1		6,102,408	July 15, '15	.03		Providencia, (S. J.).	Mex...	6,000	15		963,380	Apr. 1, '08	1.00	
Dolores.	Mex...	400,000	6	400,000	1,374,865	July 24, '11	.22%		Rambler-Cariboo.	B. C.	17,600	100	70,000	490,000	Aug. 15, '16	.01	
Dome Mines, s.	Ont.	400,000	10	400,000	890,000	June 1, '16	.60		Rea Mines, Leasing	Ont.	200,000	1	16,855	1,275,750	Feb. 20, '15	.00%	
Dos Estrellas, (El Oro)	Mex...	300,000	0.50		15,405,000	Sept. 30, '13	1.60		Right of Way	Ont.	1,685,500	1		569,514	June 15, '16	.00%	
El Favor	Mex...	3,500,000	1		210,000	Apr. 30, '14	.01		San Francisco Mill	Mex...	374,611	6		3,454	Feb. 1, '13	.05	
El Gro, g. s.	Mex...	1,147,500	6		9,138,842	July 11, '13	.24		San Rafael.	Mex...	8,000	25		445,086	Oct. 15, '08	1.00	
El Rayo, g. s.	Mex...	260,020	2		180,440	Apr. 24, '11	.35		San Toy, s. l.	Mex...	6,000,000	1.00		6,798,260	Jan. 11, '12	2.00	
El Triunfo, c.	Mex...	2,000,000	1		20,000	Aug. 25, '11	.01		Santa Gertrudis, Hdgo.	Mex...	1,500,000	5	364,500	2,519,772	June 16, '16	.24	
Esperanza, s. g.	Mex...	450,000	1		12,621,250	Aug. 2, '15	10		Sta. Gertr'y Guadalupe, g. s.	Mex...	60,000			3,960,000	Mar. 27, '09	1.00	
Granby Con., c.	B. C.	149,985	100	749,982	6,350,311	Aug. 1, '16	.20		Sta. Maria del Paz.	Mex...	9,600	12%		8,960,000	Jan. 2, '13	2.50	
Greene-Cananea, c.	Mex...	474,411	100	2,431,405	6,666,850	Aug. 28, '16	2.00		Seneca-Superior.	Ont.	478,844	1	622,649	1,643,761	Aug. 15, '16	.30	
Greene Con., c.	Mex...	1,000,000	10	2,500,000	12,544,000	July 25, '16	1.00		Seneda, s. l.	Mex...	960	20		4,439,840	July 11, '11	8.00	
Greene Gold-Silver, pf.	Mex...	300,000	10		194 371	Mar. 28, '07	.40		Sorpresa, g. s.	Mex...	19,200	200		3,879,540	Jan. 5, '11	34.00	
Guanajuato Con.	Mex...	640,000	5		600,000	Gct. 8, '06	.07%		Standard, s. l.	B. C.	2,000,000	1	400,000	2,300,000	Aug. 1, '11	.02%	
Guanajuato Dev., pf.	Mex...	10,000	100		274,356	Jan. 1, '11	.70		Tenimcam'g & Hud. Bay	Gnt.	7,741	1		1,940,250	Nov. 10, '14	3.00	
Guenahelm Explorat.	Mex...	833,732	25	10,713,456	34 032,760	Apr. 3, '16	11.88		Tezuitlan, c.	Mex...	8,000	100		1,534,155	July 22 '16	.03	
Haleybury, s.	Ont.	60,000	1		50,000	Apr. 6, '11	.50		Tough-Oakes.	Ont.	531,600	6	199,311	265,750	July 3, '16	.12%	
Hedley	B. C.	120,000	10	120,000	1,943,620	June 30, '16	.50		Tretheway, s.	Gnt.	1,000,000	1		1,061,985	July 15, '16	.05	
Hinds Con., g. s. l.	Mex...	6,000,000	1		88,000	Feb. 27, '08	.02		Wettlaufer-Lorrain, s.	Ont.	1,416,690	1		656,386	Oct. 20, '13	.05	
Hindgar.	Ont.	240,000	100	1,160,000	6,370,000	Mar. 31, '13	.95		Yukon, g.	Y. T.	3,600,000	6	625,000	8,108,111	June 30, '16	.07%	
Jimulco, c.	Mex...	10,000	100		975,000	Feb. 27, '11	1.06										
Kerr Lake, s.	Gnt.	600,000	6	300,000	6,420,000	June 1, '16	.25										
La Blanca.	Mex...	140,000	20		2,775,700	Mar. 31, '13	.90										
La Republica, s.	Mex...	400,000	6		110,000	Aug. 15, '11	.06										
La Rose Con., s.	Gnt.	1,498,627	6	224,793	6,611,913	July 20, '16	.06										

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ELKTON MINE, CRIPPLE CREEK.



AJAX MINE, VICTOR.

The Roosevelt Tunnel and Cripple Creek Mine Operations

W. A. SCOTT.

The Roosevelt tunnel, being driven by the Cripple Creek Drainage & Tunnel Co., is already an economic factor in the mining operations of Cripple Creek district. Pumping operations are gradually becoming unnecessary as the tunnel is extended, except as to mines whose workings are deeper than the tunnel level, and in these few cases the pumping lift to this drainage channel is not great. Even those mines situated several thousand feet away from the course of the tunnel have been effectively drained, showing the existence of water channels in a basin capable of being dewatered through this deep tunnel.

The portal of the tunnel is in Gatch park, in Cripple Creek canyon. The tunnel has been driven a distance of 21,200 ft., and the distance from the present heading to the point of destination, in the Vindicator's Golden Cycle mine, is 7800 ft. The outflow of water is subject to considerable variation, but measurements taken on Sept. 1 showed a flow of 10,300 gals. per minute. The bore is 7 ft. high and 9 ft. wide. The base is taken up by an 18-in. gauge car track on one side, and a drainage channel 4 ft. wide and 2 ft. deep on the other side. The channel extends about a foot in depth below the base of the track bed, and is built up a foot above that bed by planks set upon edge in concrete, the entire channel being covered with planks. The pipe line for compressed air is laid on top of the covered channel, next to the tunnel wall.

The initial course of the tunnel was 15,000 ft. northeasterly to the El Paso mine, tapping its workings at a depth of 1500 ft. As soon as this group was reached, all broken rock resulting from tunnel driving was hoisted through El Paso shaft until the Elkton mine was reached last June; since then all dirt from the tunnel has been hoisted through Elkton shaft. The course of the tunnel from the El Paso to the Elkton was almost due east, the Elkton ground having been cut at a depth of 1650 ft., which was 92 ft. below the base of the latter's shaft. To make a connection with Elkton, a cross-cut was driven 47 ft. off the main tunnel to a point directly below the shaft, and from that point a raise was made 92 ft. to the shaft; this raise is of same dimensions as the shaft and becomes a part of it.

Compressed air for drills was supplied by compressors at the portal of the tunnel until the El Paso mine was reached; for the drive between the El Paso and Elkton, air from the El Paso compressors was used, and as soon as the Elkton was tapped, and connection made, the compressor of the latter plant was brought into use, and this service will be continued until the heading of the tunnel is advanced far enough to make the plant of some other mine available.

The breast of the tunnel at this time is about 1500 ft. east of the Elkton shaft, the course being easterly under the saddle between Battle mountain and Bull

hill, thence onward toward the Vindicator group. The strike of the tunnel is about 1500 ft. south of the Cresson shaft and 1800 ft. north of the Portland's deep shaft No. 2. It gives 1925 ft. depth on the Cresson group, measured vertically from the collar of the shaft; and it will cut the 2100-ft. level from the Portland No. 2 shaft, and the Vindicator's Golden Cycle shaft at 1950 ft. Direct drainage of Last Dollar, United Gold mines, some properties of Stratton estate, Granite group, and Vindicator shaft will be accomplished.

The tunnel work, under direction of C. H. Fuller, has been marked by excellent progress during the last 2 months, the average having been 400 ft. per month, by the use of two drills, with 8 men on a shift, working three shifts, breaking and hoisting 115 to 120 cars of rock in 24 hours, using 16-cu. ft. cars. In this work, the Ingersoll-Leyner Model 18 drills are being used.

The project was started in 1907 for the drive of 28,900 ft. Having driven 21,200 ft., and accomplished, thus far, what was desired in the matter of deep drainage for the major part of the district, the last lap of 7700 ft. seems comparatively free from discouragement. The Cripple Creek Drainage & Tunnel Co., which is pushing the project to a conclusion, is backed by the Portland, El Paso, Vindicator, Cresson, Elkton, Granite, United Gold Mines, Mary McKinney and other mines.

The Portland.

The mining operations of Portland Gold Mining Co. are under the superintendency of Frank Smail, assisted by Fred Jones. No. 1 shaft, 1700 ft. deep, and No. 2 shaft, 2000 ft. deep, are 700 ft. apart, the collar of No. 2 being about 150 ft. higher than that of No. 1. Ore is being mined on all levels, from the highest to the lowest, the gold and silver being in sylvanite, associated with iron sulphide. Each shaft has three compartments, two for hoisting ore and waste and one for air columns and electric cables. Both shafts are timbered with creosoted Oregon timbers. The workings, which are all connected, are practically free from water, having been drained by the Roosevelt tunnel after the El Paso-Elkton water channels were tapped.

Electric haulage has been in use some time on the 1700 and 1800-ft. levels, whereby ore in 1400-lb. cars is hauled to either shaft by storage battery locomotives, and dumped into ore pockets, from which it is loaded into skips for hoisting.

The Portland mill is situated high up on Battle mountain, in the vicinity of No. 2 shaft, and the ore destined for treatment in that mill is hoisted through that shaft.

The old haulage tunnel, which starts on the surface near the old Independence shaft-house, and runs 1800 ft. north to No. 1 shaft, cutting same at a depth of 260 ft., is being enlarged and will be equipped for electric haulage, the intention being to use 6-ton cars for hauling ore to the Independence mill, now owned

and being reconstructed and re-equipped by the Portland Co. Most interesting plans are being worked out by the Portland Co. and its staff of engineers and metallurgists for the mill referred to.

This company, like some others in the district, finds the matter of disposal of mill tailings an expensive problem. A large bulk of such tailings are already banked up in the ravine below the mill now under reconstruction, these being held back by a dam. To provide for the disposal of tailings to be discharged from this mill in the future, a wooden flume, 3700 feet long, 12 ft. wide, and 6 ft. deep, lined with half-section clay tile, is being laid on trestles, and extends



MOUTH OF ROOSEVELT TUNNEL.

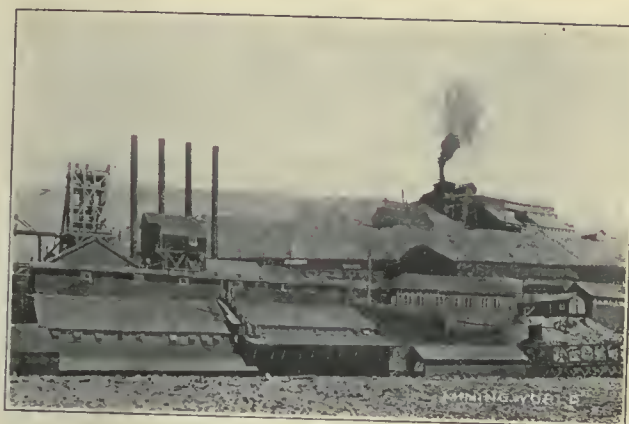
from the upper side of the dam down the ravine to a pump station. The tailings are to be conveyed by gravity to end of the flume, but from that place they will be pumped through a metal pipe line over a hill and discharged upon low ground. The pumping will involve a lift of 160 ft.

The Cresson.

The mine of the Cresson Con. Gold Mining & Milling Co. is one of the phenomenal producers in the history of Cripple Creek district. Some months ago the property was transferred by purchase from Chicago owners to a Colorado syndicate, headed by



THE PORTLAND MILL AT VICTOR.



NOS. 1 AND 2 PORTLAND MINE SHAFTS.



GOLDEN CYCLE MINE, CRIPPLE CREEK.



VINDICATOR MINE IN THE FOREGROUND.



CRESSON MINE, CRIPPLE CREEK.



EL PASO MINE, CRIPPLE CREEK.



MARY M'KINNEY MINE, CRIPPLE CREEK.



ISABELLA MINE, CRIPPLE CREEK.

A. E. Carlton, C. M. McNeill and Spencer Penrose, the first named being president of the company. Richard Roelofs, superintendent under the old regime, is general manager under present ownership, and special credit is accorded him, not only for direction of the underground work, but for the economical handling of the property.

A report issued by the president, A. E. Carlton, on Sept. 7, showed a net production of \$250,000 between June 24 and Aug. 1, 1916. According to the same report, the estimated ore available in the mine on Aug. 1 was worth \$4,130,000, net; that is, this is the estimate after deducting freight and treatment charges. On Sept. 7 the company had \$1,064,745 cash on hand, and 100 cars of ore in transit, worth \$1,000 per car.

This property is at the foot of Raven hill, on the upper course of Eclipse gulch. It is being operated and further developed through a 2-compartment shaft, having a depth of 1640 ft. Equipment includes a steam hoist, an air compressor of capacity of 2000 cu. ft. free air per minute, driven by direct connection to a synchronous motor. This supplies power for 30 drills, including heavy drills and stopers.

The ore, when hoisted, is passed through washers and screens, the washings and screenings being shipped separately; the coarse ore is passed from trommels over a moving slatted picking belt, from which 6 men do hand-sorting. The washed and sorted ore is conveyed to shipping bins on the railroad track over a 2600-ft. aerial tramway. The mine is producing around 6300 tons of ore per month, of an average value of \$30 per ton. This ore is shipped to the Colorado City mills.

The ore bodies are found east of the shaft, cross cuts having been driven from each level to the ore. The ore occurs in segregated masses, a stope of \$30-ore opened on the 1200-ft. level being one of the largest ever seen in the district. This is a continuation of the ore body opened on the higher levels. This shoot has a length of 450 ft. and a width varying from 25 to 140 ft. Ore is being hoisted from five levels—one above the 1200, and three below it.

Attention was directed to the Cresson about a year ago by the discovery of a cave on the 1200-ft. level, from which \$1,000,000 worth of ore was shipped within 6 weeks. This cave was 25 ft. long, 20 ft. wide and 30 ft. high. It contained a big tonnage of high grade ore, broken by nature, and the walls, also, were lined with sylvanite ore of high grade.

The mine is operated on the filled-stope plan by the use of pillars. The workings are already drained by the Roosevelt tunnel. Supt. Roelofs has been identified with the property for nearly 10 years, and up to July, 1916, the Cresson dividends amounted to nearly \$4,000,000.

The Vindicator.

The Vindicator Con. Gold Mining Co. recently purchased the Golden Cycle mine, adjoining the Vindicator group, situated at the southern base of Bull

hill. The Vindicator and Golden Cycle shafts are probably 1500 ft. apart. The former has a depth of 1900 ft. and the latter 2200 ft. The Roosevelt tunnel, when it reaches Golden Cycle mine, will strike it at the 1900-ft. level, and this is one of the cases in which it will be necessary to pump water up to that drainage tunnel. The Vindicator and Golden Cycle are now operated as one property, and the pumping plant in Golden Cycle shaft serves to keep the entire group dewatered, the present volume of water raised to the surface being about 450 gals. per minute. There is a steam pump at the 1900-ft. station that discharges at the surface, and electric driven pumps at the bottom of the shaft lifts the water to the 1900-ft. station.

On taking over the Golden Cycle, the Vindicator Co. proceeded to build thereon and equip a flotation plant of 350 tons daily capacity, making use of the coarse crushing plant already on the property. The ore, after being reduced to 3-in. size in the old plant, passes by belt conveyor to a chute through which it is carried to hoppers in the new plant. The hopper feed discharges upon a conveyor, and thence into a 6-ft. Stearns-Roger ball mill having chrome steel balls: the product of this mill passes to a second ball mill of the same kind, the last product being 40 mesh. A Dorr classifier works in closed circuit with the second ball mill. The classifier overflow passes to a Dorr thickener. Following this will be oil flotation treatment in which two 6-cell Minerals Separation machines will be used for roughers, and one 6-cell machine for cleaner work. The rougher tailings will be partly dewatered and then stacked. The flotation product will be taken from the cleaner cells, the tailings from the latter being returned to the head of the mill. The ore here consists of gold tellurides, associated with iron sulphide, in a quartz and porphyry gangue. This plant is to be ready for operating in October.

The Vindicator Co., having no dump room near the plant for mill tailings, has installed equipment for depositing them 8000 ft. away, on the opposite side of a mountain spur. The tailings from the rougher cells go to a sump tank, from which they are pumped to thickener tanks, where they are so dewatered as to leave a consistency of equal parts water and sand. In this form it is forced by two Byron Jackson 2-in. centrifugal sand pumps through a 3-in. metal pipe to the dumping ground above mentioned, making a lift of 425 ft.

At the Vindicator shaft is a crushing, screening and ore-washing plant to treat the reject from the ore shipping bins, after the ore of shipping grade is sorted out. In this process the revolving trommels of 6-mesh and 40-mesh are used, the two screen products made running about \$13 per ton. The best values are obtained in the fines, and the screening reduces about 15 tons into 1 ton. The washings, which are worth about \$70 per ton, are dried by steam driers before being shipped.

The ore to be treated in the new flotation mill at

the Golden Cycle shaft is to be taken from the dumps of both mines; it is estimated to run about \$2.25 per ton.

On the operating staff of the Vindicator are: W. E. Ryan, general superintendent; J. H. Haynes, metallurgist; A. R. Minner, mill superintendent.

The Isabella.

This property is on the northeast slope of Bull hill. Clark G. Mitchell, superintendent during the last two years, states that the mine is producing 2000 tons of ore per month, averaging 1 oz. gold per ton. The 1915 production amounted to \$500,000, and the production for the first 7 months of 1916 was \$350,000 gross. The mine is operated through the Lee shaft, 1275 ft. deep, and the Empire shaft, 1140 ft., the two being 1200 ft. apart. There are 14 levels off the Lee shaft, and 9 off the Empire, the entire workings aggregating about 20 miles. The Lee is the main operating shaft, and is connected with the Empire by 5 levels. The air compressor, steel shops, ore bins and offices are at the Lee.

There are two principal veins, known as the Victor and Buenavista, the dip of both being away from the shafts. The opening of rich ore on both veins on the 1275-ft. level was the cause of satisfaction to the management, as some lean ground has been found on several levels above this. Considerable ore taken from the Buenavista stopes on and above the 1275 level sampled an average of \$100 per ton. A 150-ft. winze is being sunk on east Victor vein from the 1275 level, and when that depth is reached a cross cut will be driven to the Buenavista vein, and also to the shaft.

The workings are drained, to a large degree by the pumping operations on the Vindicator group, on the opposite side of Bull hill. The small volume of water that comes into the sump at the bottom of Lee shaft is raised by a pump and is forced 400 ft. laterally, discharging into a vein where it disappears. The bottom of the Lee shaft is 1000 ft. higher than the lowest workings of the Vindicator group, so that mine drainage is never likely to be a serious problem with the Isabella. The Roosevelt tunnel eventually will drain all the Bull hill mines.

The Isabella has 30 to 40 sets of lessees, who work on a royalty basis. Some leases run 2 years, paying a graded royalty of 10% to 40%, the lessee paying all his own expenses except for hoisting waste. In other cases the split-check lease is in vogue, whereby the company furnishes the supplies, the lessee furnishing the tools and labor, and the mill check for the ore is split 50-50 for company and lessee. On either plan, the lessee does some development. For 1915 the company performed 1590 ft. of development and the lessees 15,600 ft.

Stoper drills are used for all purposes, the leasers desiring but one kind. In the drill work, blowpipes are used to clean out drill holes, throwing a mixed jet of water and air into the hole while the drill is in action, through a small steel tube. This keeps down the fine dust and makes more sanitary conditions.

The company is spending \$10,000 in the construction of new ore bins, and a screening and washing

plant at Lee shaft. The cyanide plant, on the hillside 500 ft. below Lee shaft house, has been remodeled and is ready for operation. It has a crusher, rolls, revolving screens and tanks for sand leaching. The plant will handle 75 tons per day, and is to treat ore running \$3 to \$4 per ton. A tunnel has been driven 300 ft. from the mill to the 110-ft. station in the shaft and mill ore is to be taken out that way.

Stratton Estate.

The Stratton Cripple Creek Mining & Development Co., owned by the Stratton estate and managed by F. M. Keith, has no less than 15 properties on Bull, Globe, Gold and Womack hills and on Poverty gulch. The most prominent of these are the Dearborn, Orpha May, War Eagle, Plymouth Rock and Abe Lincoln. Practically all are being operated under 1 and 2½-year leases, on a graded royalty basis. The American Eagle is the only one being operated by the company direct. Ore production is running a little in excess of 1000 tons per month.

Granite Group.

Granite Gold Mining Co., C. C. Hamlin, general manager, operates the Gold Coin, Granite, Dillon, Dead Pine and Monument mines in one connected group. These extend in one continuous series of workings from the center of Victor northerly into Battle mountain to the lines of the Portland and Ajax. The Gold Coin shaft is 1300 ft. deep, that of the Dillon 1690 ft. The Dillon is to be the main working shaft; the waste will continue to be taken out to Eclipse gulch through Gold Coin tunnel. New electrical equipment is being put in position at the Dillon for hoisting. The compressor there will be operated by the Gold Coin steam plant. Dillon shaft will be sunk 200 ft. deeper. Ore being produced now amounts to about 3000 tons per month, and this tonnage is increasing. The grade of ore is about \$25 per ton. D. L. McCarthy, Victor, is superintendent.

Mary McKinney.

This mine is in charge of I. D. Buckles, and the ore shipments reach a maximum of 1000 tons per month. The workings from the 1300-ft. shaft are drained by the Roosevelt tunnel, the level of which is 70 ft. below the 1200 level. The ore being mined comes from the 800, 1000 and 1200 levels.

Union Leasing Co.

This company has been operating the Gold Sovereign, under a lease which has about expired. From this mine 10,000 tons of ore per year has been shipped. The company has taken a long-term lease on the Gold Dollar mine, on Beacon hill. It has a 916-ft. shaft and considerable amount of lateral work. A new electric hoist has been placed in position and other equipment includes a 10-drill air compressor. This company's leasing operations, here and at Red Cliff, are under direction of C. G. Jackson, superintendent. The Mabel, Percy and Chester, at the latter place, are producers of copper, zinc, silver and gold ore, and equipment is being installed for using power drills. The ore will be shipped to Leadville.

A Detector to Locate Buried Iron Objects.

This device is an adaptation of the compass, to a new use, that of indicating the location of iron objects when buried in the earth, and hidden from view. It is arranged to be held in a vertical position instead of a horizontal and is more delicately balanced and adjusted than any compass. While the compass, delicate as it is, directs the commerce of the world, just so will this "detective" device direct one to the object of search when trying to find a valve box or iron pin, when "just out of sight." This detector has a highly magnetized, hardened steel needle delicately balanced on hardened pivots, between two jeweled bearings.

It is fitted into a white metal untarnishable case, with a silvered dial in a special cup receptacle, with a snap in beveled glass; has a screw stop which keeps out all dirt, and is provided with a soft iron pin, which



A UNIQUE DETECTOR.

by magnetism when not in use holds the needle free from vibration, thus preventing undue wear on the pivots. When this instrument is held vertical in a north and south line and free from any surrounding disturbances, the needle will lie approximately in a horizontal position, or parallel to the earth's magnetism.

Its use depends upon the fact that an iron stop box, valve box, surveyor's corner pin, or other iron object, when placed vertically in the earth becomes a magnet, the upper end being one of the poles of the magnet. If the device being held vertically and in a north and south line, is gently swung over a stop box, the top of the box being one pole of the magnet, will attract one end of the needle, and repel the other, and the needle will be caused to swing or dip from its horizontal position. It is this swing or dip of the needle that indicates the location of the stop box, or

other object. There is a little dip of the needle, and it is this dip which must be looked for.

In using the detector a good plan is to stand facing north or south; hold the instrument by the ring, the dial facing either east or west; one can by stooping over and with a long steady sweep of the arm cover easily 3 ft. at a swing, watching the needle while so doing. If the box is not located in the first strip taken, one would step to one side and cover the adjacent strip. Always swinging instrument close to the ground and as steadily as possible. If the box is deeply buried the deflection will be slight, if shallow the dip or vibration will be very pronounced.

With a little practice one is able in a short time to locate stop boxes, and iron stakes, which are covered to a considerable depth and which would necessitate hours of digging to find, and in many cases the ruining of a lawn, or tearing up of good streets. It is the size of an ordinary watch so that it can be easily carried and always at hand when wanted. No need of measuring when one has any idea of where the box is; it is quicker than measuring even when one has the figures.

Antimony Deposits in Alaska.

The considerable demand for antimony during the last year has stimulated the development of certain Alaskan deposits of ore of that metal, from which ore to the value of about \$74,000 was mined and shipped during 1915. Stibnite, the sulphide of antimony, has been noted at 67 localities in Alaska, but only a few of these have produced and marketed ore. In 1915 the production of antimony ores was begun at four mines in the Fairbanks and at two in the Nome district. All the operations were small and most of them consisted of digging out the rich ore near the surface by open cuts and of breaking and hand sorting it. These deposits form the subject of a report recently published by the Survey as Bulletin 649, a volume of nearly 70 pages, entitled "Antimony Deposits of Alaska," by A. H. Brooks. According to this report, the Alaskan antimony deposits may be divided into three principal groups—siliceous gold-bearing stibnite lodes, stibnite-cinnabar lodes, and stibnite-galena lodes. Each of the first two of these groups is further divided, according to structure, into fissure veins, shear vein deposits, and stockworks. These deposits seem to have been formed in a rather recent geologic age, probably at the time of the intrusion of certain tertiary igneous rocks, though no metalliferous lodes have been found in the tertiary sedimentary rocks.

Following is a formula submitted for an acid-proof lining for tanks: 10% litharge, 20% short-fiber asbestos and 70% sand. Mix to a plaster with 40° Bé. solution of sodium silicate. An application of acid after drying will "set" the cement and render it acid-proof.

Ore Sampling Conditions in the West

T. R. WOODBRIDGE.*

(Continued from page 538.)

In order to avoid many conditions that seem unsatisfactory in all methods of hand sampling, there are in use various devices that are placed in the line of the moving stream of ore and automatically divert for the sample a fixed proportion of the stream. These are known as mechanical or automatic samplers.

Many advantages are claimed for the mechanical system of sampling. Except for the cleaning of the machinery, the only hand labor required is for unloading the ore, and even this is avoided if the ore is delivered in dump cars. The operation is continuous, and if the plant is properly managed, the sample may be placed on the drier within a few minutes of the time required by hand methods for merely delivering the ore to the sampling floor for the first coning. The ore is not rehandled nor is it stored for various lengths of time near other samples from which it might easily be salted. The unmixed condition of the ore is less of a factor, and if the machine and general plant are correctly designed and constructed the work can be done at a much lower operating cost. With simple and proper precautions the susceptibility to error and manipulation existing in hand methods is eliminated.

An interesting fact is the universal use of the mechanical system by custom sampling plants. The nature of their work is such that these plants are in a position to compare their sampling systems with those of every other plant to which they forward ore. These comparisons are not only yearly or monthly averages, but are also those of individual lots or mixtures of several lots forwarded as one. A well-conducted custom plant makes a study of comparative returns from different smelters and mills and, to this end, frequently makes shipments of what are termed "split lots" of the same ore to two or more smelters or mills. It is not an uncommon practice for custom plants to resample several consecutive portions of the same lot of ore, which are then sent to as many different smelters or mills merely for a comparison of results. They are also constantly studying any change made at any plant with which they have business relations. For these reasons it is probable that a custom plant shipping regularly is better posted as to the reliability of certain methods than is the purchasing plant using them.

The custom plant does not buy all the ore that it samples, but usually does a large proportion of its business in what is termed "sampled-in-transit" ore; that is, ore which the mine sends to the custom plant to be sampled as a check on the sampling that is to be done later at the purchasing mill or smelter. Therefore, the preferable system for the custom plant would seem to be that which is most reliable under all circumstances.

Among the objections to mechanical methods are the greater initial cost of the plant, the heavy cost of renewals of machinery, the difficulty of cleaning thoroughly, the danger of flying dust from a dry, high-grade ore, and, more serious than all else, the fact that with an unscrupulous operator, machines may be and have been so built or arranged that a correct sample is impossible. Too much stress cannot be laid upon this feature of the mechanical methods. The combination of an incorrectly constructed machine and improper delivery spouts is a more serious cause of error than any hand method heretofore discussed. A cone may be improperly formed or the shoveling improperly done but, in both these operations, conditions may be inexplicably changed at any time and, on account of a surprising average of errors, a correct sample may result; whereas, with an improperly designed or adjusted machine and a discriminating delivery, there can be no hope for anything but error. This possibility and its application by many sampling plants in the past has given rise to most of the opposition to the general use of mechanical systems but, fortunately, exposure and agitation have made such practices almost as unsafe as the occasional placing of screens in the bottom of the elevators.

Devices for mechanical sampling operate on either of two distinct principles which separate them naturally into two classes—stationary devices which continuously divert certain fixed sections of the stream of ore for the sample, and moving devices which are so operated that during several fixed periods per minute they divert the whole of the moving stream of ore for the sample. These devices are commonly and more graphically described as those taking part of the stream all the time, and those taking all of the stream part of the time. The first class of the mechanical samplers now in use is represented by the whistle pipe and the bank or combination riffle.

Stationary Devices.

The whistle pipe, in combination with coning and quartering, is in use in a number of plants which are under one management.

The whistle pipe is a vertical iron pipe with five notched openings cut halfway through the pipe, each being placed at an angle of 90°; measured horizontally, from the one immediately above. In these notches are rectangular pieces of steel, so placed that the top edge forms a diameter of the pipe. Above every notch is placed a cast-iron liner, so shaped that the lower end is smaller than the upper, which collects the ore in a smaller stream just before it strikes the dividing edge. When the ore is delivered to the top of the whistle pipe, it falls on the first diverting partition, which causes approximately half of it to leave the pipe and

*U. S. Bureau of Mines; excerpts from advance proofs, Technical Paper 86.

fall into the reject bin. The other half continues down the pipe until it strikes the second partition, set at right angles to the preceding one, where it is similarly divided. This process continues through five diverting partitions, so that the sample finally leaving the pipe represents one thirty-second of the original lot. The rejects from the five openings are discharged into the housing and are diverted by chute to the reject receptacle.

The advantages of this device are its low original cost, economy of operation, and the simplicity and rapidity with which it reduces the ore to such a small proportion of the original amount. A disadvantage is that there is no possibility of recrushing the ore until it has been reduced to one thirty-second of its original bulk. This makes it necessary to crush the whole lot to whatever degree of fineness is required by this small sample. As it is rather unusual to change a set of rolls or a screen for lots of small tonnage, it is probable that the crushing limit is that of the average large lot. A maximum size of particles which would be safe for a 100,000-lb. lot would tend to cause an error in a 20,000-lb. lot. Another possible source of error is that the rectangular piece of iron forming the partition is inserted on an angle rather than in a vertical position. As this partition wears, the dividing edge will recede toward the outside of the pipe and cause too large a proportion to go into the sample. If the feed is uniform, the error resulting may not be serious, but if the stream of ore has a tendency to segregate, a recession of the dividing edge may cause a serious error. Inasmuch as the device must be housed to prevent the escape of ore and dust from the reject, there is little or no opportunity for inspection during sampling, so that a temporary clogging at the sampling partitions could readily remain undetected for varying periods of time, thus forcing an undue proportion of the ore into either the sample or reject. The cast-iron liners tend to wear unevenly, the greater wear taking place where the coarse ore strikes, thus establishing lines of flow that might result in an improper division of the sample.

Bank or Combination Riffle.

The bank or combination riffle is in use in connection with the Vezin sampler in four plants. This device consists of five riffles set in one frame, the top riffle being placed over two lower ones, which are in turn followed by two more set below them. The ore is fed from a chute or hopper to the first riffle, where the stream is divided into a number of smaller streams, of which every other one falls on one side and the rest on the opposite side of the riffle. From the spouts on both sides of the first riffle the streams of ore impinge on inclined iron aprons, by which they are diverted to the two riffles. Four sets of streams flow from these two riffles, each set representing one-fourth of the original lot. Two of these unite and fall into the reject receptacle; the other two sets are diverted to two aprons and the two riffles, where they are again

divided into four sets of streams. Two of these sets unite and fall into the reject receptacle; the other two, each being one-eighth of the original lot, may be united or may be kept separate as original and duplicate samples. If the sample so produced is larger than desired, it may, with or without further crushing, be passed through a similar set of riffles, or it may be elevated and passed through the same set. This repetition may be continued until the desired weight is obtained. The riffles may be built in a rigid frame, or they may be hung with rods so that a workman may swing one or more of the sections across a falling stream of ore.

Among the advantages claimed for this device is the fact that it divides the original stream of ore into a large number of smaller streams before separation, thus avoiding the error possible in coning and quartering where only four cuts are made before separation. Further, it is easily operated and, as the ore is generally finely crushed when it reaches this point and is fed to the device without a long drop, the wearing of the dividing edges will be slow.

On the other hand, its construction is not simple, and great care is required in constructing the dividing partitions and preserving them in proper condition. There is danger of the partitions becoming clogged by damp ore, pieces of wood, or cloth, and as they are not easily accessible for examination, they may remain clogged and part of the riffle may for long periods of time take no sample or else an undue proportion of the ore may pass into the sample. In order to guard against this tendency, the riffles are frequently tapped with a hammer and may be seriously bent out of shape. The great disadvantage of all devices of this type is that, under nearly all conditions, a falling or sliding stream of ore acquires certain tendencies that are developed by the conditions surrounding its previous handling. For instance, if one side of a delivery chute is lower than the other, or if there is a decidedly low place anywhere in the bottom of the chute, the fine ore will seek that low point. If there are several such places or depressions, all will form lodging places for the sliding fine ore. If there is a straight delivery to the chute, the coarse ore will be more or less evenly distributed in its flow, but if there is an angle at any point in the delivery, the coarse ore will also be found to have regular lines of flow.

The uneven wear of the face of a set of rolls tends to deliver the crusher ore in separate streams and, at the same time, to segregate the coarse and the fine ore. An angled spout causes an evident segregation. In fact, any number of conditions may exist that make the delivery of a stream of ore anything but uniform. Therefore, it is possible, and highly probable, that one or more of the divisions may intermittently or regularly receive an incorrect proportion of the fine or coarse ore and the cause may be exceedingly difficult to detect. Correct samples may be nevertheless obtained on account of the compensating average of errors.

In the bank riffle the ore that slides down any one

of the small spouts tends to separate into different sizes as it impinges upon the small diverting apron. The finer and damper ore adheres to the apron surface for an appreciable length of time and, when it is finally dislodged, it drops into the nearest division in the succeeding riffle. However, another pile immediately begins to form, so that there is built up a series of pyramids which causes the rolling coarse particles to be diverted to both sides and consequently into certain divisions in the following riffle. The first diversion may cause a small and hardly appreciable error, but as the ore passes through three sets of riffles and may be repassed one or more times, there may be a cumulative error which, especially in sampling high-grade ore, may seriously affect the final sample. This tendency is so well recognized that riffles are sometimes given a swinging motion, in order to break the lines of regular flow. However, as this correction in the regular process generally depends on the memory, convenience, or whim of the workman, it is at best spasmodic.

(TO BE CONTINUED.)

Hydrostatic Amalgamator.

Herewith is an illustration of the Hydrostatic amalgamator, manufactured and placed on the market by Hydrostatic Amalgamator & Supply Co., 415 Seventeenth street, Denver, Colo. The machine is built to handle the material from a 5-stamp battery, from 12 to 30 tons in 24 hours. It is also adapted to handle a proportional volume from tube mills, ball mills or



THE HYDROSTATIC AMALGAMATOR.

placer sand. While it is suitable for material as coarse as 12 mesh, its greatest efficiency in gold recovery is obtained in handling a finer product; the finer the pulp the greater the extraction. Its efficiency does not depend upon water pressure, but is a matter of a continuous flow.

In operating the machine must stand on the level, the amalgam plate being placed inside the receptacle.

the silvered side up; the mercury is so poured as to form a thin coating over the plate. When the pulp or placer sand is fed with the required flush of water it rises in the feed pipe to the height of the overflow, making a column of pulp and water, which eliminates foam and froth. The air being excluded from the mercury prevents oxidation. The pulp or sand, escaping from the feed pipe into the amalgamating receptacle, radiates from the smaller to the larger diameter, and the gold is caught on the plate and moved along and off the plate into the mercury around the outer edge of and under the plate.

By reason of the larger diameter of the discharge column the speed of the flow is much reduced and the overflow current is not strong enough to disturb the mercury or amalgam, the sand and concentrates being held in suspension and carried out by the flow. The hopper is not built up to gain pressure, a higher head being considered detrimental. In making the clean-up the hopper is taken off and the receptacle removed, and the idea is to provide extra receptacles and plates, so as to replace immediately those removed from the clean-up. It is recommended that the mercury in the amalgam be retorted to obtain exact results, as in some cases the finest particles of gold are known to pass out with the mercury in wringing. Some of these machines are now in use in California and Oregon.

Mining Laws of Korea.

The Governor-General of Korea has issued new mining laws to supplant those issued in 1906. These have been translated and they consist of 64 articles based on the mining law of Japan. The main feature of importance is that, in the future, foreigners, as individuals, will be prohibited from obtaining mining concessions in the country. The grant of mining interests by the new regulation is to be limited to Japanese subjects or lawful persons established in accordance with Japanese law. Mining rights already in existence and held by foreigners are not to be interfered with. Foreign juridical persons in order to succeed to such rights must become juridical persons established in accordance with Japanese law, and must have their head office in Korea. Priority of application will probably no longer ensure the grant of mining rights, although this is not expressly stated in the ordinance.

In the last fiscal year, ended June 30, according to statistics recently compiled, Alaska shipped through Seattle to the markets of the United States merchandise and precious metals valued at \$65,946,000, of which about \$17,000,000 consisted of gold and silver. The figures for the fiscal year 1916 were double those recorded for 1912.

Silica is, strictly speaking, the only acid refractory substance used. The others owe their acid character to the presence of silica.

Two Kinds of Loyalty from Employees.

LETSON BALLIET.

What we want, and expect, of our employees and workers is loyalty, efficiency, economy and results. We expect them to take proper care of their tools, not to waste supplies, nor time. We expect them to conserve power and powder. We want them to be punctual in starting work. We want them to work until the last minute of their day.

In fact, we even demand it, and penalize or discharge employees for failure to meet our demands.

In return for the above we give them a place to work, specify their tasks, and pay them wages. In most cases we give them full union wages, or the going wage scale.

We destroy the individuality of our employees, at a cost of results that might have been obtained, by specifying their tasks and kick if they accomplish it ahead of time.

Many employees know more about the execution of the work than their employers or bosses. You can hide your appreciation of satisfactory work by an employee—you can claim credit for efficient management on the result of his work—but you cannot conceal his ability from your competitors. Efficiency is so scarce that everybody is willing to pay well for it. Some bosses don't want a man who knows more than they do, and others want the best they can get.

When you fail to recognize the services of an efficient employee, you'll find that someone else will give him a rise in pay for his services. After you have lost his services you'll find the secrets and methods of your own business being used by your competitors.

If your employees are loyal to you, they expect that you will be loyal to them.

The profits of your business are not limited to a "union scale" of profits. You want all the profits that it is possible to get.

Cheap labor is the most expensive. It reduces profits.

Loyalty can be paid for only with loyalty. Ability and loyalty will come to the top, and if you don't pay for it with loyalty and proper compensation, some one else will. You'll find your best men going over to your competitors. It's cheaper to pay what is right than to struggle with incompetent men to compete against able, efficient competition. How many business enterprises would be flourishing today if they had been operated by competent men?

It is better to raise wages of good men than to raise competitors with men you have trained.

To demand loyalty and efficiency is all right—but if you expect to keep it you must give loyalty and remuneration for it.

Nowhere is this condition more apparent than in mining.

The employees know what the mine is working to

accomplish as well as you do. Yet they are hampered with "fool orders" that have exactly the opposite effect from that which was intended.

At one mine I saw an order posted on the bulletin board which read: "Drillers must not tear down, until 15 minutes before quitting time." This order forced the mining company to pay for time, instead of for the work that might have been accomplished in less time. There are a thousand reasons why such an order should never have been posted. Is such an order loyal to a man's ability? No. It simply is an order that states—"We want 8 hours' time for a day's pay regardless of ability."

At another mine I saw an order posted: "Stoppers must put in 16 holes in a shift." In this mine there were places where 20 or more holes could easily have been made by some men, yet no one ever put in more than 16 holes. If something caused a delay, the men shortened their holes, and called for 16 primers just the same, regardless of results to be obtained. In one place the stope opened out, and a new man put in 9 holes, which was amply sufficient to break all that could be broken. The shift boss came into the stope, and the man explained that "9 was enough." The shift boss replied: "I know it, but you had better call for 16 primers when you go to shoot."

In both these cases the individual ability of the men is absolutely destroyed—efficiency is impossible—while the men become mere machines to expend a given amount of energy or time, for a day's pay, regardless of results.

I am not advocating higher wage scales. If the wages were \$100 a day and the same method was employed the result would be no different. I am pointing out the personal equation of the situation, and that if you don't recognize the personal ability of your employees your competitor will. Loyalty of any employee to your interest demands loyalty from you to his interest. If you want results pay for loyalty with loyalty.

Flotation Oils—An instructive booklet has just been issued by the General Naval Stores Co., giving specific information on flotation oils. In this publication the "frothing" and "foaming" properties of various kinds of oils are discussed. Suggestions are given for combining them to produce the proper combination of physical properties to successfully treat a given ore. The book is a summary of the company's observations on oils as applied to flotation, both through letters from operating companies and investigators whose comments were invited and as a result of actual large scale tests conducted at mills in the west. The pamphlet will be mailed to those interested on receipt of request to the company at 175 Front street, New York city.

The electrolysis of solutions containing cyanide only produces cyanates, which have no solvent action on gold and silver.

Notes on Flotation in the Southwest

L. C. PENHOEL.*

The importance of flotation as an adjunct to the concentration of ores is well recognized. Mill designers are now giving the process due consideration and it is important that the flow-sheet be designed to permit good working conditions for the flotation plant. It is true that most of those in the southwest conducting extensive operations in concentration were working with the idea that they were doing good work, long before flotation was introduced or even thought of; and, in these cases, where the installation had to fit the mill, there is excuse for rather poor working conditions.

Time has been short since the general adoption of the process and such companies as Inspiration Con.

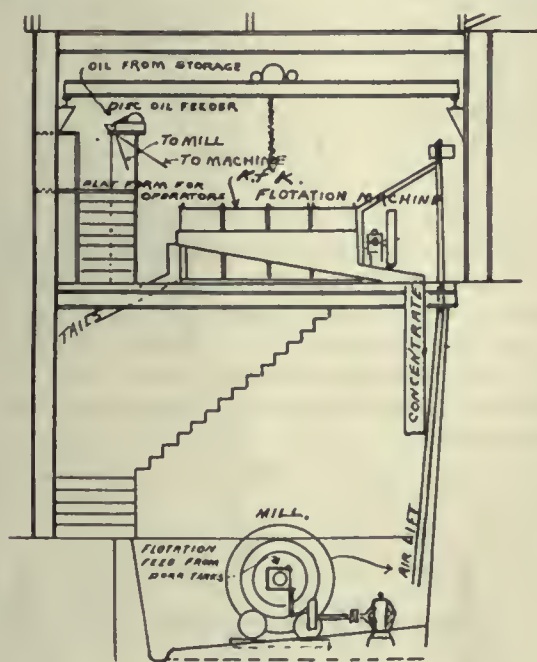
Mountain Mining Co., at Tyrone, N. M., and the flotation annex to the concentrator of the Moctezuma Copper Co., at Nacozari, are good examples. At the latter plant preparations are being made to treat at a considerable profit every 24 hours some 600 tons of material which heretofore went to the creek.

In general these plants use an oil mixture consisting of 60 to 80% coal tar, 10 to 20% creosote, 10 to 20% pine oil, and in quantities of from 0.4 lb. to 4 lbs. per ton of ore.

Insoluble content of concentrates run about 20 to 30%. Sixty to 80 mesh material is about the coarsest size permissible with good extraction. Copper sulphide contents of tailings are reduced to 0.15 to 0.4%.

Naturally, with those who were the first to make concentrates, of which a large part is produced by flotation, some points have shown up that can now be observed and used with profit.

Most important is the mechanical handling of such



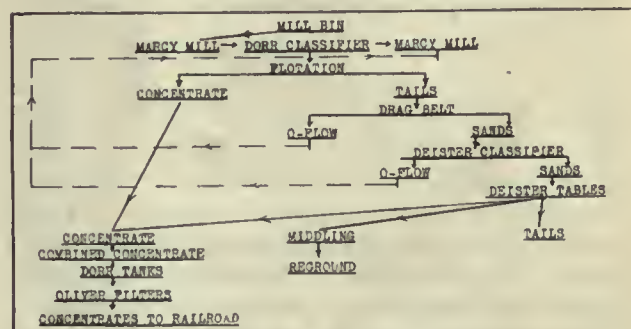
ARRANGEMENT OF THE MOCTEZUMA MILL.

were among the pioneers to build a plant, in which flotation plays an important part. It is well known that this mill is now doing very good work. It has illustrated the case of a low-grade concentrating ore being ground fine, in this instance to 48 mesh, before being treated by a concentrating machine and a good mill-saving being cheaply made.

In the newer mills, flotation has not done away with the vanners, as it was at first thought it would do and in applying it to the flow-sheet, it either precedes or follows the vanners.

Efficiency Being Studied. Mixture Used.

More attention is being paid to raising the general efficiency of the operation, namely, in giving more room and light, also more consideration is given to the feeding of the oils. The new concentrator of the Burro



FLOW SHEET OF INSPIRATION MILL.

concentrates in large quantity. This trouble always begins when the froth leaves the machine and it goes without saying that it is necessary to provide every possible means to insure against choke-ups. In the settling tanks, the trouble grows worse. At Inspiration, they have overcome this trouble in an ingenious way by using Dorr settling tanks.

Dewatering of Concentrates.

The thickened concentrates are best further unwatered by filter press, the Oliver being the one in general use. The product discharged from the filter generally contains from 12 to 18% moisture and it is best to convey it continuously from the filter by belt conveyor. Some precaution must be taken to clean the belt after discharging. Brushes are short lived and are generally replaced by scrapers. Also, scrapers are used on head and tail pulleys to keep the material from building up and causing the belt to run off.

Storage. Bin Designs.

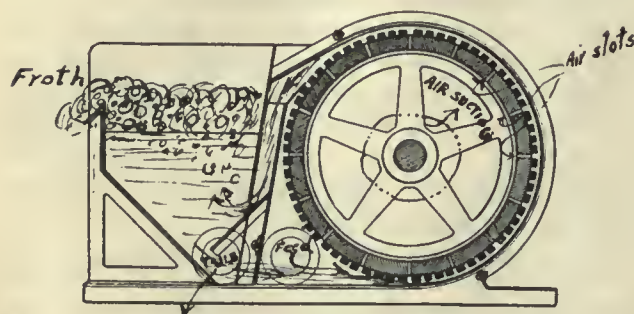
In designing a bin for the storage of concentrates it has been found that, even in a bin with vertical sides

*Southwestern Engineering Co., Los Angeles.

and a relatively large opening in the bottom, the concentrates will pack and arch, so as to give much trouble. One large company has designed a bin of rectangular section wider at the bottom than at the top and fitted with bottom discharge doors, in sections, so that the whole bottom can be dropped. Further precaution has been taken in making the bin small and its capacity will only be 50 tons.

Use of Oils and Reagents. Feeding.

At first, oil mixtures were scientifically concocted by the flotation expert, and, with a combination of five or six different kinds, he, perhaps, would have an "X" mixture which was a secret. With other reagents it was the same way, and it came to be accepted that



THE K. & K. FLOTATION MACHINE.

flotation work could only be entrusted to a trained chemist. Happily, this has all been greatly simplified and the promiscuous use of acids and other reagents, also seeking an oil for every ore, is a thing of the past. For this enlightenment we are indebted to the experimenter. The chemist and physicist have been rather behind in the development of the process. There is no doubt that their efforts will bear fruit and where the reasons are clearly explained, further developments may be expected. It is encouraging that there are some able men, who in their research work are trying to simplify and hold the explanation of a few physical laws.

In feeding oils and other reagents, it is necessary that exact quantities be fed continuously, and as these quantities are small, much trouble has been experienced in devising means to accomplish the results. A visit to the large plants reveals the ingenuity of all hands in this direction.

Types of Machines Introduced.

In reviewing the many attempts made to develop a flotation machine, one can readily see just how little is known regarding the part that the machine itself plays in the operation of producing a mineral froth. There are, perhaps, no operators, large or small, using flotation, who have not, at some time, experimented in the design of a machine. Original ideas were plentiful and the seeming simplicity of the process, when viewing a good flotation operation, gave the idea that any means of violent agitation would bring about the desired conditions. Nothing so far has come from

efforts to produce a machine of the purely agitation type, which promises any more than the original mineral separation machine. Straight agitation has not proved an economical means for introducing air into pulp, and, for the economical working of flotation, as the term is now understood, the aeration of the pulp plays an important part.

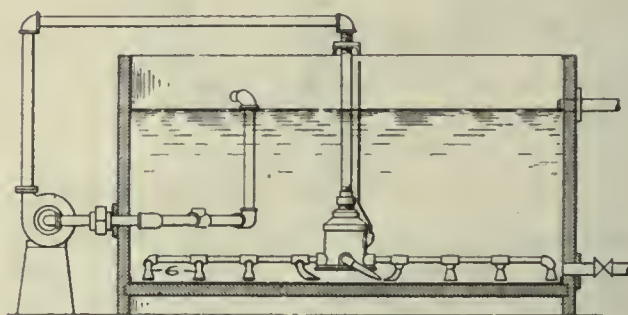
The next machine to come into use was that of the pneumatic type. This requires some pre-agitation to oil the pulp and effects the aeration of the pulp by introducing air under pressure. Several types of this machine are in use. In effecting the aeration of the pulp with this machine, the air is mechanically divided by introducing it into the pulp through some porous medium.

The last machine to be developed is alone of its type, and is known as the K. & K. flotation machine. It effects its results in an entirely different manner. Although it has been in successful operation for almost 2 years, it has only recently been brought to the attention of those interested in flotation.

Amalgamator with Self-Rotating Agitator.

Albert E. Vandercook, of Alameda, Cal., has designed a new form of amalgamator which consists of a tank with a mercury coated amalgamating plate in the bottom and a special agitator operating just above the plate. This agitator has a hollow rotating hub with hollow arms attached and nozzles at the ends of the arms. The illustration shows clearly how they are arranged.

The liquid carrying the finely ground ore and



AMALGAMATOR WITH SELF-ROTATING AGITATOR.

metallic particles is forced down through the arms and out of the nozzles against the amalgamating plate. The reaction of the discharging jets rotates the agitator. A high extraction is insured because the incoming slime is forced into intimate contact with the plate. He has assigned his patent to the California Macvan Co.

Graphite cathodes and anodes have given the best results, as they resist the action of the chlorine and acids better than lead plates, and do not warp with a high-current density.

Actual Costs of Mine Haulage by Horses and by Compressed Air

RAVUL GREEN.*

The following comparisons only apply to mines working under the following conditions: Seams pitching 25° or more; pit cars containing 2 or 3 tons; rails weighing 30 to 40 lbs. per yd.; grades fluctuating but little from 0.46 to 1.00% in favor of the loads; gangways roomy; tracks fairly well kept; curves few and slight.

Compressed Air Haulage.

An average summer month of 1915 was chosen for the test. The output was 33,826 tons, and the number of haulage shifts 19.5. All expense chargeable to haulage, including work done on idle days, holidays, and Sundays, has been allocated to that item. Two hundred* 3-ton steel cars were in use, equipped with 18-in. Hadfield wheels. The gangway was laid with 40-lb. rails. Besides the morning haulage shift, an afternoon and a midnight shift were employed. Only sufficient drivers were occupied on the midnight shift to fill all cars in preparation for the day shift, besides handling such supplies and material as are always needed in a coal mine. These extra hands being chargeable to haulage, tend to increase costs, especially if there are many idle days. All locomotives were of the H. K. Porter standard compound type. The haulage comprised two operations: Firstly, the gathering or loading from the mine chutes, and haulage to a main parting—the trips consisting of some 10 to 20 cars, with 6-ton locomotives; secondly, the haulage of 40-car trips, from the main parting to the tippie approach, by the use of 9-ton locomotives.

The monthly expenses amounted to: Track cleaners, drivers, trackmen, etc., \$2335; power house labor, \$599; material repairs, cars, boilers, locomotives, \$426; coal and other supplies, \$1238; total, \$4598.

In order to obtain an accurate account of depreciation costs, the following items were taken from the equipment ledger: Charges for haulage, \$13,345 (being 50% proportion of \$26,690 cost of boilers, pumps, heaters, and headers); two compressors, \$25,000; eight locomotives, \$28,300; pipe lines, \$12,800; 200 cars, \$30,000; boiler and power house at 50% proportion charging haulage, \$5000; total, \$114,445. Depreciation at 11% per year would equal \$1048 for 1 month. Ton miles handled for the month, 70,260. Cost per ton mile per item: Mine labor, \$0.033; powerhouse labor, \$0.007; material repairs labor, \$0.006; coal and other supplies, \$0.017; equipment 11%, \$0.015; total, \$0.078.

If a full month's run had been realized, that is, if the shipments had reached, say, 41,000 tons instead of 33,000, the theoretical cost would have been \$0.060

instead of \$0.078. However, it is doubtful if this figure would be reached in practice, as it is based on all the costs decreasing in the same ratio as the tonnage increases, which, in this case, is obviously untrue. For example, the mine labor, the material repairs, and the supplies increase practically in the same ratio as the tonnage. Again, the power house and equipment accounts are more or less fixed in their total, whatever the tonnage. Probably \$0.070 would be a very conservative figure to take in such an instance.

Horse Haulage.

The details of conditions under which the test was carried out were: Total tons shipped during the month, 15,573; days haulage worked, 25. The cars were steel framed, wooden boxes, of 2-ton capacity, 18-in. Hadfield wheels; rails, 40 lb. to the yard; tracks in fair condition—no sharp curves; grade quite uniform, averaging 0.5 of 1% in favor of the loads. An afternoon shift of drivers was employed in order to prepare a full string of loaded cars for the morning shift. Good heavy horses were used. The haulage consisted of two operations: First, hauling from the mine chutes by single horses to a main parting; second, hauling from the main parting to the tippie approach by means of a 3-horse spike team, 20 to 25 pit cars composing a trip.

The monthly expenses amounted to: Track cleaners, drivers, helpers, \$884; repairs to cars, etc., \$164. Supplies and attendance on 22 horses totalled \$330. Depreciation charges: For horses this figures as follows, averaging over a period of 5 years: Total horses owned, 83, value \$16,600. Less horses killed, 20, value \$4000; loss on 28 horses sold, \$3560; loss on value of balance, \$3500; total, \$11,600. Loss in five years, 66%, or 13% per year.

Depreciation on horses: 22 horses at \$200 each equals \$4400 at 13% yearly, for one month equals \$48. Depreciation on equipment: 130 pit cars at \$110 each equals \$14,300; stables, stable equipment, tools, \$2966; total, \$17,266. Depreciation at 11% per year equals monthly \$167.

The total monthly expenses are therefore as follows: Labor, \$1048; supplies, \$330; depreciation horses, \$48; depreciation equipment, \$167; total, \$1593.

Total ton miles hauled, 14,450.

COMPARISON PER TON MILE.

	Compressed air.	Horses.
Labor	\$0.046	\$0.072
Supplies	0.017	0.022
Depreciation	0.015	0.015
Total cost.....	\$0.078	\$0.109

The conclusions to be deduced from the above

*Rocky Mountain Branch, Canadian Mining Institute.

facts are that: First, compressed air haulage is about 3 cts. per ton cheaper than horse haulage; second, cost of supplies and depreciation are about the same in each case; third, compressed air permits of from two to three times as much coal (in certain cases probably more) being handled than by horse haulage; fourth, the main reason for lower cost by compressed air is due to the labor item, in this case about 3 cts. per ton; fifth, the total of 7.8 cts. per tons for compressed air haulage could undoubtedly be reduced to 7 cts. for a month of 25 working days.

Six Months' Metal Production of Ontario, Canada.

Returns of production for the first 6 months of 1916, made to the Ontario Bureau of Mines by the metalliferous mines and works of the Province, are summarized in the following table, which also gives comparative quantities and values for the corresponding period of 1915.

	Quantity		Value	
	1915.	1916.	1915.	1916.
Gold, ozs.	173,021	235,060	\$3,570,072	\$4,822,740
Silver, ozs.	11,101,909	10,267,743	5,188,763	6,188,269
Copper, lbs.		77,795		14,368
Cobalt (metallic), lbs.		121,817		103,677
Nickel (metallic), lbs.		13,933		5,899
Molybdenite (concentrates), lbs.		12,631		13,075
Cobalt and nickel oxides, lbs.	141,500	401,408	56,812	204,638
Copper in matte, tons.	8,523	11,426½	1,704,600	2,285,096
Nickel in matte, tons.	15,182	20,651½	7,591,000	10,325,766
Iron ore, tons.	134,077	80,698	288,296	243,268
Pig iron, tons.	225,940	295,349	2,856,040	4,424,496

The production for the 6 months ending June 30, 1916, shows a material increase in value of all metals over that for the first 6 months of 1915, with the single exception of iron ore.

Gold.—If the present rate of production is maintained, Ontario should reach the \$10,000,000 mark for the year, as compared with \$8,500,000 for 1915. Of the total yield the Porcupine camp contributed all with the exception of \$545,434 produced by the Croesus in Munro township, the Rognon near Dryden, the Tough-Oakes at Kirkland Lake, and the Canadian Exploration Co. at Long Lake near Sudbury. The Hollinger Con. and Dome Mines are the big producers of the Porcupine camp. Before the year is out Boston Creek will probably be contributing to Ontario's gold production. Development is proceeding on some of the more promising claims at Kowkash (situated east of Lake Nipigon) on the National Transcontinental railway.

Silver.—Since the beginning of 1916 the price of silver has advanced considerably, the average being 62½ cts., low 56½ and high 77¼ cts. As a result production has been stimulated, and the value as compared with 1915 figures shows a considerable increase. Although the quantity sold was less than for the corresponding 6 months' period of 1915, the total production was greater, over 1,000,000 ozs. remaining to be marketed. Undoubtedly the life of the Cobalt camp will be prolonged as a result of introducing flotation treatment for handling low-grade dumps and slimes. Nipissing still leads in output with a valua-

tion of \$1,766,561. The Mining Corporation of Canada (Cobalt Lake and Townsite City) is the next large producer, followed by Kerr Lake, Coniagas, McKinley-Darrah-Savage, Secena-Superior, etc., in the order named.

Cobalt.—With the outbreak of war the European market for cobalt oxide was suddenly cut off. However, new markets and new uses for metallic cobalt have improved the situation. High-grade steels are now produced from cobalt alloys. Metallic cobalt production is greatly in excess of last year.

Nickel.—Metallic nickel from cobalt ores is produced at the refining works of the Deloro Smelting & Reduction Co., Ltd., formerly known as the Deloro Mining & Reduction Co. The output shows an increase over the 1915 production, which was not marketed during the 6 months' period.

Copper.—Apart from the nickel-copper deposits of Sudbury, there has been a revival of copper ore mining in Ontario, partly due to the high price of the metal. The old Tip Top mine and other properties near Mine Centre, in the district of Rainy River, are now producing. The Rand Syndicate is operating near Timagami. The Sable River Copper Co. at Massey has erected a mill and is using the flotation process for the treatment of copper ore.

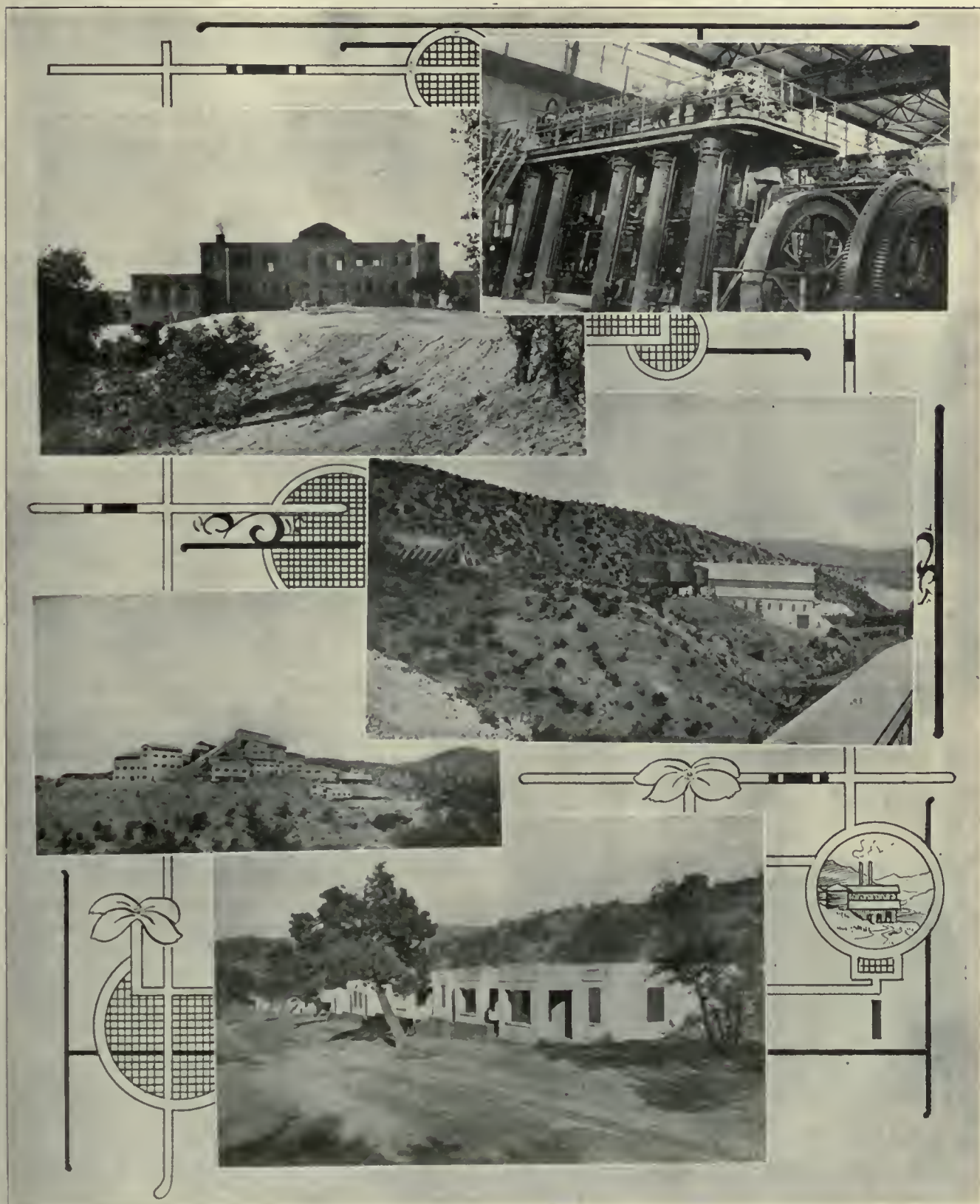
Nickel-Copper Matte.—The smelters of the Canadian Copper Co. at Copper Cliff and the Mond Nickel Co. at Coniston are turning out nickel-copper matte at an unprecedented rate. The production, as compared with the first 6 months of 1915, shows an increase of nearly 40%. The valuation of the metallic contents of the matte has been made on a basis of 10 cts. per lb. for copper and 25 cts. for nickel. The figures given for metallic copper and nickel separately show that the prices were over 18 and 42 cts. per lb., respectively.

In addition to the above mentioned companies the Alexo mine, near Porquis Junction, produces a small amount of nickel-copper ore, which is treated at the Conister smelter.

Molybdenite.—This mineral occurs widely in Ontario, but is mined chiefly in Renfrew county. It is wanted at the present time for use in the manufacture of high speed tool steel, and for this purpose molybdenum will probably replace tungsten to some extent. The demand for molybdenum steel to be used in munition factories comes largely from the allied nations—Britain, France and Russia. Molybdenite concentrates containing 85% or more of MoS₂ are worth about \$1 per lb. Ferro-molybdenum is now (September) being manufactured for the first time in Canada by the Orillia Molybdenum Co. at Orillia, and the Tivani Electric Steel Co. at Belleville.

Iron Ore and Pig Iron.—The only shipments of iron ore were from the Magpie mine, operated by the Algoma Steel Corporation of Sault Ste. Marie. Although iron ore production shows a decrease as compared with the same period in 1915, that of pig iron shows a material increase, both in tonnage and value.

Improvements of Burro Mountain Copper Co.



VIEWS OF RECENT IMPROVEMENTS OF THE BURRO MOUNTAIN COPPER CO. AT TYRONE, N. M.

1. The T. S. Parker Hospital, costing \$75,000. 2. Interior view of power plant equipped with two Diesel oil-burning engines. 3. Exterior view of power plant, which equipped cost \$300,000. 4. The 1800-ton concentrator, representing an outlay, with its equipment, of \$1,000,000. 5. Group of steel-concrete houses for employees; 100 have been completed.

Graphite Development in Burnet County, Texas.

ALVIN STRONG.

The first 50-ton unit of a 200-ton mill for concentrating graphite on the property of the Texas Graphite Co., 11 miles northwest of Burnet, Tex., will soon be in operation. The three other units will be completed as rapidly as the machinery, which has already been ordered, arrives.

Mining will be all open-cut work for a long time to come. The deposit is 400 ft. long, 200 ft. wide,



FIRST UNIT OF TEXAS GRAPHITE CO.'S MILL.

proved to a depth of 100 ft., and is enclosed between perpendicular granite walls running northeast and southwest. The schist in which it occurs runs from 8 to 12% graphite in its crystalline form. It is estimated that 3 weeks' mining will supply sufficient material to keep the mill running for 3 months. It is expected that all four units of the mill will be in operation before the end of September.

The company is a holding one, capitalized at \$100,000, officered as follows: P. B. McCabe, president;



LABORATORY OF TEXAS GRAPHITE CO.

Dan McFarland, vice-president; Jos. Pangle, secretary-treasurer. The plant in full operation will employ 12 mill hands to each unit, while other work will bring the total employed during periods when mining is in progress up to 100. Seventy men are now employed at the camp.

A shaft is being sunk in a ravine which skirts the camp in the hope of securing enough water to run the

mill. In case the shaft does not tap a sufficient supply, tunneling will be resorted to at water-bearing levels. If this fails, a pipe line will be laid to the Colorado river 3 miles away, and water will be pumped to the mill against a head of about 160 ft.

The concentrates from the mill will be shipped to Jersey City, N. J., for refining, a plant being now under construction at that place for this purpose.

California's Mineral Production.

F. McN. HAMILTON.*

The mineral output in California during the year 1915 amounted to \$96,663,369 worth of crude materials. There were 49 different mineral substances, and of the 58 counties in the state all but two contributed some mineral product.

As compared with the 1914 output, the two notable features are the almost startling increases in some of the metals, and the decrease in petroleum, both in quality and total value. The result, however, is a net increase in the grand total value of \$3,348,596 over the 1914 total.

Of the metals, antimony again entered the active list after an absence of several years. Copper increased over 10,000,000 lbs. in amount and \$3,114,192 in value. Gold increased \$1,788,800. Quicksilver increased 25% in amount and more than doubled in value. Tungsten increased from a value of \$180,575 to \$1,005,467. Zinc increased from 399,641 lbs., worth \$26,381, to 13,043,411 lbs., valued at \$1,617,383!

Petroleum decreased approximately 12,000,000 bbls. in amount but the average price per barrel was slightly higher, so that the net results was a decrease in value of \$3,983,272.

California yields commercially a greater number and variety of mineral products than any other state in the United States, and possesses latent possibilities in other items as yet undeveloped. The total annual value of her output is surpassed by but four other states—they being the great coal and iron producers east of the Mississippi river. Of several items, including borax, chrome and magnesite, California is the sole producer. For several years California led all others in gold, petroleum, platinum and tungsten.

Zinc and molybdenite have recently been found in New Zealand. The deposit containing the molybdenum was discovered at Takata and the samples assayed were found to contain 50% molybdenum oxide. Ore declared to be pure sulphide of zinc has also been discovered at Wangapeka, 53 miles from Nelson. The reef is from 4 to 5 ft. wide and the ore is said to run 18% zinc.

The total production of explosives, excluding exports, according to Bureau of Mines figures, was 460,900,796 lbs., as compared with 450,251,489 lbs. in 1914.

*State Mineralogist.

Chicago Meeting American Mining Congress

Carl Scholz, president of the American Mining Congress, speaks enthusiastically of the coming convention which opens Nov. 13.

"As a resident of Chicago I personally urged the congress to hold its convention for 1916 here," said he, "feeling that this is really the center of trade, industry and transportation. Now that the local committees are in the midst of their labors, I find that the selection was in every way ideal. The greatest experts in metal, coal and oil have already promised to be here. The governors of all the states are appointing strong delegations, and it looks as though we would be able to crystallize the sentiment of the entire country on several important issues, notably those of mine-law revision and of added mine safety.

"People generally fail to realize the vast importance of these meetings. Here is where, often, the most important and epoch-making legislation begins. As an illustration, the establishment of the Bureau of Mines was the work of the American Mining Congress. The Federal Trade Commission is in a way the creation of this congress. While the bill adopted by congress differed materially from that suggested by us, it had the approval of Mr. Davies, the first chairman. In fact, it was his prediction that every feature in the American Mining Congress measure would eventually be adopted.

"The American Mining Congress is also the inspiration for most of the distinctive coal and metal men organizations of the country. For it was the American Mining Congress that first brought together the producers of coal and metal so that they were able to work to better ultimate results than heretofore. It was our initiative that brought co-operation in the matter of establishing uniformity of sales terms, uniformity in the preparations for production and, above all, the adoption of more efficient methods of construction in mining. I do not wish to say that the American Mining Congress claims the credit for all these things. But it was at the meetings of the congress that the metal and coal men first met, and at these gatherings was born the determination to work together, to consult and co-operate.

"The advance in metal prices due to the European war has in no way lessened the great work of the American Mining Congress. In fact, many of the papers to be read by experts at the coming convention will deal with this problem of preventing disintegration after the war and a return in mining fields to the lethargic conditions of a few years ago.

"We intend to have an absolutely fearless discussion of the labor question. Col. George Pope, president of the American Manufacturers' Association, has agreed to discuss the subject from his standpoint, and we will have either Secretary of Labor Wilson, or some one as authoritative, reply. Of course in many of the states, such as Ohio, Indiana, Illinois, Iowa and Pennsylvania, contracts govern the mine labor situa-

tion. But in the far west the situation is very different. In fact, it is the purpose of the congress to formulate a plan for labor legislation and regulation on which all sides of the controversy can to an extent agree.

"In the matter of safety work there will be some excellent papers read, and I look for some illuminating discussions. Right into this discussion I hope to have injected some remarks on the necessity of preparedness, for after all in the matter of safety the co-operation of employes is just as essential as safety methods adopted by employes.

"As a matter of fact, 90% of the so-called efficiency is the willingness of the rank and file to accept orders from people who know their business. It has been said that men become machines in the German army. That is far from true. They simply learn what every subordinate should learn, obedience to the man who is directing operations.

"I have just returned from attendance at the Arizona meeting of the American Institute of Mining Engineers. While there I was asked to speak on the essential difference between that body and the American Mining Congress. I told them that I deemed their body the medical adviser of capital, for their business is to advise on investments. And the American Mining Congress is the spiritual adviser to all interests in mining. We take up the problems that all have in common and try to find a solution for them by advocating needed legislation and needed reforms.

"While in Arizona at the convention I took occasion to invite to our gathering J. S. Douglas, the man who discovered what may possibly be the greatest copper mine in the world, the United Verde Extension.

"And this reminds me of one great topic which is coming before the convention of the American Mining Congress, and which no man interested in mining can afford to miss—that is the topic of flotation. To the lay mind that means but little. To the mining man it spells revolution in the matter of mining production. Think of it! By the flotation process they are mining profitably copper ore running 1.8%. This process, which is simply the use of oil bubbles to float crushed ore, has put a value of millions into vast tailing dumps.

"And not alone will the government experts discuss flotation, but the men who are making enormous saving in values wherever there are sulphide ores will be in attendance to tell the world how the simplest of ideas, the affinity of a little foaming oil for sulphide ores, is enriching the world by millions and millions—all of which had previously been washed away or gone up in smoke, or was lying in vast refuse dumps at every mine."

Business Affairs of the Meeting.

"Legislation along several lines of great importance

to the west should command the careful attention of all those interested in the development of the western states," says J. F. Callbreath, secretary of the Congress.

Mr. Callbreath says the convention promises to be the largest gathering of mining men ever assembled in the United States and will offer splendid opportunities for the western states to present their claims before prominent citizens of the east, which can give the congressional support necessary to accomplish the results the west needs. Discussing the various issues now pending before congress, Mr. Callbreath said:

"The next session of congress will have under consideration the Foster bill for revision of the mineral land laws of the west. It will be recalled that a bill for a commission to investigate conditions through public hearings in the western mining centers and make recommendations to congress was introduced by Senator Smoot and passed the Senate, but failed to receive the approval of the house committee on mines and mining. In its stead Dr. Foster, chairman of the committee, introduced a bill intended to meet the requirements without the preliminary work of a commission. This bill was severely criticised by the west and the mining journals. A thorough discussion of the subject will take place at the Chicago convention. Dr. Foster himself will lead the discussion and defend the plan he proposes. The discussion will be lively if the critics of his bill meet him on the floor. A plan for future action will probably be outlined, and a campaign begun to bring about the practical legislation desired.

"The question of whether the senate committee amendment to the Ferris land leasing bill shall prevail is of vital importance to the west. Whether the resources of the west are to pay endless tribute to the national government, through a federal leasing system, or be subject to taxation by the states themselves, concerns directly every taxpayer. It is a question of home rule, with the western industries controlled by those who know them, as against control by a cumbersome agency 2000 miles away.

"The question will probably be finally determined at the next session of congress. The bill has passed the house and it is now before the senate. The senate will probably approve the recommendations of the committee, and unless the west rallies to the support of the senate committee recommendations there is grave danger that the house will refuse its approval.

"These and other important questions will be considered at our Chicago convention in November.

"The proceedings of the American Mining Congress convention this year will be held in sections, of which there will be six, each one devoted to a particular branch of mining activity. This arrangement, introduced into the proceedings of the congress this year for the first time, will enable each delegate to give his attention to the particular branch of the industry in which he is interested. Two entire floors

of the La Salle hotel and several rooms on other floors have been engaged for the convention.

"The question of a compensating tariff duty upon imports of lead, zinc and tungsten ores will occupy a foremost place in the discussions of the lead, zinc and tungsten sections."

New Tests for Molybdenum.

In the March issue of the *Journal* of the Chemical, Metallurgical and Mining Society of South Africa, Dr. James Moir gives some new and sensitive tests for molybdenum. The first relates to the formation of a characteristic blue color which ordinarily appears as a fugitive tint in the first stage of reduction of molybdic acid by nascent hydrogen. The author has improved this test and secures a permanent blue color.

Hydrazine, N_2H_4 , forms in the writer's experience the best reagent for developing the blue color. A solution containing a trace of alkali molybdate when acidified with acetic acid and treated with a little hydrazine sulphate and boiled, rapidly turns deep-blue and retains this color on boiling. Hydroquinone may be used in place of hydrazine with much the same result. An analogous but more remarkable reaction is that obtained when a slightly acid solution of MoO_3 is treated with potassium iodide (in some excess) and boiled for some time: iodine is slowly liberated and the solution turns blue. The use of phenylhydrazine for reducing molybdenum has been described by Spiegel and Maas (*Berichte*, 1903, p. 513), but the reddish coloration obtained is different and seems to contain phenylhydrazine. Simple hydrazine is an improvement.

The best known sensitive test for molybdenum is that in which the acid solution is treated with sulphocyanide and a tiny piece of zinc added, when a crimson coloration is obtained in a few seconds. If iron is also present the solution becomes blood-red on adding the sulphocyanide, but on adding the zinc this becomes colorless through reduction (to the ferrous condition) and after a few seconds becomes crimson if Mo is present. If the solution is strongly acid the coloration verges to red and is less sensitive; if nearly neutral the coloration resembles that of permanganate. It is probably due to $Mo(SCN)_3$. Another modification of the test for Mo in presence of Fe is to add stannous chloride to the acid solution until the yellow color just disappears and then add sulphocyanide.

Another well-known reaction for MoO_3 in the absence of iron consists in adding potassium ferrocyanide. Mineral acid must be present, and a russet-brown precipitate is obtained which still contains hexavalent molybdenum.

In the presence of acetic acid (not mineral acid) tannin (or gallic acid) gives a similar reaction, which has been known for some time. The writer has improved this by substituting pyrogallol or pyrocatechol for tannin. Either of these when added to a molybdic acid solution previously treated with sodium acetate gives a very sensitive orange coloration.

What the Mining Companies are Doing

Rochester Mines Co., Nevada.

The following is the report of the Rochester Mines Co. for the period from May 1, 1915, to May 15, 1916:

Bullion sales and other income.....	\$ 533,186.85
Mining and milling costs.....	433,732.47
	\$ 99,454.38
Administrative and general expense.....	46,807.08
Operating profit	\$ 52,647.30
Interest on notes payable.....	6,895.81
Net profit	\$ 45,751.30
Proceeds from sale of stock.....	92,550.50
	\$ 138,301.99
Deduct sale of stock and impairment of capital.....	113,850.49
Surplus May 15, 1916.....	\$ 24,451.50
Assets—	
Cash in bank, bullion, etc.....	\$ 40,722.27
Prepaid insurance	583.55
Outside investments	550.00
Fixed assets	2,161,742.38
Total assets	\$2,203,598.20
Liabilities—	
Accounts payable, taxes, etc.....	\$ 30,355.70
Capital stock, net worth.....	2,173,242.50
Total liabilities	\$2,203,598.20

Nevada Douglas Con. Copper Co.

The company has issued the following statement of its operations for the fiscal year ending June 30, 1916:

Mining	\$ 54,200.94
Maintenance	2,819.70
Mill operations	19,655.72
Western Nevada operations.....	5,522.96
General expense	9,444.90
Revenues	140,175.82
Operating expense	76,400.60
Net operating revenue from mining operations.....	63,775.22
Accrued taxes	1,500.00
Net income after deducting all operating expense....	11,044.66

Butte & Superior-American Zinc.

J. L. Bruce, general manager for the Butte & Superior Mining Co., is inspecting the properties of the American Zinc Co. in Wisconsin and Tennessee. He will also visit the smelters recently acquired by the American Zinc Co. through purchase from the Granby Co. in Missouri and new properties in the Joplin district.

This inspection trip is preliminary to the announcement of plan on which the Butte & Superior and American Zinc companies may be merged. Both are controlled by the Hayden, Stone and Jackling interests, and the proposed consolidation will give the new company five smelting plants in addition to the most extensive zinc mining properties held by any company in the United States.

Butte & Superior output in August was back to normal, with total ore production, 50,000 tons, from which 14,000 tons of concentrates were produced and 15,000,000 lbs. of zinc in concentrates secured. Recoveries were from 93½ to 94%.

Cost of production increased on account of advance in wages and advance in cost of supplies. This will result in about a 10% reduction in profits over the second quarter. In addition there was a shutdown due to an accident at the shaft that curtailed production. New shafts are rapidly approaching completion, foundations for the new hoist are in, and it is expected to have the hoist in operation by the first of the year.

Miami Copper Co.

Profits approximating \$5,650,000 will have accrued to Miami Copper Co. from operations during the first 9 months of this year—estimating September results. This will be equal to \$7 per share, or more than sufficient to meet a full year's dividend requirements at the current \$6 rate.

Surplus today amounts to about \$5,000,000, which will have been augmented materially by the time the November dividend payment of \$1.50 per share falls due.

Profits for the 6 months ended June 30 totaled \$3,499,000.

It is estimated that profits for the third quarter will approximate \$2,150,000, or 66% of the net for the first 6 months.

Miami has sold itself well ahead at high prices. Although not participating in the big copper sale, Miami has effected sales through the early months of 1917 at prices equaling and in some instances higher than the average to be paid on the big export contract.

The Porphyries.

Production of four of the leading porphyry coppers for August are given in the following tables:

UTAH COPPER.

	1916.	1915.	1914.	1913.
January	11,999,910	8,009,646	10,649,036	7,560,521
February	11,849,972	8,202,467	9,492,898	7,819,900
March	12,714,651	10,203,882	12,704,220	8,504,040
April	14,557,282	12,015,148	13,132,779	9,834,894
May	15,950,215	14,053,765	13,616,993	10,312,695
June	17,877,432	14,730,912	13,268,106	11,637,949
July	20,302,228	14,641,009	13,768,958	9,849,043
August	20,315,440	15,966,543	8,245,520	10,620,981
September		14,159,289	6,672,194	11,817,428
October		16,004,607	7,765,396	10,236,575
November		13,722,723	6,668,049	11,121,078
December		14,497,485	6,795,567	10,762,490

RAY CON.

	1916.	1915.	1914.	1913.
January	4,263,440	4,053,147	5,705,000	3,869,006
February	5,767,087	4,830,553	5,600,000	4,007,918
March	6,379,581	5,579,513	6,223,617	4,422,872
April	6,294,033	5,303,213	6,277,693	4,614,565
May	6,278,611	5,016,048	6,495,719	4,405,217
June	6,598,594	4,205,119	6,226,536	4,392,612
July	6,834,492	4,352,571	2,962,000	2,526,000
August	6,597,032	5,581,734	3,300,000	4,401,566
September		4,997,083	3,180,000	4,470,551
October		5,894,441	3,273,348	4,871,566
November		5,576,083	3,196,457	4,900,994
December		5,725,009	3,126,538	5,232,167

CHINO.

	1916.	1915.	1914.	1913.
January	5,316,975	3,563,618	6,131,840	3,440,274
February	4,617,220	3,722,803	5,769,948	4,018,789
March	6,333,255	4,446,087	5,566,819	4,002,809
April	4,496,270	5,027,548	6,109,888	4,046,813
May	6,359,294	6,442,977	5,666,881	4,067,486
June	7,243,618	6,984,977	5,656,102	3,876,533
July	6,883,403	6,650,429	5,087,750	4,933,325
August	6,326,116	6,640,923	3,165,501	6,650,867
September		5,254,286	2,957,704	4,435,873
October		6,319,194	3,060,000	4,914,844
November		6,939,006	3,047,684	4,402,909
December		6,302,045	2,827,891	4,525,792

NEVADA CON.

	1916.	1915.	1914.	1913.
January	6,157,862	3,069,919	5,791,122	5,169,708
February	6,533,412	3,210,569	4,598,243	4,798,537
March	6,565,559	4,535,192	5,218,227	5,555,320
April	7,716,101	4,710,684	4,880,043	5,650,608
May	7,723,148	5,271,756	4,959,589	5,932,275
June	8,651,772	5,124,480	4,483,175	6,344,863
July	8,537,231	6,292,413	5,477,313	5,403,919
August	7,688,014	6,201,856	3,062,637	5,989,373
September		6,021,850	2,718,471	4,441,671
October		5,880,083	2,801,507	5,898,046
November		5,435,487	2,612,071	5,443,047
December		6,201,247	2,651,658	5,343,862

Isle Royale Copper.

The third quarterly dividend of \$1 per share has been declared by the Isle Royale Copper Co. At the present time Isle Royale is milling the largest tonnage of rock in its history, and, what is equally important, for every ton of rock that goes to the two mills which serve this mine, a ton is placed in reserve. The rock is running about 14 lbs. of copper to the ton.

For some time Isle Royale's refined copper output has averaged over 1,000,000 lbs. per month, so that for the current calendar year the mine's production should exceed 12,000,000 lbs., produced at a cost of not far from 13¼ cts. per pound. This figure includes 1½ to 2 cts. per pound for extraordinary development, new shaft sinking, and other expenses of a similar nature.

There is every prospect that for the current 12 months Isle Royale will earn \$1,500,000 net, or \$10 per share on its 150,000 shares. On Jan. 1 last the company had a surplus of

quick assets of \$400,000, so that as long as the present price of copper holds Isle Royale should be able to maintain quarterly dividends of \$2 per share.

For 1917 the official expectation is a production of 15,000,000 lbs. of copper. Incidentally sales of Isle Royale copper have been made for delivery next April at 27½ cts. per pound.

Hollinger, Ont.

The balance sheet of the Hollinger Con. Mines Co. as of Aug. 11 shows as follows:

Assets—	
Capital assets	\$23,592,270.98
Current assets	687,153.94
Gold assets (estimated)	399,919.98
	<u>\$24,679,344.90</u>
Deficit—	
Dividends paid up to August 11th	\$ 1,200,000.00
Amount due shareholders of Acme, Millerton and C. M. & F. Co.	720,000.00
	<u>\$ 1,920,000.00</u>
Profit from operations Jan. 1, 1916, to Aug. 11	1,697,423.01
	<u>\$ 222,576.99</u>
Assets	\$24,679,344.90
Deficit	<u>222,576.99</u>
	<u>\$24,901,921.89</u>
Liabilities—	
Capital stock issued	\$24,000,000.00
Current liabilities	177,921.89
Unpaid patriotic contribution	4,000.00
Amount due shareholders of Acme, Millerton and C. M. & F. Co.	720,000.00
	<u>\$24,901,921.89</u>

Mining costs during the period mentioned were as follows:

Account.	Total.	Per ton of ore milled.
Exploration	\$ 477.44	\$0.011
Development	20,160.56	.603
Production	77,055.51	1.777
	<u>\$103,693.51</u>	<u>\$2.391</u>

The mill ran 92.7% of the possible running time, treating 43,355 tons. The average value of the ore treated was \$9.61 per ton. Milling costs were \$1.053 per ton.

Goldfield Con., Nevada.

The total production of the Goldfield Con. Mines Co. for July was 26,700 tons of ore, from which resulted the net realization of \$30,016.20. Operating costs are given as follows:

	Per ton ore.
Total mining	\$2.88
Transportation .....	.07
Milling	2.11
General expense .....	.38
Marketing .....	.03
Bullion tax .....	.03
Filter royalty .....	.03
Flotation royalty .....	.05
Surface .....	.04
Total operating costs	<u>\$5.62</u>
Miscellaneous earnings .....	.10
Net operating costs	<u>\$5.52</u>
Construction .....	.11
Net costs	<u>\$5.63</u>

Miscellaneous Company Notes.

Net profits of the Tonopah Belmont Co. for August were \$92,636. Dry tons milled totaled 12,364; 2,232,369 ozs. of gold bullion was produced and 199,445.02 ozs. of silver.

That Anaconda favors the building up of a big cash surplus for future needs is evidenced by its continuing the \$2 quarterly dividend. The present disbursement calls for payment of \$4,662,500. Up to the end of this year Anaconda will have paid out in dividends \$7 a share on outstanding 2,331,250 shares, or \$16,318,750, compared with \$4,662,500 disbursed in 1915 and \$5,838,125 in 1914. Production, which is sold up to end of the year, is running at rate of about 340,000,000 lbs. annually. The company is earning at rate of between \$45,000,000 and \$50,000,000 a year, or well over \$20 a share. Anaconda in 1917 stands an excellent chance to earn

over \$25 a share with copper metal above 25 cts. a pound. This would mean earnings of something like \$100,000,000, or about \$50 a share, in 2 years.

For the year 1915 the Quincy Mining Co. earned between \$20 and \$23 per share. Owing to underground disturbances operations at one shaft were cut down for several months. Barring further hindrances the company should produce about 21,000,000 lbs. of copper during the present year. Dividends were paid during the last two quarters at a rate of \$16 per annum, earned despite curtailment of operations.

Six of the Calumet & Hecla subsidiaries are now paying dividends, where in recent years only Ahmeek and Osceola have been the regular distributors of dividends. Thus far in 1916 the Calumet & Hecla Mining Co. has received \$2,226,908 from its subsidiaries, compared with \$866,776 last year and \$245,322 in 1914. The payments this year equal \$22 per share on Calumet & Hecla stock, which compares with previous high record of about \$9 per share in 1913.

Wolverine Copper Mining Co. is now netting close to \$100,000 a month and will continue as long as copper remains at its present price. Once an extremely low cost producer, Wolverine during the past few years has been experiencing radical fluctuations in the matter of costs owing to the varying copper contents of its rock. At the present time the cost is about 9½ cts. per pound, which covers higher wages and bonuses paid miners and the increased cost of supplies.

The Victoria Mining Co. is at present producing about 130,000 lbs. refined copper per month, which will be very materially increased early this month on the completion of the additional compartment in No. 2 shaft, which has been in course of construction for several months. The new hoist started operations a few weeks ago. Thus far in 1916 calendar year profits average \$13,000 monthly, or about \$1.50 a share per annum, which have been applied to cost of new construction. The company has no debt, with present balance of assets amounting to \$135,000.

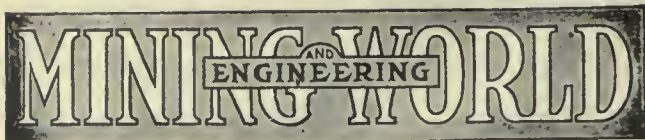
It is expected that Mohawk Mining Co. will show earnings this year of between \$22 and \$23 per share against \$20 paid out in dividends. The last 4 or 5 months of 1916 will each result in net profits in excess of \$200,000, while present indications point to net for the full year of close to \$2,200,000. If Mohawk maintains the record of earlier months of 1916 an excellent showing as to costs for the year will have been established, the outlook now being for an average of about 8½ cts. a pound, including all charges. The company closed its last fiscal year with a surplus of approximately \$300,000, which has not been encroached upon in the payment of two semi-annual dividends of \$10 each.

The Mason Valley Mines Co. offers to stockholders of record Oct. 14, 200,000 shares of stock at \$5 per share, in proportion of two new for three present shares. Stock has been underwritten. Subscriptions are payable on or before Nov. 1, 1916. President Dodge states that the company has acquired the Gray Eagle group of mines in Siskiyou county, California, consisting of 14 patented claims covering about 256 acres. The company is also doing development work on other properties under option. For the 8 months to Aug. 31, 1916, total income of the company was \$12,133 and expenses \$69,710, or a net loss of \$57,576. Current assets on Aug. 31 totaled \$336,772, and current liabilities, \$37,303.

According to present indications Utah Con. Mining Co. will this year make net profits of between \$6 and \$7 per share. This would permit of an extra or increased distribution over the \$3 dividend rate now being maintained. Provided the mine yields for the balance of the year copper and lead at current rate of production of about 1,000,000 lbs. monthly of the former and 1,500,000 lbs. of the latter, Utah Con. will have turned out in 1916 about 12,000,000 lbs. of copper and 18,000,000 lbs. of lead, comparing with 9,000,000 lbs. and 17,000,000 lbs. respectively in 1915. Higher wages and greater cost of materials have naturally been reflected in increased cost of production and the estimated earnings of at least double the present dividend requirements were arrived at after making due allowance in this item. In addition to the income from its own mining operations Utah Con. has an investment in 8250 shares of Anaconda.



DR. JAMES DOUGLAS.



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*Illustrated.

WHO'S WHO IN MINING.

Dr. James Douglas, this week's subject of "Who's Who in Mining," is as responsible as any one man in the country for the wonderful advances made in the treatment of copper. His work, particularly in the hydrometallurgical treatment of copper and other methods for extracting the metal from its ores, places the mining industry in unquestionable indebtedness to his wonderful inventive genius.

Dr. Douglas was graduated in 1858 from Queen's University, Kingston, Canada; was professor of chemistry at Morrin College, Quebec, for a number of years, coming to the United States in 1875 to take charge of the copper works at Phoenixville, Pa. Later he became identified with the copper industry of Arizona. He is president of Phelps, Dodge & Co., the El Paso & Southwestern railroad, the Copper Queen Con. Mining Co., and is connected in various official positions with other copper and industrial corporations.

He is a member of the leading societies and has been honored by their highest offices. As a writer he has several notable works to his credit, and he is also a frequent contributor to mining societies' publications and to the technical press.

September Dividends Largest in the History of American Mining.

When dividends of \$78,772,612 were paid in the 9 months of 1913 by 146 American mines and works it was thought that the zenith had been reached. But this record has been far outclassed by the declarations of 155 companies during the 9 months of 1916. According to reports made to Mining and Engineering World, these companies divided among fortunate shareholders the magnificent sum of \$165,675,300. This is equivalent to nearly 25% of the total dividends paid during the last 10 years. With the exception of 1908, when disbursements amounting to \$32,351,450 were paid during the 9 months' period, dividends have been fairly regular, ranging from approximately \$45,000,000 up.

September proved the most remunerative in point of dividends paid of any single month in the history of the industry, when disbursements totaled \$29,551,869, but \$2,799,581 less than was paid during the first 9 months of 1908. Of the September payments the coppers were responsible for \$17,169,994, the gold-silver-lead-zinc properties \$7,243,744, and the metal-

lurgical companies \$5,138,131. Owing to the fact that a part of the earnings of the securities-holding companies are derived from holdings in other companies, their dividends are not included among those paid by the so-called operating companies included in these reports. The \$4,200,000 declaration of the Kennecott Copper Corporation and a goodly part of the \$3,600,000 of Phelps, Dodge & Co., besides others, could rightfully be added to the total for the copper properties, as these earnings were derived solely from operations of properties directly owned by them.

For a record of achievement by a single industry the performance of American mines and works in the years past is little short of wonderful, for the companies paying dividends in 1916 have made disbursements since their incorporation totaling \$1,236,373,691—this on an outstanding share capital of \$925,428,697. Should the dividends paid in previous years by companies not included in the 1916 dividend payers be added to the above total, we would have a total running well up in the billions.

Of the \$165,675,300 paid during the 9 months of 1916, the coppers contributed practically one-half, or \$80,763,234, with 38 companies participating. To date these 38 companies have enriched shareholders to the extent of \$651,833,960, on an issued capital of \$346,146,618.

Owing to the close relationship of the four metals, gold, silver, lead and zinc, dividends paid by companies operating this class of properties are classified under the one head—gold-silver-lead-zinc. One hundred eleven of these properties were not so far behind the coppers, for they divided among shareholders \$66,503,509. To date these companies have disbursed \$369,412,804, on an issued capitalization of \$307,970,039.

Of the 111 companies mentioned above 85 operate properties in the United States, and during the 9 months of 1916 paid dividends amounting to \$55,720,525, and since incorporation \$282,847,294 on a \$196,644,778 outstanding share capitalization. Twenty-one are Canadian properties, with \$7,519,355 for the 9 months' period and \$67,831,042 to date. But three Mexican companies report dividend payments in 1916—these paying \$1,043,629.

The six metallurgical companies had the best 9 months' period in their history, dividing among shareholders \$18,408,557. To date these companies have paid dividends totaling \$212,066,927, on an outstanding share capital of \$270,003,040.

Eight securities-holding corporations have had a remarkable 9 months' period, for they divided among shareholders no less than \$37,973,081. To date these companies have to their credit \$155,424,205 in dividends.

The following is a list of companies paying dividends in September with the date of payment the amount per share and the total amount paid. For dividends by these companies in previous months and

by companies paying dividends prior to 1916, see tables published elsewhere in this issue:

	Sept.	Amt. per share.	Amount paid.
American Sm., pfd.....	1	\$1.75	\$875,000
American Sm., com.....	15	1.50	1,000,000
Argonaut, Calif.	25	.07½	15,000
Big Four Expl., Utah.....	4	.05	20,000
Bunker Hill Con., Calif.....	4	.02½	5,000
Bunker Hill & Sullivan, Idaho.....	5	.40	163,500
Butte & Superior, Mont.....	30	6.25	1,813,741
Caledonia, Idaho.....	5	.03	78,150
Calumet & Arizona, Ariz.....	25	2.00	1,283,846
Calumet & Hecla, Mich.....	22	20.00	2,000,000
Cardiff, Utah.....	19	.25	125,000
Centennial, Mich.....	1	1.00	100,000
Center Creek, Mo.....	1	.15	15,000
Cerro de Pasco, Peru.....	1	1.00	666,667
Cerro Gordo, Calif.....	23	.02½	25,000
Champion, Mich.....	8	6.40	640,000
Chino, N. M.....	30	2.25	1,957,455
Copper Range, Mich.....	15	2.50	895,102
Cresson, Colo.....	10	.10	122,000
Dome Mines, Ont.....	1	.50	200,000
Federal M. & S., pfd.....	15	1.00	120,000
Gemini, Utah.....	6	5.00	25,000
Golden Cycle, Colo.....	10	.02	30,000
Grand Gulch, Utah.....	9	.03	7,195
Hecla, Idaho.....	20	.15	150,000
Hedley, B. C.....	30	.50	60,000
Hercules, Idaho.....	20	.20	200,000
Hollinger, Ont.....	8	.05	240,000
Homestake, S. D.....	25	.65	163,254
International Nickel, com.....	15	1.50	2,510,076
Interstate Calahan, Idaho.....	30	1.50	697,485
Kennecott, Alaska.....	30	1.50	4,200,000
Kerr Lake, Ont.....	15	.25	150,000
Lucky Tiger, Mex.....	20	.08	57,227
Magna, Ariz.....	30	.50	120,000
National Lead, com.....	30	1.00	206,554
National Lead, pfd.....	15	1.75	426,501
National Z. & L., Mo.....	30	.05	25,000
Nevada Con., Nev.....	30	1.00	1,999,457
Old Dominion (holding).....	29	3.00	880,059
Old Dominion M. & S., Ariz.....	29	3.00	486,000
Oroville Dredging, Calif.....	29	.12	83,413
Phelps, Dodge & Co.....	30	8.00	3,600,000
Prince Con., Utah.....	5	.05	50,000
Quincy, Mich.....	25	4.00	440,000
Ray Con., Ariz.....	30	.75	1,178,469
St. Joseph Lead.....	20	.75	1,057,098
St. Mary's, Mich.....	18	2.00	320,000
Seneca-Superior, Ont.....	15	.30	143,665
Standard, B. C.....	14	.02½	50,000
Superior, Mich.....	30	1.00	100,000
United Globe, Ariz.....	30	18.00	414,000
United Verde, Ariz.....	1	1.50	450,000
Utah Apex, Utah.....	30	.25	132,054
Utah Con., Utah.....	2	.75	225,000
Utah Copper, Utah.....	30	3.00	4,873,470
Yak, Colo.....	30	.07½	70,000
Yellow Aster, Calif.....	6	.02	2,000
Yellow Pine, Nev.....	25	.10	100,000
Yukon Gold, Y. T.....	30	.07½	262,500

In the United States District Court, Wilmington, Del., Judge Bradford filed an opinion in the case of the Minerals Separation Co., Ltd., a corporation of Great Britain, vs. Miami Copper Co. Suit was brought for alleged infringement of three United States letters patent for processes relating to ore separation. Three claims of patent number 835,120 were in suit and of these, two were sustained by the court, and held to be infringed by defendant; while the third was held to be invalid as being too broad. Several million dollars are involved in the suit. In reply to an inquiry an official of the Miami Co. states that the decision only affects a comparatively small additional saving that is made by flotation as the bulk of its recovery of copper is by table concentration. Counsel for the company are confident that the decision will be reversed by the higher courts.

On another page of this issue will be found an interesting description of Cripple Creek mine operations, which include the driving of the great Roosevelt tunnel. This latter work is being carried on quietly and without any of the usual trumpeting following such an immense undertaking, but its completion will be of untold value to the mines benefited, principally doing away with heavy unwatering costs.

PERSONAL.

E. A. Austin, mining engineer, Flat City, Alaska, is now in Jarbidge, Nev.

Mark L. Requa, mining engineer, San Francisco, has recently returned from Alaska.

W. D. Abel is now superintendent of the Three R. Mining & Milling Co., Patagonia, Ariz.

P. S. Gray has joined the engineering force of the Winona mine in the Michigan copper country.

T. W. Duncan, San Francisco, is in Deadwood, S. D., examining properties for English capitalists.

J. S. Coupal, mining engineer, Boston, is on his way to Peru, where he will examine gold properties.

Sherman B. Eaton, mining engineer, is engaged in magnetic survey work in the Lake Superior country.

C. F. Williamson, former mining engineer with the Cananea Con. Copper Co., Mexico, is now in Reno, Nev.

J. L. Head, mining engineer, recently of Flat River, Mo., is now with the Calumet & Arizona Co., Warren, Ariz.

H. B. Barling, mining engineer, New York, has returned from a professional trip to several of the western states.

Howard D. Smith, mining engineer, San Francisco, has returned recently from a trip to New York and London.

Edwin R. Eaton, mining engineer, New York, is installing a mill on a manganese property at Sugar Grove, Va.

Alden H. Brown, mining engineer, 115 Broadway, New York, will leave shortly for Russia on mining investigation.

W. H. Staver, mining engineer recently in Ophir, Colo., has moved his offices from Lynchburg, Va., to Washington, D. C.

Wilson W. Hughes is now superintendent of the Monitor Belmont Mining Co. He was formerly at Guanajuato, Mexico.

A. J. Fasbinder, a construction engineer formerly in Tampico, Mexico, is now at Homestead, Pa., with the Carnegie Steel Co.

Elmer E. Bray, mine operator with headquarters in Los Angeles, is in New York City in the interest of western properties.

R. E. Cranston, mining engineer, San Francisco, has been appointed consulting engineer for the Mining Associates, Ltd., Salida, Colo.

Ralph Meyers, mining engineer, Philadelphia, is making an examination in the Porcupine district, Ontario, for New York interests.

Thomas Stroup, formerly in the engineering department of the Tennessee Copper Co., is now with the Utah Copper Co., Salt Lake City.

Frederick Hellman, consulting mining engineer, Chuquicamata, Chile, has been appointed consulting engineer for the Guggenheim interests.

A. T. Sweet of the class of 1916 of the Michigan College of Mines has been appointed instructor in the metallurgical department of that college.

Hector F. Escardo and William Bull, mining engineers Peru, are in this country and have been investigating method in the Butte district, Mont.

H. J. Kroll, mining engineer, accompanied by his father, F. W. Kroll, is making an auto trip from Houghton, Mich., to Lordsburg, N. M., where his brother, F. A. Kroll, is chief

engineer for the Eighty-Five mine. Mr. Kroll will take up engineering work.

C. H. MacDowell, vice-president of the Mineral Products Corporation, Marysville, Utah, has been inspecting the properties and is now in Salt Lake City.

L. O. Howard, former superintendent of the Old Dominion smelter, Globe, Ariz., is now superintendent of the International Smelting Co.'s smelter at Miami, Ariz.

Joseph Jensen, formerly a mineral inspector in the service of the U. S. General Land Office, is now assistant professor of mining at Carnegie Institute, Pittsburgh, Pa.

V. V. Kelsey, engineer and geologist for the Clinchfield railroad, Johnson City, Tenn., was in charge of the railroad's mineral exhibit at the chemical exposition in New York City.

Kirby Thomas, mining engineer, New York, and R. S. Knappen of the Columbia University have concluded an investigation of manganese deposits in the Santiago region of Cuba.

J. William Knight, recently appointed general manager of Rico Wellington property at Rico, Colo., has recently been visiting the mine and has returned to his headquarters in Salt Lake City.

Arthur K. Adams, formerly mining geologist for the Mascot Copper Co., Dos Cabezas, Ariz., has left for Chile, where he has accepted a similar position with the Andes Copper Co.

Walter A. Barrows, Jr., consulting metallurgical engineer, Brainerd, Minn., has been elected president and general manager of the Thomas Iron Co., Easton, Pa., to succeed Ralph H. Sweetser.

A. E. Carlton, president of the Cresson Con. Gold Mining Co., Cripple Creek, Colo., and affiliated with many other companies of the district, has been appointed a trustee of the Colorado School of Mines.

M. A. Rowan, mining engineer for the coal properties of the Chicago & Eastern railroad, is temporarily located at Clinton, Ind., where he is engaged in opening the old Klondyke shaft in the No. 4 vein. He is also preparing to sink a shaft west of it to the No. 5 vein.

W. B. Milliken, who recently returned to Denver, Colo., from Nicaragua, Central America, has opened an office in McPhee building, that city, as metallurgist and mining engineer. Mr. Milliken and H. E. Fredericks, Denver, own the Linda Ventura mine, some distance interior from Bluefields, Central America.

A. T. Holman, formerly superintendent of the Vindicator and Golden Cycle mines, Cripple Creek district, Colorado, goes to Nicaragua to become superintendent of the Linda Ventura mine, out from Bluefields; and Geo. F. Bridger, formerly at Guanajuato, Mexico, goes to the same property as mill superintendent. The Linda Ventura is owned by W. B. Milliken and H. E. Fredericks of Denver.

OBITUARY.

Will A. Childs, for many years superintendent of the Hecla & Torch Lake railroad, which carries the rock from the mines at Calumet to the mills at Lake Linden, died at Calumet, Mich., Sept. 26 after an illness of over a year. Mr. Childs was born at Constable, N. Y., Oct. 14, 1844, and after a 3-years' service in the Union army, from which he was discharged with the brevet of captain, and a year's attendance for a business course at the old Detroit University, he entered the employ of the Calumet & Hecla in 1866 and consequently was in its service for a little over 50 years, being the second oldest in its force and a recipient of a gold medal in July for his long, able, and faithful performance of his duties. He was Judge of the Probate Court 1872-1880, for 6

years captain of the Calumet Light Guard, and a director of the Merchants & Miners' bank since 1874.

Henry M. Mosher, a well known lease operator in the district surrounding Idaho Springs, Colo., died in that city on Sept. 17, 1916. He was born in Brazil in 1887 and came to Colorado in 1907, where he first located at Central City and later Idaho Springs. The principal property which he operated was the Lake mine, which in a little over 2 years produced something over a half million dollars.

William G. Ramsey, vice-president of the du Pont Powder Co. and chief engineer of its construction department, died Sept. 28 after a brief illness of pneumonia. Major Ramsay built many explosive factories throughout the country and recently was engaged in the construction of a plant in Montana, which will be named Ramsay, in his memory. He was about 55 years of age and was prominent in the business and in military interests in Delaware. During the Spanish-American war, he served as a major in the United States army. He was keenly interested and held various offices in the Delaware national guard and was prominent in various rod and gun clubs.

SCHOOLS AND SOCIETIES.

Exposition of Chemical Industries.—The Second National Exposition of Chemical Industries was held at the Grand Central Palace, New York City, last week. The feature of the exposition was the unusually large number and variety of the exhibits. Among the exhibitors were the following: Hardinge Conical Mill Co., Kelley Filter Press Co., Eimer & Amend, the Dorr Co., Sweetland Filter Press Co., Abbe Engineering Co., Foote Mineral Co., Huff Electrostatic Separating Co., Mine and Smelter Supply Co., Raritan Copper Works, Roessler & Hasslacher Chemical Co., Ruggles-Coles Engineering Co., and the Westinghouse interests. The United States Bureau of Mines was also well represented. A series of moving pictures was presented which showed how the raw products are produced, how iron ore is mined, the process of zinc mining, milling and smelting and the mining and extraction of radium.

NEW PUBLICATIONS.

Triangulation and Primary Traverses in the Various States. Washington, D. C., U. S. Geological Survey. Bulletins.

Separate bulletins for each state and in some cases groups of states are now being gotten out by the U. S. G. S. They contain the location and necessary survey data with respect to U. S. G. S. triangulation stations.

Mica in 1915. By Waldemar T. Schaller. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. II:21; pp. 13.

The condition of the industry during the year, production, properties of mica, occurrence, uses, prices and imports during the year are considered under separate headings for the United States. Briefs are given on the foreign mica industry in Canada, Brazil, Korea, China and India.

West Virginia Geological Survey County Reports, 1916. By Charles E. Krebs, D. D. Teets, Jr., and I. C. White. Wheeling, W. Va., State Geological Survey. Report 1916; pp. 778; illustrated.

This is the usual annual report which has been published for the last several years. A complete set of maps is included with the report, there being separate geological and topographical maps for both of the counties reviewed in the report. The entire area of Raleigh county and western portions of Mercer and Summers counties are in the area described. Part I is on history and physiography of the dis-

trict; Part II, geology which is mostly stratigraphy of the coal and other formations; Part III, mineral resources which are principally prospecting for oil and gas and the production of coal; and, Part IV, paleontology.

Mineralogic Notes. By Waldemar T. Schaller. Washington, D. C., U. S. Geological Survey. Bulletin 610; pp. 164; illustrated.

For the greater part the information herein contained is of a highly theoretical nature. The contents were assembled from the results of independent research by the author the work having been confined to uncommon minerals of no economic importance but of considerable importance to the crystallographer and mineralogist.

Sensitiveness to Detonation of Trinitrotoluene and Tetranitromethylanilin. By Guy B. Taylor and Willard C. Cope. Washington, D. C., U. S. Bureau of Mines. Technical Paper 145; pp. 13.

The investigations of these explosives were carried on with respect to their use in blasting caps to supersede the long used fulminate of mercury. The text discusses the nature and property of these explosives and describes both the results and methods used for testing the explosives.

Triangulation and Primary Traverse in Texas. By R. B. Marshall. Washington, D. C., U. S. Geological Survey. Bulletin 644-P; pp. 77.

Data is given on the triangulation stations established from 1913 to 1915. The information is given in tabulated form, there being a separate table for the stations in each quadrangle in the state. The azimuth and back-azimuth or latitude and longitude are given, as also are distances. The different quadrangles are arranged according to counties and only as much descriptive matter is contained in the bulletin as is necessary for locating the triangulation station.

Upper Ordovician Formations in Ontario and Quebec. By A. F. Foerste. Ottawa, Ont., Canada Geological Survey. Memoir 83; pp. 279.

In going over the formation of this era complete descriptions are given of the various formations as noted at their horizons in different localities. Though the work is of little direct economic importance it is of the greatest importance as regards the studying and nature of formations and further interest of value in this memoir is that it has aided greatly in correlating formations in other districts as to their geologic succession.

Report on the Pipe-Line Transportation of Petroleum. Washington, D. C., Federal Trade Commission. Report; pp. 467; illustrated.

In accordance with a resolution of the U. S. Senate directing that an investigation be made into Oklahoma oil prices, transported by interstate lines, this report was written. In carrying out this work most of the lines in the district were reported on as regards the cost of construction and method of the same in detail for each line separately, also the cost and method of organization and operation. Details as regards the earning power of the different lines are given in reviewing the operations and finances of the various companies operating in the district.

Mineral Resources of Alaska. By Alfred H. Brooks and others. Washington, D. C., U. S. Geological Survey. Bulletin 642; pp. 279; illustrated.

This report is on investigations made during 1915 and reviews for the greater part progress made by operating, producing and prospecting companies. Different sections are covered by different authors, but the text of each report is similar in nature and each contains a geographic map of the area covered. Besides reviewing production and operations of different districts an account is given of the coal-land leasing laws as well as a reprint of the exact laws. Water power investigations made in southeastern Alaska during the year are also covered in a separate chapter and a complete index of the entire bulletin is included.

TRADE PUBLICATIONS.

Moulded Electrical Insulations and Sundry Composition Goods. Dickinson Mfg. Co., Springfield, Mass. Catalog No. 7; pp. 22; illustrated.

Different forms of electrical insulating devices of different compositions are listed. Brief descriptions are also given and accompanied with illustrations.

Tools for the Builder and Mechanic. L. S. Starrett Co., Athol, Mass. Catalog No. 21; pp. 336; illustrated.

In general the catalog needs but little explanation, as what is included under measuring instruments for the mechanic is so well known. The line of tools contained is very complete and accompanied with a good index. Each tool considered is illustrated, briefly described and the prices given.

The Campbell System of Magnetic Separation. Zinc Concentrating Co., Boston. Booklet; pp. 8; illustrated.

This system of magnetic separation is stated as being of special value in the treating of zinc, iron-sulphide ores and table middlings. In the form of an article the system is briefly described in its different departments and specific data on results obtained through its use in the field are given, while the concluding pages review operating costs of the system.

Brass, Lead, Tin and Copper-Lined Pipes and Fittings. United Lined Tube & Valve Co., Boston, Mass. Booklet; pp. 24; illustrated.

The construction, description and prices of different kinds of pipe and fittings, manufactured by the company, are given, with sectional views where necessary to show the construction of the equipment. Acid-proof valves, pipe, etc., are spoken of, with particular reference to acid mine waters, leaching plant solutions, etc.

Testing Machines. Tinius Olsen Testing Machine Co., Philadelphia, Pa. Booklet; pp. 31; illustrated.

Illustrations are given of the machines made by this company for the testing of materials, principally structural, to ascertain their strength and other physical properties. Machines for the testing of different properties of concrete, steel, wood, etc., are included. An illustration is given of each machine and is accompanied with a brief description on the use and in what sizes the particular machine may be obtained.

Cast Iron Pipe. Central Foundry Co., New York. Catalog and Booklet; pp. 24 and 14; illustrated.

The catalog is practically confined entirely to illustrations, though some brief descriptions are given as well as complete tables of details for each class of pipe and style of pipe-fitting, such as bends, elbows, tees and crosses, etc. The line of pipe and pipe-fitting, however, is complete. The booklet, "Universal Pipe in Service," gives various views and short descriptions of both mine, plant and various other installations using the company's pipe.

Oxy-Acetylene Welding and Cutting Equipment. The Turner Brass Works, Sycamore, Ill. Catalog W. 303; pp. 16; illustrated.

Besides the catalogued equipment contained a concise discussion is given regarding this company's particular equipment and oxy-acetylene equipment in general. Tanks, torches, burner tips, regulators, gauges and complete outfits in wooden cases are included in the catalog section. In the concluding pages illustrations are shown of difficult welding jobs which may be easily accomplished by oxy-acetylene welding.

Boiler Tube Cleaners. The Lagonda Mfg. Co., Springfield, Ohio. Catalog L-9; pp. 36; illustrated.

Ordinarily one page is confined to the illustration and description of the construction, operation and uses of the different kinds of cleaners and sundry other equipment. The

first few pages, as a preface, takes up the subject of boiler-tube practice in a general way, including a description of the Lagonda cutter-head. Water-driven cleaners for boilers and turbines are described in several different styles, as also are types driven by compressed air or steam. Besides this several types of special cleaners and other miscellaneous equipment and repair parts are given consideration.

Texaco Crater Compound. The Texas Co., New York. Booklet; pp. 31; illustrated.

This booklet tells the story of the Texaco Crater compound for lubricating and it is stated that the compound is a straight heavy lubricant containing no filter substances. The nature and features of the oil and what class of service it is most adaptable to is brought out. It is claimed that the lubricant may be used as a preservative for hoisting and other wire ropes as well as a lubricant of machinery, and practical applications of its use in the field are described briefly for different cases. The importance of lubricating wire rope is spoken of and among other subheads are "How Crater Prevents Wear" and "How Crater Prevents Corrosion."

INDUSTRIAL AND TRADE NOTES.

Carney Hartley, M. E., 318 Colorado building, Denver, recently took over the intermountain agency for Julius Blum & Co., New York, dealers in steel, bronze, copper, brass, nickel and other metals, for shops and mines. This line includes drill steel.

The Denver Rock Drill Mfg. Co., Denver, has built a 100 by 125-ft. addition to its shops in which new machinery and equipment are being installed. This additional floor space and new shop equipment will result in increasing the company's drill-making capacity between 40 and 50%.

The Denver Quartz Mill & Crusher Co., Colorado building, Denver, reports many sales and installations of its mills in all sections of the mining country. Jos. S. Bartley, manager of the company, states that 1916 is the best year the company has experienced and he anticipates a still better season for 1917.

The Mine & Smelter Supply Co., Denver, recently sold two 6 by 4½-ft. Marcy ball mills to the Missouri Cobalt Co., Frederickton, Mo., and has an order from Allis-Chalmers Mfg. Co. for 30 No. 6 Wisley concentrating tables for export. Among the sales of Marcy mills made this year were 15 of these machines to the Braden Copper Co., for its mills in Chile, S. A.

The Vasco concentrating mill, built and equipped at Stevens camp, Boulder county, Colorado, by Hendrie & Bolthoff Mfg. & Supply Co., Denver, has operated 60 days and demonstrated its adaptability to treating tungsten ores. It is so arranged that the flow-sheet may be altered as required for different grades of ore. The fine concentrates are made by 6 Card tables, manufactured by this company.

Morse Bros. Machinery & Supply Co., Denver, has shipped from its yards and warehouses over 200 cars of mining machinery since January 1, 1916. These shipments have been distributed to all the mining states and to other countries. A recent shipment outside of the United States, consisted of a McDougall roaster to Cuba. All this is evidence of the activity in mining and the consequent demand for equipment.

The Western Electric Co. has moved its offices and show rooms in Buffalo from 98 Terrace to 709-711 Main street. The new location with two large show windows fronting on as many streets affords splendid display facilities. The full line of Western Electric quality products will be carried and the high standard of service that marked the company's business at the old office will be strictly maintained at the new. J. W. Tabb is the manager.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Juneau.

According to E. Renfer and Charles Renfer, who have been going over the Broad Pass country, they have recently made a good strike on a quartz vein after spending several months in the district. The strike is along Ohio creek, and of such proportion that it will be worked on a very large scale as soon as the railroad is constructed. The location is about 7 miles from the railroad and it will be a simple matter to haul freight from the railroad. The ledges are exposed for hundreds of feet and contain gold, silver and lead.

Miller & Co., who have been working in the district for a distance of 200 ft., have been able to trace the same ledge which appears on the surface. Representatives of the Rockefeller family are in the district now, investigating some property which is owned by Dr. J. H. Callie, of the coast. There are about 20 men in the district now, prospecting and doing assessment work.

Valdez.

The latest assays from every face in the Granite Co.'s property are good and show increases, according to reports of President B. F. Millard. Assays show on the "hoist level" 10 ins. of \$71.10 ore, 8 ins. of \$295.58, and 14 ins. of \$166.19. Some of the richest ore ever found in the mine is now in the face of the hoist level. This also holds good on the 210 level. We are getting high grade ore there, and have had a continuous pay shoot for 250 ft. On the 350 level we are getting \$4 ore. Starting at 50 cts., it is getting better all the time as we go in, and I believe when we get over to catch the shoot of rich ore on the 210 level we will have it as good on the 350. The average of the 210 level for month of August was \$16, and the vein averages 38 ins. wide. The hoist level on the granite side is showing up rich. We followed the fault on the slate end of 350 level 80 ft. to the right and picked up the vein with milling values. This gives us pay ore on three levels and no doubt it continues from one level to another. I still hold that our best ore will be found going into the granite and perhaps on the upper side of the dike. We have had trouble getting good miners and had to fill up with black men, but after sorting out we have a fair crew.

Developments at the Black Diamond group are encouraging and plans are now being made to operate through the winter. The Black Diamond claims cover two veins. One of them is the same that runs through the Three-in-One. The other is a parallel vein several hundred feet away. Both of the veins have been traced the full length of the claims. The property has been located for several years, and considerable development work has been done. This work has demonstrated that the ore in the lead crossing the Three-in-One carries the same values on the Black Diamond as in the former property. On the parallel vein, where the work is at present being done, it has been demonstrated that this vein carries ore equally as rich as the other.

The development work now in progress is in charge of Frank Kempfer and he expects to have the property sufficiently developed by spring to warrant the erection of a mill.

ARIZONA.

Oatman.

Development of the past few weeks by the Tom Reed Mining Co. point to the possible development of a second mine equal to its main or Ben Harrison mine, which has al-

ready enabled the company to pay almost \$3,000,000 in dividends. The company owns 477 acres, and its main mine covers about two claims. Some three-quarters of a mile to the southeast of its main shaft, on the Black Eagle claim, an exploration shaft was put down 600 ft. and a big vein of fine mill ore opened on several levels. Another shaft was then started some 600 ft. to the northwest of this shaft, and at 400 ft. tapped the vein, and at this time the ore shoot is at least 18 ft. in width, showing average values of \$14.67 in free-milling gold. Exploration work has given results which cause the officials to believe that the ore shoot is continuous from the new shaft, which is on the Aztec claim, to the extreme southeastern limits of the Black Eagle, a distance of several hundred feet. Indications seem to favor this section of the lode upon which Tom Reed is located, developing into a mine of importance equal to the old main workings. In the main workings ore is being stoped on several levels, and on the 1400 drifting operations are entering what appears to be the downward continuation of the main ore shoot worked on the upper levels.

Big Jim is now upraising from the 400 level in order to ascertain just how high the ore shoot first opened on that level extends upward. Splendid ore is being developed.

Nellie, in the Black Range section, has just cut a station at the 350 level, and has opened a body of the typical green. adularia-quartz which is the mineral carrier in the Oatman ores. The development has caused much excitement, although not enough work has been done to prove the importance of the find.

The Adams shaft in the same section is now down 275 ft., and a change of formation has been encountered which is significant. The company expects to enlarge its working force within a few days. No lateral work will be done until a depth of 400 ft. is attained.

The Gold Dust, in a winze from its second level, 800 ft. to the northwest of the shaft, has opened an ore body 14 ft. in width, and averaging \$12. The company has 50,000 tons of pay ore blocked out. The old Orion mill, on this property, is the scene of experiments with a new amalgamating device which gives centrifugal agitation of pulp and amalgam, and it is claimed that a very high saving is being effected, and that treatment cost is very low. If the test continues successful, the mill will be equipped for a large production.

The Gold Ore Co. is said to again be considering the erection of a 30-ton mill, and its officials are manifesting much interest in the experiments at the Gold Dust property.

The Lucky Boy Co. is preparing to resume operations. The Esperanza will resume shortly, as will also the Lazy Boy.

The mill of the United Eastern is now more than 60% completed, and is being rushed by a big force of workmen. Before the end of the year the United Eastern should enter the productive list.

The Gold Range Co. has negotiations for refinancing and the resumption of operations well under way.

United Northern, at a depth of 500 ft., is entering formation which causes Engineer Goldsworthy to anticipate important news within a few days. It is highly oxidized, heavily impregnated with hematites and carries good values.

Oatman United plans to resume extensive operations within 30 days. Others which will soon probably be operating again are the Lucky Sam, Arizona Gold Star, Times and Telluride.

Pictured Rock at a depth of 250 ft. appears to be driving into the hanging wall of its vein. Steady and favorable operations are in progress on the North Star, Oatman Amalgamated, Sun Dial, Black Range, Jerome Oatman, Oatman

Gold Mining & Milling, Arizona Central, Chicago Syndicate, Wrigley Exploration, Oatman Belle, and a number of others.

Tuscon.

Oro-Belle directors held a meeting last week in Michigan and called a meeting of the stockholders here Oct. 20, to ratify the agreement made recently with John Hays Hammond's representatives whereby Mr. Hammond and his associates will develop the mine on an optional basis. There are yet some details to be arranged and the terms will not be made public for a few days. A full meeting of the board of directors was present: H. W. Fesing, Prof. A. E. Seaman, and Wm. Duffney—all of Houghton; and Pres. W. B. Andrews and R. J. Andrews of Duluth. T. A. Merritt of Duluth, one of the original and largest stockholders, also attended the meeting. Mr. Hammond's proposition will be probably accepted. Wm. Duffney, who was of Boton, was elected to fill the vacancy caused by death of Benj. F. Chynoweth of Houghton.

CALIFORNIA.

Goldstone.

The Goldstone district is fairly launched on an era of active developments. Five companies and 15 sets of lessees are working, and fully 30 independent miners are prospecting proven ground. A large number of prospectors are active. The new custom mill, owned by Bullinger & DaLuge, has been placed in commission and is handling good grade quartz.

The Goldstone Mining Co. has arranged for the immediate installation of a hoist and power drills, and plans to sink the shaft 700 ft. From this level a series of crosscuts will be extended to tap the various veins disclosed near surface. New York capital is interested.

H. L. Cowles, representing Chicago capital, has taken an option on several properties and expects to close an important deal shortly. The United Goldstone Mining Co. has arranged for early work on its 23 claims. Several veins outcrop and some high-grade ore is in evidence.

Beaumont.

A long-term lease has been taken on a group of magnesite claims near Winchester by the W. Wells Co., 101 Broad street, New York. Lessees agree to mine not less than 1500 tons of ore monthly. If desirable, the property may be purchased outright for a specified sum. A large tonnage of good ore is on the dumps, and extensive reserves are indicated underground.

Jackson.

The strike of the miners in Amador county continues in force, but indications are favorable for the eventual triumph of the companies. Operations have been resumed with a full force at the Plymouth Con., near Plymouth, the employees asserting they were never in favor of a walkout, and are contented with wages and hours. At several other properties some work is going on and the pumps are kept in constant commission. A few acts of violence have been reported, but the authorities appear to have the situation under strong control and agitators have been promptly quelled.

Masonic.

A good output continues to be made from the Serita mine, controlled by the Stall interests. The enlarged Pittsburg-Liberty mill is running steadily on ore from the main Serita levels. It is reported that some good ore has been recently exposed in the Pittsburg-Liberty mine. A number of outside properties are receiving attention. Considerable Reno capital is interested.

Williams.

Quicksilver mining is very active west of this place, with several good producers receiving attention. At the Boggus mine, controlled by J. W. Boggus and associates, ore of excellent grade has been opened and the furnace is now fired with oil instead of wood, effecting a monthly saving of \$100.

Placerville.

The extensive chrome deposits at Negro Hill have been acquired by the Noble Electric Steel Co. of San Francisco, and preparations made for the daily shipment of 30 tons per

day to eastern points. The smelter at Heroult is handling all the chrome ore it can accommodate at present. The company is prospecting numerous manganese deposits and producing considerable ferro-manganese by the electric furnace method.

Grass Valley.

At the late meeting of Union Hill stockholders all officers were re-elected with the exception of G. S. Johnson, who was succeeded by W. H. Hamilton. Ore extracted from the scheelite deposits is paying all operating costs, and 10 tons are held for better prices. Considerable high-grade tungsten has been recently exposed. The gold veins are being steadily followed and as soon as the shaft is sent 400 ft. deeper comprehensive lateral work will be undertaken at this point.

Columbia.

Rich gravel has been encountered in the Ranch mine, acquired last spring by the Springfield Tunnel & Development Co. Considerable coarse gold is present and the drift is apparently on the rim of an extensive and wide channel. The main tunnel on the Springfield group is advancing rapidly and raises and drifts are being extended to open the main gravel deposits. It is stated that late work has demonstrated the success of the enterprise beyond all question.

Alleghany.

Work was resumed in the Rainbow Extension last week by a new company which has taken a bond and lease on the ground. Power drills will be provided and an effort made to intersect extensions of rich shoots formerly worked in the adjoining Rainbow and other mines. The property has never been worked to any extent although well located.

Georgetown.

The Georgia Slide Mining Co. has taken over the Beebe and Mulby Point mines and is arranging for extensive work. It is reported the Eureka mine, owned by the Woodside-Eureka Co., will also be operated in conjunction with the Beebe. All the properties contain considerable ore and have been worked extensively. At the Georgia Slide a large amount of development work has been accomplished in the past year and new ground proven. Colorado and California capitalists are chiefly interested. J. C. Ingersoll will have charge of the new operations.

Plymouth.

The Plymouth Con. is installing a powerful electric hoist and expects to have it in commission early this month. The 30-stamp mill is crushing over 340 tons per day, the stamps being aided by rolls and other fine crushing machinery. The product averages around \$5.43. August net earnings were \$22,467.

W. J. Loring, consulting engineer and president of the Plymouth Con., has taken a 3-months' option on the Hardenburg mine, about 2 miles east of Jackson. The mine is well-equipped and is located among some of the best producers on the Mother Lode.

Downieville.

Operations have been resumed at the Gold Bluff-Oxford group after a brief idleness and 45 men are at work. The mill is again operating on ore of good character. The group is controlled by the Cliff Leasing Co. of Salt Lake. Sol Camp is superintendent.

Keeler.

Announcement was made today of a dividend of 2½ cts. per share, declared and paid last week by the Cerro Gordo Mines Co., whose zinc-silver property in Dayo county has within a year become one of the most important producers of the southwest. The history of the past 12 months is one of the most encouraging from a mining standpoint recently written in California. When L. D. Gordon of San Francisco assumed control a year ago, and during 3 months of a lease he had previously obtained, just prior to operations on company account, directed extraction of every available pound of zinc ore. Since that time the company has paid off indebtedness of \$40,000, created a treasury reserve of \$50,000, paid its \$25,000 on the outstanding 1,000,000 shares and paid for improvements costing \$15,000. The latter included an entire electric system to operate hoist and compressor, a warehouse at Keeler and the covering of three tramway terminals. The

gross revenue represented in these items is about \$130,000. The production of zinc and silver continues at the usual rate and the management believes that the dividend rate may easily be maintained.

COLORADO.

Georgetown.

At the Capitol mine, which for years has been worked as a producer of silver, leasers have opened a vug of ore estimated to contain \$100,000. Three weeks ago miners working on a raise 290 ft. from the main tunnel level uncovered a streak of ore $2\frac{1}{2}$ ft. wide, all first-class, which ran 1390.41 ozs. gold. Alongside this is another streak 3 to 4 ft. in width which gave 88.50 ozs. gold.

Telluride.

The Wagner Development & Mining Co., operators of the Alta mines and other groups in Gold King basin, has purchased the Junta 65-stamp mill, including the tramways, etc. Next year after the completion of the new wagon road now in course of making the entire purchase will be moved up to include the Alta mines.

The Ophir Gold Mines & Reduction Co. has filed articles with the county clerk. The holdings of the company are those which Jim Belisle and Newton Sankey have been developing. The directors for the first year are C. M. Goddard, Denver; James M. Belisle and Newton Sankey, Norwood. They have a number of gold-bearing claims above Ophir and also have a vein of molybdenite from which some nice specimens have been taken.

The Tomboy, Smuggler and Liberty Bell mills are making more concentrates from the individual properties than for years.

Manager Smith, of the Highland Mary Mining Co. at Ophir, let a contract for 100 ft. of work on its property at Swamp canon to Mose Hill. The drift they will extend is the one in which they made an excellent strike a week or so ago, and they want to determine the extent of the ore body opened.

At the Black Bear mine they are doing considerable building, enlarging the workshop, putting an addition on the converter house, etc. They will shut down for a month while they enlarge the shaft and get ready for installing a skip to take the place of the bucket now used.

The Imes at Sawpit, being operated by Ouray interests, is showing some good ore. The property is the old Fourth of July claim.

Ophir.

The raise at the Silver Bell has reached the highest or sixth level. Its raise is 2-compartment and the distance between the mill crosscut and the higher level connected is 828 ft. It was run on ore all of the way. There is a mill on the property which could be brought into use. The mill equipment is 50 stamps. True vanners and bumping tables, and with the flotation and grinders, the mill would be up to date. The mill crosscut is now in 1800 ft. and may be driven in further—for when work on this level was discontinued it was being pushed south towards a considerably stronger mineral zone than that through which they had previously passed. The Kracaw group upon which the company has a lease lies to the south of the Bell. These have splendid surface indications, and have also been proven at some depth and are considered good claims.

Ouray.

King Bros. & Lovinggood, lessees of the St. Paul property near Red Mountain, have made another good strike on that property, opening up a new ore shoot 15 by 18 ft. The discovery was made about 25 ft. from the body opened up early in the spring, and appears to be even better than the old one, which has netted an average of something over \$800 per car. Since the first of the year they have shipped about 50 cars of ore running as above stated. They are now working 18 men and may increase the force.

The Gold Crown Mining Co. has decided to push its mill to completion. The company has acquired some good min-

ing property and it is all situated just below the city, convenient to the railroad and its mill. Completion of the mill is the key to the successful operation of the property.

A recent good find of quartz several inches wide has been made at the Governor. Alongside the quartz are several inches of talc that pans \$5 per lb. The extent of the ore bodies are as yet unknown.

Cripple Creek.

Vindicator's flotation plant it is said will be ready for operation by Oct. 15. It is now under construction at the old La Bella buildings and new ones erected for the purpose below the Golden Cycle mine dump. During the past year the company has made numerous tests with Vindicator and Golden Cycle ores, and these tests have warranted the construction of the new plant. The mill will have an initial capacity of from 350 to 500 tons and it is the plan of the company to increase this capacity from time to time until 1500 tons daily, the ultimate capacity, is reached. In the mines of the company there are reserves of low grade ranging from \$5 to \$8 a ton available, while the ore house dumps are estimated to contain in excess of 3,000,000 tons of waste ranging from \$2 to \$3. This ore will be treated. Ore conditions in the main Vindicator shaft are said to be in better condition than for a long period past, and in places the ore body at the 16th level is reported to be 50 ft. wide and averaging \$30 a ton.

A raise from the 1st level at the War Eagle Con. has disclosed ore and a new rock house is being constructed at the War Eagle shaft. The raise carried up to within 75 ft. from surface has entered a new flat. Supt. Kissel has opened the vein for about 20 ft., and is breaking ore about $3\frac{1}{2}$ ft. thick. The values are 1 oz. gold. The more important development is the cutting of the Josephine vein by a cross-cut carried 85 ft. east of the new 3-compartment shaft on the Happy Year claim, from the first level station at a depth of 125 ft. from surface. The vein as exposed measures $5\frac{1}{2}$ ft. Drifting will now be started, and from past developments along this dike it is practically assured that other ore shoots will be disclosed within the boundaries of the company. Rapid progress is being made in the Happy Year shaft and a depth of 225 ft. has been attained. This shaft, the main working shaft for the War Eagle group, is to be continued down to the 500 level and from the present indications the work will be accomplished before the close of the year.

Breckenridge.

The output of the four gold dredges in Breckenridge district for 1915 was \$700,000, and it is estimated by H. J. Reiling, president of the French Gulch Dredging Co., that the 1916 production will considerably exceed that figure. The French Gulch, which operates a dredge with 6-cu. ft. buckets, is handling 70,000 cu. yds. per month, recovering about 27 cts. per yard. The record of a recent weekly cleanup showed \$5667. The dredge operates to a depth of 43 ft. on French creek, taking up about 1 ft. of the bedrock. The Tonopah Placers Co. operates one dredge on French gulch, down stream from that of French Gulch Co., of about 70,000 yds. capacity; also, a dredge on the Blue river, and one on Swan creek. The last two named have capacities of 150,000 yds. each per month. It is understood the grounds being dredged on the Blue and Swan run about 15 cts. Manager Hopkins is in charge of the Tonopah Placers Co. dredges.

Red Cliff.

Iron Mask mine, at Gilman, near Red Cliff, being operated by Empire Zinc Co., is producing about 150 tons per day of zinc ore. This is treated at the company's mill, close to Red Cliff. The process is one of separating the zinc from the iron by magnetic machines, producing about 50 tons per day of zinc concentrates.

GEORGIA.

Dahlonega.

The Crown Mountain Co. is pushing work rapidly and will soon have 20 stamps running on ore from the Wallace vein, and others that have been opened. They are using jackhammer drills, and two drills break more ground than the

day crew can muck, and it requires a night crew to clean up the muck, to be ready for the day crew in the morning. Two drills working part of the time recently drilled 37 holes from 4 to 6 ft. deep, and better results are expected later as the drills are new at this mine. This part of the work is under the personal supervision of Mr. Henry Reinnier.

The Toledo mill is running 10 stamps and the tube mill regularly and expects soon to have enough ore to supply 20 stamps from the various veins opened and put in working shape during the past few months.

IDAHO.

Wallace.

The Caledonia Mining Co., which owns and operates the Caledonia mine, near Wardner, and is treating its product in a unit of the Bunker Hill & Sullivan mill at Kellogg, on the 5th paid a 3-ct. dividend. This makes for the current year \$755,340, and will increase the grand total to \$1,638,181. The net earnings for August were approximately \$100,000, as compared with \$90,000 in July, according to President Stanley A. Easton, who states also that there are no new developments of consequence in the Keating tunnel level, where search is being made for the ore body that faulted several months ago. The quest for the deposit still is being continued, however, and the belief prevails that the effort will be crowned with success.

Diamond drilling has located an important deposit in the Copper King mine, near Mullan, according to H. W. Ingalls, secretary of the Copper King Co., who states that the drill has penetrated 17 ft. of ore, part of which is high grade, and the remainder concentrating material, the shoot carrying from 5 to 10% lead and fair copper values. The drilling is being done from the face of the west drift in the lower crosscut tunnel, about 1400 ft. below the outcrop and about 480 ft. of ground had been penetrated before the ore was encountered. It is believed to be the same shoot that has been opened in the upper workings, and the company plans to explore it both from the main tunnel and from the drift from which the diamond drilling has been done.

The Constitution Mining Co., which owns and is operating the Constitution mine, in the Pine Creek district, will expend about \$20,000 in new equipment, to be installed and ready for service not later than Jan. 1, according to Judge George Turner, president of the company. "Contracts for the construction and machinery for a mill of 100 tons daily capacity have been let and we expect to have the plant in operation by Jan. 1," said Judge Turner. "We had plans prepared by Supt. Ziegler of the Success mill some time ago, and we finally decided to put the concentrator in operation as soon as possible, so as to take advantage of the 3 months of sleighing in marketing our product. For a time we favored postponing the construction of the mill until railroad transportation was absolutely assured, but we concluded that the operation of another mill might hasten the construction of a railroad and that in any event we should not be long without railroad facilities. Meanwhile we shall do very well for the winter season with sleighs."

The Sunshine group, in the Beaver creek district, rapidly is developing into one of the most promising properties in the region, according to Dr. E. G. Ellis of Missoula, Mont., treasurer of the Sunshine Co. "Plans are under consideration for consolidating the holdings of the Sunshine and other Beaver creek companies, and if the deal is consummated the amalgamated concern will have one of the finest groups of partly developed properties in the Coeur d'Alenes," said Dr. Ellis. "The consolidation will not include the Ray-Jefferson Co., despite rumors to this effect, but a number of the men interested are among those who made the Ray-Jefferson what it is, and they no doubt will duplicate the performance with the proposed new merger. Our development consists of a crosscut tunnel, the bore to be run an estimated distance of 900 ft. to cut the ore body already developed in the Toughnut claim at an additional depth of about 450 ft., which will give over 800 ft. depth on our present ore body. We already have run over 80 ft., all in high grade milling

ore from 4 to 8 ft. wide, and in places we have cut into high grade shipping ore. We have proved our ore shoot over 200 ft. long. We have contracted for an Ingersoll-Rand drilling equipment and air compressor, part of which already is on the ground."

Boise.

Robert N. Bell, state mine inspector, is authority for the statement that the richest gold quartz strike in the history of the state was made recently in an abandoned mine at Atlanta, 80 miles from Boise, a district that was one of the western Eldorados in the early days, but which has been dormant for the last 20 years, the deposits presumably having been exhausted. The camp is credited with production running into the millions of dollars in free milling gold, but at depth the formation became refractory and the different holdings were deserted. The new discovery, comprising a pay streak from 2 to 10 ins. wide, has been opened for 280 ft., giving a vertical depth of 180 ft., in a crosscut 60 ft. above the main working level of one of the old properties. The high grade stringer assays \$2000 a ton, and careful sampling across a face of 2 to 3 ft. wide is said to show average values of \$200 to \$500, while picked specimens carry bands of native gold fully half an inch thick. The discovery was made in the deepest level of the Atlanta camp, being about 1000 ft. below the surface. The ore now is being sacked for shipment, and in the next month it is said that a consignment will be forwarded to the smelters that will compare favorably with some of the output of other bonanza camps of the west.

LAKE SUPERIOR.

COPPER.

Houghton.

Copper Range has taken option on Secs. 10, 11, 12, 13, 14 and the northwest and southeast quarters of Sec. 15, which are located in two rows, the first sections above the last three, lying on an east and west line Secs. 12 and 13, as the eastern ends. The tract is 3 miles long from east to west and 2 from north to south, and its eastern end is directly under the eastern end of the Globe. Some work has been done on this before, on the Globe to the north and the Challenge to the south, but in neither case was there any attempt to make a cross-section. There is considerable overburden in some places, but there are many places where there is but little, and quite a large number where there is none. The county road crosses a conglomerate that is almost completely exposed.

At the 250 ft. level in order to crosscut about 40 ft. or so to the two sandstones and the intervening shale or slate so as to be able with that from the 50 ft. level to get out rock for the experimental mill, where flotation on a commercial scale of native copper will be carried on for the first time in history and where also it will be used as a commercial process in the Lake Superior copper country. From the successful experiments that have been made by Prof. Chapman at the metallurgical department laboratory at the Michigan College of Mines it is considered here that the process will work out very satisfactory on a large scale. It will be some time before the mill will be ready for the rock.

North lake, about 400 ft. southeast of its shaft in crosscut, has just crossed a lode 25 ft. wide that has a good deal of copper in small particles, but not of merchantable grades. The crosscut will be continued, as there is at least one more lode passed through in the diamond drill explorations that gave a promising core. The northwestern drift which is seeking the North lodes of the South Lake, is progressing; it still has quite a way to go.

Isle Royale's dividends of \$1 quarterly and \$1 extra confirm the belief that at last it is on the road to success. Before any great depression in the price of metal takes place, the development will be so great that construction costs will be of the past, and the reserves will be so large that with 6000 to 8000 tons daily, this mine will give substantial profits even with 12-ct. copper. After No. 7 and No. 1 have been fully equipped and beginning to get a fair sized production, it is

likely that another shaft will be sunk, and perhaps after that is in commission there will be still another. It is now certain that the shaft-rockhouse for No. 7 will be constructed of wood and will be similar to that at No. 5, which will be completed in about 2 months. No. 7 will in about 60 days be cut out all the way down to full size. The daily tonnage has decreased very slightly to between 2900 and 3000 tons as compared with the last 3 months of between 3150 and 3000, about 2200 tons being milled at its own mill.

Quincy is keeping up its development at about the same rate. Sinking is proceeding at all three shafts, No. 2 being engaged in cutting its plat at the 76th level, the deepest of the mine, No. 8 is doing the same at the 65th level, and No. 6 is almost down to the 74th. The ground in these lower levels is fully equal to that which has shown such marked improvement in the copper contents, especially in mass. The normal tonnage, which fell off somewhat a while ago owing to the repairs made necessary by air blasts, has been attained again, and about 4000 to 4100 tons will be coming daily for a very long time. As the ground shown at No. 9 shaft had been of too low a grade to be profitably mined, drifts much lower are being carried over from No. 8 to test the values at depth.

Keweenaw has in stock pile 35,000 tons for the mill test that will be given soon. There is also a large amount broken down in the mine ready to be hoisted. All the rock that can be handled by the Ball stamp—200 to 250 tons daily—can be easily supplied, as there is quite a large amount of stoping ground available.

Ahmceek has good grades of commercial copper in the 75 ft. of drifts that have been so far opened on the Kearsarge lode with a good width. The bonanza fissure, which runs at right angles to the Kearsarge amygdaloid at the No. 2 shaft, containing much copper in the sheet form with an average thickness of about 9 ins., and which contributes about 150,000 tons monthly to the mine's production, disclosed a pathway so profitable with its good contents that it paid all expenses, to the conglomerate.

South Lake is shipping at the rate of 150 tons daily to the Franklin mill. This is a profitable production from which some money will go into the treasury.

Victoria will begin to sink its shaft from the bottom of the skippit about 30 ft. below the 26th level, to the 27th. The best disclosures in the mine are at the first named level, and it is hoped that the good ground extends down into the 27th.

Calumet & Hecla will very shortly add the second and last unit to its old boiler plant; this only completing this part of the leaching plant as originally planned. The leaching plant is a most complete success, as very few changes have been made and those only of small importance. One-half has been in operation for some time now and the other will not be long into going into commission.

IRON.

Nashwauk.

There are four plants for washing siliceous iron ores in this district. Butler Bros. operate one at the Harrison mine. The plant is of steel construction. To a unit there is 1 revolving screen, two 25-ft. log washers, 4 turbos and a number of concentrating tables. The Hawkins mine of the Wisconsin Steel Co. also has a washing plant like the Butler. This is working night and day with a daily production of about 5000 tons of concentrates. All of the ore from the Hawkins pit is treated. At the Crosby mine of the Cleveland-Cliffs Co., another modern plant was constructed during the last year and is seeing its first season of operations. This is a half unit capacity. It has a trommel, a log washer, 2 turbos and 5 single-decked Overstrom concentrating tables. The LaRue Mine of M. A. Hanna & Co. has a washing plant working on a different principle than those used in the other mines. Here what is called the Wetherbee system is used. It plans to simplify the process and do the work now done in the other plants by the turbos and the tables. The plant is working satisfactorily with a capacity of 150,000 tons of concentrates.

Another feature is the large Bucyrus shovel used by Butler Brothers on stripping contracts and described re-

cently in the Mining World. New mines have been developed, which will produce large tonnages during the year. The Mace No. 2 mine of the Longyear-Bennett interests, was stripped last winter and is now shipping. The Kevin, stripped and mined by Butler Bros., shipped its first cargo in September. The Harrison, also mined by Butler Bros., is developing into a good producer.

Ironwood.

At the Woodbery shaft of the Newport mine the work of concreting is going ahead steadily. The shaft is now bottomed to the point originally decided on. The machinery comes slowly, deliveries being held up from lack of material, etc. The company is mining at its usual rate and will have a fair shipment for the year.

MISSOURI-KANSAS.

Joplin, Mo.

In spite of the excellent weather conditions now prevailing in the Joplin field, there is still a lack of water for milling purposes. This, together with the high price of powder and mine supplies, continues to hold down the output of ore to a surprising extent, in view of the prices paid for both zinc and lead ores during the past 3 weeks. Especially noticeable during the week was the strength of lead ore, which brought from \$70 to \$75, which represents a price much above the level being paid for zinc. Naturally ore producers are selling this class of ores very freely, and are depleting their surplus stocks while the price of ores are so high. This high price also helps materially in keeping a very large number of the sheet ground mines going at the present time.

In the West Joplin field there is considerable prospecting. The Old Keller land on West 28th street has been leased to the Tulsa Zinc & Lead Corporation, who has opened up a very good deposit of ore at the 100 level. In addition to the upper level a new shaft is being sunk 165 ft. to open up a run of ore said to exist at that point, in thickness from 30 to 40 ft. During this development the company has started the construction of a mill which is expected to be ready by Oct. 15. Those interested in the property are Jesse A. Harp, Ft. Smith, Ark.; T. F. Moffett, of Joplin, and J. W. Fulkerson and Dr. B. U. Cunningham, of Tulsa, Okla.

On a lease of the Riseling land on West 7th street, the Osceola Lead & Zinc Co. is rapidly completing a new shaft on its lease for which plans have just been drawn for a new 400-ton mill. It is believed that the ground will be opened up sufficiently to supply this tonnage by the time the mill is completed. Stokes & Shoemaker have developed a very rich prospect on a tract of ground southeast of Joplin which shows a 20-ft. face of ore, and so far has been outputting 20% zinc over a custom mill. A new shaft is being sunk to the 180-ft. level, and while this is being done a 150-ton mill will be erected. As a sub-lease, Haggard & Wade Mining Co. has opened up a prospect at the 160 level on the adjoining 10 acres. A short distance west of the old Bumble Bee, Gus James and the Lackey Bros. are sinking a shaft on a sub-lease to open up an ore body which they have developed by sinking of three drill holes. In the same vicinity B. R. Clarke & Co. are completing the erection of a 150-ton mill and have three shafts in good ore.

The Old Saginaw Mining & Leasing Co. has succeeded in draining a 750-acre tract southeast of Joplin. The company has spent much time and money in unwatering this tract. For many years it was a great producer of ores at a shallow level and is now being sub-leased to small producers.

In the Tuckahoe field there has been a revival of activity among the old diggings. On the Sheridan and Adams tract a company of prospectors have reopened the Old Cherokee mine and have been unusually successful in opening up a prospect at the 155 level. The ore is high grade and a good production is now being made with hand jigs.

Immediately north of the Cherokee Mining Co. is a 10-acre lease being opened up by the Gunny-Sack Mining Co. This property was at one time known as the Little Minister and has extensive workings at the shallow level. The new

company is undertaking a prospecting campaign to open up the lower level.

On the Old Pilgrim ground the Three-"J" Mining Co., composed of H. L. Aikens, John Damon, B. F. Neff and Walter Neff of Joplin, are opening up a prospect showing a 9-ft. face of zinc ore. Drifting is being conducted in two directions and the company is taking out some very rich ore.

Carthage, Mo.

Playter Bros. of Joplin, and Steve Chitwood of Carthage, have taken a lease on the old Carthage-Pleasant Valley camp and are drilling out a portion of the ground. The company is trying to find the extension of an old ore deposit worked by previous operators, and will conduct a thorough prospecting campaign upon their lease.

The Osage Mining Co., northeast of Carthage, in which Dr. Chas. Powers of Springfield, J. W. Ellis and Edgar Fugitt of Webb City, is putting down a shaft to the 180 level, in an endeavor to open up an ore deposit which was demonstrated by drilling at this point. The shaft has just entered the ore deposit and the prospect is said to be promising.

MONTANA.

Butte.

J. P. Meyer of St. Louis was in Butte this week. He was recently elected president of the Granite Bi-Metallic Mining Co. at Philipsburg. He succeeds L. M. Rumsey, Jr., of St. Louis. The Granite Bi-Metallic is working steadily and is producing regularly. No big development work has been started yet, Mr. Meyer said:

Retimbering of the Butte Main shaft has been completed and crosscutting will begin at once on the 700 level, the Main Range's lowest, and an old crosscut on that level, which is already in a distance of 200 ft., extended to the side line of the property, a distance of 1200 ft. This work will require about 6 months' time. The 500 and 600 levels are being cleaned and a car of ore of good grade already has been mined, which will be shipped this month. All the surface improvements at the Main Range have been completed, with the exception of a dry, which will accommodate the miners of the Colusa-Leonard Extension in addition to those of the Main Range. At the Colusa-Leonard a Nordberg, a first-motion hoist, is being installed. The old engine house has been dismantled and a new one will be built immediately. Sinking of the Colusa-Leonard shaft to the 1600 will begin as soon as the engine is in place. The present depth of the shaft is 800 ft. The Tuolumne Copper Mining Co. is operating both the Colusa-Leonard and the Butte Main Range, in addition to the Tuolumne mine. At the Tuolumne mining of ore is in progress on the 2200, 2400 and 2600 levels, and the old stopes on the 1200 and 1400 levels also are being worked over. The sinking of a winze from the 2600 to the 2800 and 3000 levels is under way. Sixty tons are being shipped daily from the Tuolumne, which tonnage will be increased within 30 days, according to Manager Paul A. Gow, who returned Wednesday night from several weeks spent in the east in connection with the Tuolumne affairs. Development will be pushed vigorously at the three properties now controlled by the Tuolumne Co.

Helena.

The net earnings of the Scratch Gravel Gold Mining Co., of which W. E. Cullen of Spokane is president, were \$119,947 for the 11 months ended Aug. 31, according to the official report of the management. The output of the property was 2847 tons during the period, and the net smelter returns were \$42 a ton. The main working shaft has been sunk to the 500 level on the incline of the vein, where a station has been cut and drifts started both ways. The deposit is said to be about 7 ft. wide, carrying a high-grade pay streak 12 to 30 ins. in width. Drifts also are being run east on the 300 level and west on the 250 level, and recent reports state that the ore opened in these workings is running about \$65 a ton.

Operation of the Franklin mine on Scratch Gravel from Dec. 20, 1914, to Aug. 15, 1916, show the mine produced

\$342,516.72 of ore. Expenses of operation were \$125,738.02, leaving a net profit of \$216,778.70. A total of 195 carloads of ore were shipped returning an average net profit of \$1111 per car. The mine has been taken over by a company organized by the heirs, so the record of its operations will no longer be available.

Dillon.

Dr. A. C. Sandberg of Butte, president of the National Oil Co. that is drilling a well on Muddy creek in the southern end of the county, was in Dillon last week attending a meeting of the board of directors, and while here stated that his company would let a contract for drilling a well on their oil property adjoining the Beaverhead-Alberta Oil & Gas Co., 9 miles south of here, where active drilling operations are now going on. The doctor was very enthusiastic in speaking of that oil field and especially the large deposits of oil shale there, and predicted that before long development work of these deposits would be made as he interested eastern capital in the proposition.

Red Lodge.

A group of placer claims staked out by George Peebles at the northern end of the Chapman bench, just below the mouth of Pat O'Hara creek, shows sensational values. There is no doubt that the discovery made by Peebles is the feeder for the Clarks Fork placer gold. Heretofore, there has been no gold discovered as far south as Pat O'Hara creek and it was always the belief that the gold in the river had its origin several miles north of that point. Peebles made the discovery right at the point where an old and formerly much-used trail crosses the river at a small flat north of the Chapman bench. Many Red Lodge residents have crossed that same trail hundreds of times. The claims staked out cover the ground crossed by the trail. Peebles traced his find for a considerable distance back from the river and found the evidence that he had struck it rich more and more convincing. The gold is of a much coarser grade than has been taken from the river further north and there is every sign that it exists in abundance.

Virginia City.

The Shafter mine at Summit, according to Manager A. H. Jones, is showing up well under development, and will soon become a steady producer.

Anaconda.

The Gold Leaf Mining Co. has been incorporated by F. D. Lutz, H. J. Hayes and P. E. White. The properties to be worked are situated in Granite and Ravalli counties, in what is known as the Frog Pond basin. The capital stock is \$200,000, with a par value of \$1 a share. The properties have been developed by a tunnel 1000 ft. in depth and other workings and those acquainted with it hold it as one of the most promising showings in the district.

NEVADA.

Goldfield.

Additional equipment for the Goldfield Con. flotation plant is scheduled to arrive within a short time, and the management expects to resume with the process within 40 days. An electric haulage system has been installed on the lower levels, preliminary to a heavy extraction of ore from the deep workings. Extensive developments are proceeding northerly from the Red Top-Laguna levels with good results. The mill at present is treating around 800 tons of ore daily, using the cyanide process. As soon as the flotation plant is operating at full capacity the material from the old dumps will be run through the cyanide department.

The Jumbo Extension Co. has taken a working option on the Kanrohat mine in Jefferson canyon, 6 miles northeast of Round Mountain. The property contains wide veins of mill ore and is equipped with a 50-ton mill, which has never been operated. The 564-ft. main tunnel will be driven 150 ft. further in hopes of intersecting the main vein system.

A large vein has been intersected at a depth of 900 ft. in the shaft of the Silver Pick. High-grade assays in gold and copper are being obtained. Sinking will be continued another 60 ft. to intersect another vein disclosed by the drill, and lat-

eral work started on the three distinct ledges. Late work proves there is a distinct ore channel west of the Columbia Mountain fault, with the veins dipping westerly, and many engineers believe the hitherto neglected west end of the district will soon support several producing mines.

The Diamondfield Black Butte Co. has installed a core drill and is preparing to prospect its holdings to a depth of 1000 to 2000 ft. Good ore has been opened on the 110 and 135 levels and these veins will be prospected thoroughly at depth. The company has arranged for steady shipments from its Orizaba mine, 30 miles north of Millers.

Luning.

Ore running 8 to 20% copper has been struck in the Anderson claim of the Nevada Champion group by lessees. The discovery was made at an approximate depth of 50 ft. below the glory hole level. In the Nevada Champion mine an ore body 10 to 50 ft. wide is being developed near surface. It is stated to range from 8 to 20% copper. Shipments are going out, but a car shortage is curtailing production.

Shipments have begun from the Luning-Idaho group, in the northern end of the district. A large tonnage of good-grade material is exposed. New York capital has become interested. Main offices have been moved from Luning to Reno. R. B. Todd is president.

Round Mountain.

While the season's supply of water available for treating placer ground in the Round Mountain Co.'s property has been exhausted for some time, the management, by adopting new methods, has prolonged the earning period to a considerable extent by adoption of methods commonly used in building operations. Since the water cannot be brought to the gold-bearing territory, the yardage is picked up with teams and sledges, carried over a bridge and dumped into the sluice boxes. This method of recovery, which is only partial for the ground covered, has shown the highest values for the year. It was commenced early in August, and the total for that month was 2150 yds., with a gross value of \$2.08 per yard. Another small cleanup, made Sept. 12th, yielded 871 yds. with a gross value of \$2.50 per yard. This process will be continued as long as practicable and will add several thousand dollars to the gross earnings for the season.

Manhattan.

An extra shift has been added by the Union Amalgamated, making it possible to do considerable additional development work which was not possible with only two shifts working. Developments for the past week have been very gratifying, as the ore faces have widened somewhat and the average values improved. The main ore shoot which had faulted at the 250 has been picked up by a raise from the 300 and shows good values as far as developed. The mine has been inspected by Directors James and William Forman, and President C. F. Wittenberg, who all expressed themselves as being highly pleased with the continued improvement in the mine. A number of improvements have been talked of which will include raising a 3-compartment vertical shaft after sinking the present incline another 100 ft. The ore in the bottom of the drift on the 500 level shows strong and clean with average values around \$80.

The south glory hole at the Big Pine has been opened into the new ore body beyond the fault. One machine is being kept at work in the south drift and raises will put up through this new ore body at 50-ft. intervals. Considerable difficulty has been experienced in getting a spiral test that would carry the desired tonnage into the mill, but this fault has been overcome and the tonnage will be increased to 400 tons daily.

Work on the Wall group continues the same as last week, with good values in ore production and mill values in the east drift on the hanging wall of the ledge, which is 20 ft. wide. Box samples for the first 2 days of the week ran \$83, due to striking a small rich shoot in the glory hole; 250 tons will be milled next week.

The Morning Glory property adjoins the White Caps, and is in line for similar ore bodies. L. K. Kountze and Zeb Kendall, both officers and heavy stockholders, visited the property last week and again this week. Kendall stated that it was the present intention to work the property at both ends, thus exploring the extension of the White Caps and

the Manhattan Con. ore bodies, both of which trend into the Morning Glory property.

NEW MEXICO.

Mogollon.

Cleanup at Fannie mine by Socorro Mining & Milling Co. for first half of September resulted in 16 bars gold and silver bullion and the usual tonnage of concentrates.

The new ore body recently opened on Clifton mine by the Oaks Co. continues to improve, and while the work is still confined to development, considerable ore is being shipped regularly to custom works.

Good progress in sinking for the week is reported from the Pacific, Johnson and Last Chance mines, the latter operated by Mogollon Mines Co. and the former two by Socorro Mining & Milling Co. More substantial development is now being done in the camp than at any time in the past.

A committee of Arizona farmers has just visited the mills, with the view of reporting progress on tailings disposal systems being installed, and it is understood they were well pleased and approved of the methods the companies are taking, at no little expense, to avoid running mill discharge into streams. The Socorro Co. is storing on their own premises while the Mogollon Mines Co. is building a 5-mile flume to convey the waste to a suitable site.

The annual consumption of sawed timber in this district is 500,000 board feet, and in addition about 40,000 feet of round timbers are used underground. The major portion of this has been furnished by one saw mill on Willow mountain, now operated by Kelly & Hunter. A plant on Mineral creek was more recently completed, with a board flume some 7 miles in length to convey the lumber to divide just above Mogollon, whence the company has an easy decent for most of its deliveries. The water after leaving flume will be piped to base of mountain and it is expected to thus develop 250 hp., sale of which has already been contracted. It is hoped to have the power plant in commission this following spring.

Two other available power sites are also being considered, either one of which is susceptible to development on a scale sufficiently large to meet the growing consumption. Cheaper power has long been recognized as the prime factor in arriving at a solution of lower cost figures in operation and the long-proven stability of the mines warrants a strong appeal to necessary capital for the installation.

OREGON.

Prairie City.

The chrome iron mines on Canyon mountain are now ready to ship. It is estimated that during the fall about 125 horses will be used in hauling the ore to this city over a road which has recently been completed to the mine. The bodies of this kind of ore occur in the district on surface and go to only very shallow depths. The body from which shipments are now to be taken is estimated to contain 60,000 tons.

Ashland.

Manager Bartlett of the Ashland mine reports that he has enough ore blocked to last the mill for 2 years. Some of the crushing and other milling machinery from the Baden mine on Gold Hill is being brought to the Ashland.

The Grey Eagle mine near Happy Camp, on the Klamath river road, Siskiyou county, has been purchased by W. B. Thompson, New York. The property contains about 500,000 tons of developed chalcophyllite ore, averaging 5%. For years the property has been developed by Dakin & Parish, San Francisco, and several outside holdings have been added to the original location. It is stated that the new owner will immediately start extensive developments and that a large reduction plant probably will be erected in 1917.

The Marin Andrew placer mine near Scott Bar, has been sold to R. J. Barber and associates, Boston. They are preparing to operate along broadened lines. The property ad-

joins the Milne mine and has been producing for 60 years. Numerous companies in the Happy Camp, Forks of Salmon, Sawyer Bar, Scott Bar and other placer districts are preparing for a brisk season with the first fall rains.

SOUTH DAKOTA.

Rochford.

A new working shaft is being sunk on the property of the Gold King Co. The shaft originally sunk to prospect the formation at the north end of the ground was an incline and not suitable for contemplated operations. The new shaft, which is 2-compartment, timbered with square sets, is located 100 ft. northeast of the incline and it is east of the ledge, which has an easterly dip of 13 degrees. The shaft is being sunk with the aid of a horse whim and is now down 40 ft., work having been under way for 5 weeks. The incline shaft, which was sunk 90 ft., disclosed a vein 60 ft. wide. The vein has been traced by its surface croppings and by shallow workings through practically the entire length of the property. The present intention is to sink several hundred feet and open the ledge at various levels, thus affording ore sufficient to operate a reduction plant. Previous announcements of the management state that English capital will be coming for the complete equipment of mine and proposed mill, as soon as the war is over. In the meantime, sufficient funds are being raised to keep development work in progress.

Deadwood.

The annual report of the Deadwood-Heidelberg Co. was recently made public and in part is as follows: Operations in the third year of development work done by the company on the property began July 16, 1915, after a shut-down of 5 weeks. The total expenditures on the property in 13½ months of continuous work aggregate \$4056.93, which funds were raised by the sale of stock. As the ore in the main drift began to sink below the level of the tunnel and therefore could not be reached, it was decided to crosscut both to the east and west with the intention of cutting new verticals underground. The east crosscut was continued for 55 ft. and the west crosscut for 325 ft. from the main drift. In the west crosscut several veins carrying low values in gold were tapped until a strong vertical was encountered running in a northeasterly direction and carrying good values in gold. Assay returns on the vertical ore in this new find show between \$15 and \$56 and the flat deposit showing a width of 7 ft. and over 15 ft. in thickness assays between \$4.20 and \$26.00. Average samples taken from top to bottom including the low grade shale gave over \$5 in gold. This is the most important find made during the year and of value principally due to the high grade of the vertical and the distance from the mouth of the tunnel giving good reasons to believe that the ore body is continuous and can be located on or close to the surface at a distance of about 300 ft. from the point of intersection underground. Five hundred ft. of trench work done on the surface during the months of August, September and October, 1915, disclosed, besides smaller veins carrying some low values in gold, a vertical 215 ft. northwest of the main Heidelberg vein and containing a good grade of ore. The highest assay on this No. 3 vein showed returns of \$28 in gold and an average of about \$4. An incline tunnel was driven on this vein for about 97 ft. The total amount of work done at a cost of \$4,056.92 during the last 13 months shows 500 ft. of surface trench work and 460 ft. of underground development. The property has now been opened up to a point where it has been possible to interest capital to spend a larger amount of money in sinking a shaft to quartzite and incidentally developing the upper shales.

UTAH.

Alta.

The water ditch has been completed, ventilating pipes are now being placed and the tracks straightened in the tunnel of the Alta Tunnel & Transportation Co. Plans are also being considered for the starting of work on the 200-ft. vein of

brecciated limestone that has been cut in the tunnel at a depth of 1200 ft. The management has not as yet decided at which point this work will be started but there are three promising points in the tunnel from which to start work. The vein, consisting of fragments of blue limestone, white soluble limestone and porphyry, all of which shows lead, copper and silver values scattered through, strikes east, crossing the direction of the tunnel which is being driven due south. At 100 ft. north from the brecciated vein is a northeast fissure carrying considerable manganese and iron. It will intersect the brecciated vein at 500 ft. west of the tunnel proper. The contact between the blue limestone and the brecciated vein also offers a promising point at which to start the work. There is in addition a water course that is considered promising for prospecting purposes.

Beyond the present breast, which is in 2045 ft. the management expects to cut the Flora Hagen vein with any round of shots.

The tunnel of the Hellgate Co. is now in 50 ft. The portal of the tunnel is near the creek bed of Little Cottonwood, south of and about 200 ft. vertically below the portal of the old Frederic tunnel. The new Wasatch mines drainage tunnel has been started about half a mile west of the Hellgate tunnel and will pass under the Hellgate ground and drain it to a depth of about 300 ft. Before deciding on the site for the new tunnel portal, the management did some prospecting work on a prominent vein which outcrops near the creek bed near the present portal. A vein was uncovered there for some distance. The ore in one place was 4 to 5 ft. wide, while the vein was uncovered for 75 ft. along the strike. The principal values are silver, copper, lead and gold. The Cardiff fault plane crosses the Hellgate property the full length of the group. The same limestone-quartzite contact that is found in the Cardiff makes through the Hellgate ground.

Beaver.

In reviewing operations the Antelope Star Manager Nebeker says that the main tunnel workings of the Star properties had been driven into the mountain 225 ft. and for 135 ft. the workings were in ore. It's a sulphide lead ore and there are some large blocks of high grade that give assay returns of 60% lead. In addition to this there is a portion of the deposit in the brecciated lime contact of a good mill grade that gives assay returns of 5 to 7% lead. While the property is not opened up extensively the management is of the opinion that the showing to date justifies the belief that enough of the milling ore will be developed to warrant the erection of a plant for treatment at the mine. By following the ore to the face of the present tunnel the company has proven up this deposit with 200 ft. of backs. The deposit has also been proven by a shaft which attained a depth of 65 ft., being sunk on the dip of the vein. One of the new pieces of work to be performed is the sinking of a winze from the tunnel level in ore. The tunnel is to be driven ahead at the same time this work is being done, as the tunnel is following the bedding into the higher part of the mountain. This work has been decided upon as a result of new financing that has been arranged, and the management expects to get out some of the high grade ore and make a shipment to the valley smelters soon.

The Hickory mine of the Majestic Mines Co. has been producing a little of late. The ground shows some immense channels, but most of the ore is too low grade to make it profitable to ship. Some of the ore bodies prospected have shown widths of 100 ft. A little more depth will probably prove that these extensive ore bodies have been leached out and the ore deposited at lower depths, where shipping values are anticipated. It is expected that 200 ft. more depth will get into the higher values. The work of sinking the main working shaft of the Hoosier Boy is going on with satisfactory progress in this respect. The 700 level has been passed and the miners are now making for the 800. Here a station will be cut and considerable prospecting work taken up.

Eureka.

All the new machinery at Tintic Standard has been installed with the exception of a blower fan which will be in soon. The new compressor which has been installed furnishes 3 drills and the three auxiliary hoists. One of these hoists

has been installed at the new shaft, another at the No. 2 winze, which has been sunk from the 1000 to the 1200 level, and the third is installed at the No. 3 winze, sunk from the 1200 level to the 1600. The new shaft has attained a depth of 100 ft. and a contract will be let to sink this shaft to the 1100 level. Bids for this work are now being received by the officials. It is planned to drive the shaft down with speed, as its completion will reduce the expense of handling ore already developed on the lower levels. It will also aid the ventilation problem for all time and thus reduce the operating costs. As the work of developing the ore body opened on the 1600 level progresses the ore body continues to grow. It has now been drifted on to the northwest for 35 ft., to the southwest for 40 ft. and to the south for 60 ft., with no walls in sight. The ore also occurs in the No. 1 winze 600 ft. south of the present workings on the 1600 level and 400 ft. above those workings.

A new copper shoot has been encountered in the north end of Iron Blossom's, Tintic mine. This was given out by J. W. Knight, who says further that the drift that is coming up on the 1700 level from the south is showing some copper stains. It is now about 2 months off from reaching its objective. The copper ore shoot as developed on the 1200 has shown such strong inclinations to go to further depth that a new winze has been started from that level to prove the ore to lower levels. On the 1200 level the shoot has been opened up 30 ft. The size of the ore body is even larger than where it has been developed on the 1100 level, but the values have been not quite so high. The vein on the 1200 is very strong and appears to be making to greater depths. Accordingly it has been determined by the management to sink the new winze just started at least 100 ft. deeper, or to the 1300 level. On the deepest workings in the Iron Blossom, the 1700 level, for some time a drift has been making rapidly to the north end of the property. The objective is to tap the new copper shoot. This drift has encountered some ore at intervals. The last report is that the face is now showing some encouraging stains. The face is now about 500 ft. from the shoot. Iron Blossom is now producing at the rate of 1000 to 1200 tons a week. The production in August was 64 carloads, or 3200 tons. So far in September the output has been 78 cars, estimated at 3750 tons.

WASHINGTON.

Spokane.

It is anticipated that the Intermountain Mining Co., which, on Oct. 20, will pay its initial $\frac{1}{2}$ -ct. dividend, or \$8250, will be able to maintain production steadily during the coming winter, arrangements having been made to secure electric power from a nearby plant during the cold period, and it is predicted that the dividend will be increased to 1 ct. in November, according to A. T. McDevitt, closely associated with the management, who returned recently from a visit to the property. "By adding a Hardinge pebble mill, the company's concentrator, originally a 100-ton daily capacity plant, now is able to treat from 140 to 150 tons a day," said Mr. McDevitt. "There are 33 men, working in three shifts, employed in the mine and mill, and ore bodies on the 200, 400 and 700 levels, averaging from 2 to 6 ft. wide, together with other shoots that have been opened in other parts of the property, assure reserves sufficient to keep the production up to the present rate for the next 5 years, even if no new supplies are opened. The company is shipping each month 300 tons of concentrates and crude ore. The crude ore runs 20% copper and carries $1\frac{1}{2}$ ozs. silver. Shipments are being made to the B. C. Copper Co.'s smelter at Greenwood, under a 1-year contract. The freight charges are \$4.50 to \$6.50 a ton, determined by the value of the product shipped. The company's railroad has been gone over thoroughly, 1000 new ties put in and the entire line put in good condition. Timber needed during the winter in the mine has all been cut and is seasoning, and the only new equipment that may be needed is a Shay engine. All the company's bunkers on the main line are filled with ore waiting for cars and at the mine 2 carloads are ready. Shipments will increase from now on. President

Oscar Nordquist told me he could see no reason why this company should not pay 1 ct. a month in November and thereafter."

Chesaw.

After driving through 40 ft. of copper ore of good grade on the Cariboo, and not yet through the body, the British Columbia Copper Co. has increased its ore hauling force, and put on a third shift in the mine. The property lies about 4 miles northeast of Chesaw on Copper mountain, and is one of the group of four bonded in July to the company. The ore is being handled at the company's own smelter at Greenwood, B. C.

WISCONSIN-ILLINOIS.

Highland.

The New Jersey Zinc Co. has increased its mining activities in this district appreciably and shipping of carbonate zinc ore average better than a car daily. Much ore is held by small local concerns, who seem to be unable to obtain a market for their product.

Miffin.

Eagle-Picher Lead Co. through its local buyer has been invading this district, taking a car each from the Peni and B. M. & B. mines. Negotiations are pending for the sale of about 400 tons of high-grade blende held by the Peni Mining Co. Shipments for the district last week totaled 14 cars, 561 tons. The Big Tom mine, recently equipped, is now on a producing basis. A new 200-ton mill is nearing completion on the Yewdall lease for the Vinegar Hill Mining Co.

Platteville.

Reports from the field in general, for week ending Sept. 30, show shipments of 140 cars of zinc ore, all grades, to both separating plants and smelters, 5622 tons; only 1 car of lead ore cleared, 42 tons. Shipments of pyrites came from the Linden Zinc Co., 40 tons; Benton Roasters Co., 264 tons; Mineral Point Zinc Co., to prime western smelters, 424 tons; National Separators to General Chemical Co., 201 tons. The reserve of zinc ore at all points in the field is estimated at latest reports at 8000 tons; lead ore, 1000 tons; pyrites, 15,000 tons. The gross recovery wet concentrates for the week showed a falling off, only 4491 tons being reported. Net deliveries refined ore from separating plants to smelters, 3178 tons.

Prices for zinc ore showed improvement, top and 60% ore holding at \$58 base, with the range down to \$50 on seconds and medium grade. The basis of zinc content was raised, these figures applying on ores not under 54% zinc content. This made it more difficult for independent low-grade producers, and very little ore was marketed from this source.

Shipments from locals were light last week, East End, West Hill and Block-House Mining shipping 1 car each, 137 tons, and Hodge mine to Cuba, 2 cars, 87 tons. Unless low-grade zinc ore producers are soon enabled to unload some of their reserve ore many will be compelled to suspend operations.

Benton.

The Domestic Mining Co., a local organization, is meeting with big results in shaft sinking on the McCabe lease, which has been thoroughly explored with drills. Big ore deposits have been gone through in the main hoisting shaft. Jos. Piquett has the contract for sinking of a new shaft on the Meloy lease for the Vinegar Hill Zinc Co. The contract for the construction of the power and milling plant was awarded to Edward Sargent. Shipments of zinc ore for week of Sept. 30 were reported by Frontier Mining Co., 16 cars, 687 tons; New Jersey Zinc Co., 10 cars, 323 tons; Vinegar Hill Zinc Co., to separators, 12 cars, 515 tons; Fields Mining & Milling Co., under a new long term contract to Grasselli Chemical Co., 5 cars, 202 tons; to Galena Refining Co., 2 cars, 96 tons; Eagle-Picher Lead Co. took 9 cars of Wisconsin Zinc Co.'s high-grade refinery product; 4 cars were also sent to American Zinc Co., Hillsboro, 182 tons; Indian Mound Co. to Mineral Point, 2 cars, 83 tons; total, 60

cars, 2544 tons. Benton Roasters delivered 6 cars of fine pyrites from separating plant, 264 tons, to Grasselli Chemical Co.

Cuba.

Much excitement prevails in this district among operators following phenomenal strikes of zinc ore by the Standard Metals Co. of Chicago. The new find is made on the old Dall Mining Co.'s leasehold and on the Coulthard lands adjoining. The range makes at a uniform depth of 140 ft. and has been drilled out for three-quarters of a mile in length. The work of proving fell to the lot of John Anthony, a local mining man, who is interested.

A big revival in zinc mining is noted in this camp following a dormant period of over 2 years. National Separating Works shipped 5 cars high-grade zinc ore to Illinois Zinc Co., 196 tons, and to Granby Con., 44 tons; Linden Zinc Co., now operating the Campbell Separating Works, made delivery of first car high-grade ore to DePue, 40 tons; Utt-Thorne Co. delivered a car to roasters at Benton, 40 tons; Carr Mining Co., a new organization, made initial shipment to Sandoval Zinc Co., 31 tons, and Eagle-Picher Lead Co., another car high-grade from the Linden Zinc Co., 40 tons. Receipts of raw ore during the week totaled 19 cars, 814 tons.

Hazel Green.

The Big Three, the usual weekly shippers, the Kennedy, Cleveland and Lawrence mines, responded last week with 11 cars all told, 480 tons. McMillan Mining Co. is installing new and heavier pumping machinery. A new producer is being developed by the Rio Mining Co. Monmouth Zinc Co. is again producing.

New Diggings.

The Vinegar Hill Zinc Co. has installed a cage and cars at the Blackstone mine. These replace old hoisting outfits and cans. The C. A. T. mine of the Wisconsin Zinc Co. is now operating steadily with a new rig and making a 45% zinc concentrates. The Longhorn mine, another new applicant, will be complete and fully equipped by Nov. 1. Both plants have a capacity for handling 300 tons of mill rock daily.

Shullsburg.

Rodhams Mining Co. continue shipments, a car high-grade blende going to Lanyon Zinc Co., 28 tons; Winskill mine shows big, and shipments were heavy, last week's report showing 7 cars out to Galena, 303 tons.

Galena.

Restricted shipments from regular producers show here last week, the Black-Jack mine being able to make only 3 cars, 112 tons; Federal mine, 3 cars, 120 tons; North Unity, 2 cars, 89 tons; Pencroft Mining Co., a new producer, made initial shipment of a car to Cuba, 40 tons. Separators going on up district ore sent 2 cars to Lanyon Zinc Co., 93 tons; Edgar Zinc Co., 2 cars, 82 tons, and Wisconsin Zinc Co. to LaSalle, 4 cars, 158 tons.

WYOMING.

Lander.

Although the ceded part of the Shoshone reservation has been opened up regulations regarding leasing have as yet not been drawn up. The leasing will be handled by reservation authorities and the Indian department officials will rule on priorities. As soon as the leases are granted there will be a lot of drilling done on the ceded part of the reservation as several companies are holding rigs now to put on the leased land when the title is cleared. When the president signed the act there was a rush from all over the country to file applications for the reservation lands which include the Pilot and Maverick Springs fields, and several other likely localities. Filings were made in both the general land office and the Indian office at Washington, and at the land office at Lander, and the Indian office at Fort Washakie. As many as 11 applications for the same land are on file in different places.

Basin.

Progress is being made in this district and the Liberty Oil & Gas Co., operating on the Howell place, northwest of

town, with a Star rig, is reported down over 200 ft., and the formation is conforming to their reports previous to drilling. W. L. Russell and associates, who have a Star on Greybull, are reported down 1000 ft. The Liberty Oil & Gas Co. has installed a new lighting plant at their rig on the Greybull. It is making good progress with its hole. Scott Mills, drilling on the Pease lease, is making good progress and expects to bring in a good well soon. The Great Western well on the Coffield place has been cleaned out and has flowed three times during the past week. They are still bothered some with sand coming in the well and expect to get the pump working. The company will commence another well as soon as this one is disposed of.

CANADA.

BRITISH COLUMBIA.

Salmo.

The lower tunnel on the Hudson Bay is in 1650 ft. and it is expected to reach the ledge outcropping on surface at 1750 ft. Stringers of zinc sulphide have already been encountered, denoting the proximity of the objective. The upper workings have proved an ore body 1200 ft. long and from 15 to 75 ft. wide. The ledge for that distance is filled with zinc carbonate ore having 15%. In this body there occurs a streak from 4 to 8 ft. wide, which assays 38% zinc and from this all shipments have come. The upper workings are confined to two levels. The main tunnel level is 200 ft. below the outcrop. The winze level is 100 ft. deeper. The new tunnel will cut the ledge nearly under the winze at an added depth of 575 ft. During the period that the mine has been under development by its present owners shipments of ore have been maintained at an average rate of 50 tons daily. Nearly all the ore was taken out in the course of development and without resort to stoping further than to demonstrate the extent of the high-grade shoots. The Hudson Bay has for some time been a Hayden-Stone enterprise. J. L. Bruce is general manager and W. S. Grether is resident manager. Spokane people still are among its largest shareholders. Maurice W. Bacon is president and William E. Cullen is treasurer. Though not a director, R. K. Neill is in general charge of the company's property at present.

Hedley.

Development has indicated that the general average value of the ore will be \$10 to \$11 the ton, according to a recent report from President I. L. Merrill of the Hedley Gold Mining Co. The increasing baseness of the product with depth, which increases the concentrate tonnage and reduces the grade, has necessitated a change in the treatment system, and a straight cyanidation system is being installed. The ore reserve is estimated at 423,522 tons, averaging \$10.39 per ton. Of this, 35,025 tons, rated at \$8.52 per ton, are in the old workings above No. 4 tunnel, and below that are 388,527 tons, averaging \$10.55 per ton, including 75,000 tons of \$11 ore below the 800 level. The output of the property in 1915 was 74,265 tons, all of which was milled, and the total recovery was \$796,592. Operating expenses were \$421,846, including \$38,938 expended perfecting the new hydro-electric plant and in betterments to other equipment and the camp buildings. The hydro-electric station, commissioned Jan. 2, 1915, at a cost of \$192,000, or \$8000 less than the estimated price, is on the Similkameen river, just below the mouth of Twenty-Mile creek, and furnishes power to operate the 40-stamp mill and the mine machinery, as well as current to illuminate the camp and the underground.

Sandon.

Conditions in the Slocan region are better than in any previous period of its history, and the district offers unusually attractive inducements for investment.

The Slocan Star Co. has been greatly hindered in its operations by lack of sufficient power, for which reason both mine and mill are working only one shift each. All the machinery for the new hydro-electric power plant, with the exception of the wheel and one length of pipe, has arrived and is being installed, so that the plant may be put into operation within a few days. During August the company

shipped 5 cars of silver-lead ore and concentrates, which netted \$16,000 over and above operating expenses of \$10,000. The zinc shipments, whose proceeds are not included in the above figures, totaled 110 tons.

Greenwood.

At Copper Mountain the British Columbia Copper Co. is installing a pumping plant to elevate water from the Similkameen river to a distributing point 1700 ft. above the river through a pipe line 6000 ft. long. The pumping equipment will consist of triplex pumps and the pipe line will be composed of 4-in. high pressure hydraulic pipe in the lower section and 6-in. steel pipe at the discharge. The water will be used to supply the mine, the camp and a 50-ton experimental mill. The mill will be devoted to the working out of a concentration process preliminary to the erection of a 2000-ton plant on the Similkameen.

Three Forks.

The Rambler-Cariboo has much larger reserves of ore than it is usually credited with. Mining operations are proceeding on the 8, 9, 10, 12 and 13 levels, from which 75 tons of ore are being sent daily to the mill. Shipments of lead ore and concentrates average around 175 tons a month and the mill also produces about 75 tons of 33% zinc concentrates monthly. Of the latter product there is now about 1000 tons on hand awaiting retreatment in the Kaslo custom concentrator, where it will be worked up to a satisfactory shipping product. One stope above the No. 9 level shows 16 to 18 ft. of first-class concentrating ore with a streak of clean galena from 1 to 2 ft. wide in the face.

The Lucky Jim mine has developed a large tonnage of ore and by the recent completion of an upraise from a crosscut from the No. 5 tunnel to the big stope is now in shape to produce economically. It is shipping high-grade mill feed only to the Rosebery concentrator and mine run ore to Kaslo. The latter averages 21% zinc, 1.3% lead and 16% iron. The preliminary runs of the magnetic separator at the Kaslo mill yielded a product assaying 46% zinc and between 8 and 9% iron.

New Denver.

One of the finest ore showings is that in the Sovereign mine, recently bonded by Clarence Cunningham, who is operating the Queen Bess and Wonderful as well and is about to take over the Idaho-Alamo, all four properties being now on a producing basis. The intermediate level on the Sovereign shows between 3 and 4 ft. of clean galena in the face, and has proved the shoot for a length of 30 ft. already. At one point the clean ore is fully 5 ft. wide. There are 70 tons of ore sacked and ready to ship to the smelter.

In the Queen Bess, Cunningham is mining an entirely new ore shoot on the Nos. 5 and 6 levels. Owing to its being in virgin ground it has a good chance of going to the surface, and being found also at depth in the No. 9 level. It averages between 2 and 3 ft. of clean galena. He is shipping regularly also from the Wonderful.

ONTARIO.

Cobalt.

Recent reports show a good production from Kerr Lake during August with an output of 246,488 ozs. of silver, comparing with 184,697 ozs. in January, 163,995 in February, 214,902 in March, 225,423 in April, 234,598 in May, 237,942 in June, and 211,000 in July. March was the first month since 1910-11 that the company succeeded in passing the 200,000 mark. Now it is producing 250,000 ozs. per month. It probably surpasses the 250,000 ozs. per month mark since the above figures are exclusive of the Caribou-Cobalt production, in which company Kerr Lake holds the controlling interest. Eight months' production from Kerr Lake, proper, was 1,719,045 ozs.

Dome Lake, which has been closed 3 weeks, is now busy on the extension of its new mill. A new Hardinge ball mill is being installed, which will increase the capacity from 50 to 150 tons per day, giving an average output of 5600 tons per month. The mill extension will be in operation this fall.

Port Arthur.

The option on the St. Anthony gold mine held by the Dominion Reduction and Kerr Lake companies has been taken

up. It is located near Sturgeon lake, in the Rainy River district and has been under option for a year, during which time \$90,000 was spent. Two-thirds of the St. Anthony is owned by the Dominion Reduction and one-third by Kerr Lake. The total amount paid for the property has not been made public but a payment of \$60,000 was made recently. The St. Anthony was opened 10 years ago, but owing to financial difficulties it was closed down a few years ago. Considerable gold has been mined from the property. Owing to nature of ore some difficulties were encountered in the treatment of it.

Schumacher.

A new shaft known as No. 4 has been started at the Schumacher mine and is now down 30 ft. It is situated on the opposite side of the town and on this account it will probably be necessary to construct an aerial tramway as a means of transporting ore across the street to the mill. A new machine shop has been built and equipped on the property in which the company can now do their own repair work.

MEXICO.

Monterey.

According to advices that have been received from the El Oro mining district, all three of the larger mining companies operating there are now working under almost normal conditions. It is stated by Dr. H. A. Geitz, surgeon for the El Oro Mining & Railway Co., at El Oro, who passed through here a few days ago on his way east for a brief business visit, that the decree which General Carranza recently issued that all mines in the republic must be placed in operation within 60 days or the properties would be taken over by the government, is causing a general renewal of mining activities in all of the districts of Mexico, with the possible exception of those that are situated in localities where revolutionary and brigand bands are still operating. It was stated by Dr. Geitz that there has been no destruction of foreign-owned property at El Oro. Most of the mines in that camp are owned by Britishers. La Esperanza mine at El Oro, which at one time produced at the rate of \$1,000,000 gold per month, is now being worked on a big scale by improved machinery. Mine laborers at El Oro are paid at the rate of 31 pesos Carranza currency per week, which is equivalent to about 95 cts., basing the currency of the de facto government as worth 3 cts. There is plenty of corn on hand for the people of El Oro, Dr. Geitz said. The camp has been sacked by revolutionists three times. It is now in control of the Carranzistas.

NICARAGUA.

Tunkey.

The Eden Mining Co., controlled by the Tonopah Mining Co.'s stockholders, has made large expenditures in Pis Pis mining district, near Tunkey, on Ban-ban river. A cyanide-leaching plant of 100 tons daily capacity is under construction, a hydro-electric power plant has been built, and a railroad 13 miles in length has been completed from Tunkey to the company's mine, in which there are large bodies of low-grade gold ores, amenable to cyanide treatment. The locality is reached by launch, 70 miles up stream on Prinsapolka river, thence a shorter distance up the Ban-ban to Tunkey. Conditions in Nicaragua, with respect to laws, regulations and protection, are considered satisfactory.

Bluefields.

W. B. Milliken and H. E. Fredericks, Denver, Colo., owners of Linda Ventura mine, situated near Wa Wa river, on the Atlantic coast, have built a wet-crushing, sliming and sand-leaching cyanide plant of 2000 tons per month capacity, and have constructed a narrow-gauge railroad from the river to the plant and mine. The mine is producing and the mill has begun operating. The mine has a vein of gold ore 17 ft. wide, running \$7 to \$8 per ton. One shoot of ore runs much higher. Plans are made for putting in a hydro-electric power plant on the property. Their port of entry is Bluefields, from which place the route is by launch up Wa Wa river.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

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Ore, Genesis

Loftus, N.—*New Theory for Coal Formation*. [Says that coal was formed from the decomposition of carbon dioxide, which gas was near the earth's surface before mountains were made].—Coal Tr. Bull. Sept. 15 1916; p 41; pp 1½; 25c.

Robinson, Heath M.—*The Ozokerite Field in Central Utah*. [Abst. from a U. S. G. S. bulletin. Genesis, properties, production, concentration, etc., are considered].—Mg. World Sept. 16 1916; p 497; pp 1¾*; 10c.

Mineralogy and Petrography

Schroeder, J.—*The Solubility of Leucite in Sulphurous Acid*. [Details of the chemistry and methods applied thereto].—Jnl. Ind. & Engg. Chem. Sept. 1916; p 779; pp 1; 60c.

Young, George J.—*The Selection of a Method for Ore Treatment*. [On meth-

ods of testing and investigating new ores for refining treatment].—Met. & Chem. Engg. Sept. 15 1916; p 297; pp 2¾; 35c.

II. ORES AND METALS

(I) METALS AND ORES

Copper

De Wolf, William P.—*Yavapai County, Arizona, Mines and Mills*. [A general review of current conditions, with some detailed information].—Mg. World Sept. 16 1916; p 503; pp 1¾; 10c.

Maguire, Don.—*The Copper Mines of Wolf Mountain, Cache County, Utah*. [A general and geological description of the district].—S. L. Mg. Rev. Sept. 15 1916; p 17; pp 2½*; 25c.

Matley, H. A.—*Canadian Metal Trades and Preparedness*. [Deals with the production and market prices of lead and copper in Canada. Separate reviews of provinces are given].—Canadian Mg. Inst. Bull. Sept. 1916; p 783; pp 7; 50c.

Scott, W. A.—*Mining Operations in Bingham Camp, Utah*. [Describes operations of the more important properties].—Mg. World Sept. 16 1916; p 491; pp 1¾; 10c.

—*British Columbia Annual Report of the Minister of Mines for 1915*. [Reviews metal production in general for the province and in detail for operating companies].—Mg. Engg. & Elect. Rec. Aug. 1916; p 76; pp 3½; 35c.

—*New South Wales in 1915*. [Reviews the production of metals in the country].—Mg. Jnl. Sept. 2 1916; p 596; pp 2; 35c.

—*Quebec Mining Industry—A Review for the First Half of 1916*. [Brief accounts of operations at various properties].—Canadian Mg. Inst. Bull. Sept. 1916; p 796; pp 4; 50c.

Gold Fields and Mining

Capps, Stephen R.—*Mining in the Willow Creek District, Alaska*. [Abst. from a U. S. G. S. bulletin. Reviews the operations of the more important properties in the district].—Mg. World Sept. 16 1916; p 499; pp 2; 10c.

De Wolf, William P.—*Yavapai County,*

Arizona, Mines and Mills. [A general review of current conditions, with some detailed information].—Mg. World Sept. 16 1916; p 503; pp 1¾; 10c.

Tucker, W. B.—*Mines and Mineral Resources of Amador, Calaveras, Tuolumne*. [Economic mineral products are reviewed by separate descriptions of deposits and mines, with some information on the condition of the country].—Calif. Mg. Bur.; pp 180*.

—*New South Wales in 1915*. [Reviews the production of metals in the country].—Mg. Jnl. Sept. 2 1916; p 596; pp 2; 35c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

Johnson, J. E., Jr.—*Blast Furnace Products*. [Speaks of the pig products used later for steel-making, foundry iron, puddling iron and ferro alloys].—Met. & Chem. Engg. Sept. 15 1916; p 324; pp 4¼; 35c.

Reifsnider, L. B.—*Underground Mining in Cuba*. [A method which does not interfere with operations above in surface mining. The stopes are filled after being worked out].—E. & M. J. Sept. 16 1916; p 509; pp 2¾*; 25c.

Rossman, L. A.—*Nashvauk Iron-Washing Plants*. [Describes a small plant for washing and concentrating high-silica ores. Hydraulic principals are used in the machines].—E. & M. J. Sept. 16 1916; p 491; pp 2¾*; 25c.

Iron and Steel

Benedicks, Carl.—*A New Thermo-Electric Method of Studying Allotropic Changes in Iron or Other Metals*. [Abst. from a paper read before the British Iron & Steel Inst.].—Met. & Chem. Engg. Sept. 15 1916; p 337; pp 3; 35c.

Fechtchenkotchopovsky, S. A.—*Cementation of Iron*.—Rev. Soc. Russe de Metall, 1914; No. 1; p 245; pp 65.

Janssen, W. A.—*Use of Titanium in Steel Castings*. [A paper read before the American Foundrymen's Assn. telling of some of the advantages of ferro-titanium as a deoxidizer].—I. Tr. Rev. Sept. 14 1916; p 507; pp 5*; 25c.

Iron and Steel: Foundry and Furnace Practice

Johnson, J. E., Jr.—*Blast Furnace Products*. [Speaks of the pig products used later for steel-making, foundry iron, puddling iron and ferro alloys].—Met. & Chem. Engg. Sept. 15 1916; p 324; pp 44*; 35c.

Osann, B.—*Behavior of Sulphur in the Blast Furnace*. [The reduction is regarded as taking place in the semi-solid magma].—Stahl & Eisen 1916; No. 36; p 210; pp 5; 35c.

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De Wolf, William P.—*Yavapai County, Arizona, Mines and Mills*. [A general review of current conditions, with some detailed information].—Mg. World Sept. 16 1916; p 503; pp 14; 10c.

Matley, H. A.—*Canadian Metal Trades and Preparedness*. [Deals with the production and market prices of lead and copper in Canada. Separate reviews of provinces are given].—Canadian Mg. Inst. Bull. Sept. 1916; p 783; pp 7; 50c.

Speed, F. B., Jr.—*Lead-Zinc Mining in Virginia*. [A review of operations].—E. & M. M. Sept. 16 1916; p 511; pp 4; 25c.

—*British Columbia Annual Report of the Minister of Mines for 1915*. [Reviews metal production in general for the province and in detail for operating companies].—Mg. Engg. & Elect. Rec. Aug. 1916; p 76; pp 3½; 35c.

Silver

De Wolf, William P.—*Yavapai County, Arizona, Mines and Mills*. [A general review of current conditions, with some detailed information].—Mg. World Sept. 16 1916; p 503; pp 14; 10c.

—*British Columbia Annual Report of the Minister of Mines for 1915*. [Reviews metal production in general for the province and in detail for operating companies].—Mg. Engg. & Elect. Rec. Aug. 1916; p 76; pp 3½; 35c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Saint-Smith, Cecil E.—*Malvern Tin Mine, Gurrumbah, North Queensland*. [A description of the property, its operation and mode of occurrence of the ores].—Queen. Govt. Mg. Jnl. Aug. 15 1916; p 367; pp 2*; 35c.

Saint-Smith, Cecil E.—*Robson's Lodes of Wolfram, Tin, Etc., Tinaroo, North Queensland*. [An account of exploring operations and the geology and occurrence of the minerals].—Queen. Govt. Mg. Jnl. Aug. 15 1916; p 368; pp 1½*; 35c.

—*New South Wales in 1915*. [Reviews the production of metals in the country].—Mg. Jnl. Sept. 2 1916; p 596; pp 2; 35c.

Tungsten

De Wolf, William P.—*Yavapai County, Arizona, Mines and Mills*. [A general review of current conditions, with some detailed information].—Mg. World Sept. 16 1916; p 503; pp 14; 10c.

Saint-Smith, Cecil E.—*Robson's Lodes of Wolfram, Tin, Etc., Tinaroo, North Queensland*. [An account of exploring operations and the geology and occurrence of the minerals].—Queen. Govt. Mg. Jnl. Aug. 15 1916; p 368; pp 1½*; 35c.

Zinc

De Wolf, William P.—*Yavapai County, Arizona, Mines and Mills*. [A general review of current conditions, with some detailed information].—Mg. World Sept. 16 1916; p 503; pp 14; 10c.

Parmelee, H. C.—*Recent Developments in Zinc Concentration Practice in the Joplin District, Missouri*. [Details of results on the jigging and table methods now used. The possibilities of flotation are also reviewed].—Met. & Chem. Engg. Sept. 15 1916; p 319; pp 2¾; 35c.

Speed, F. B., Jr.—*Lead-Zinc Mining in Virginia*. [A review of operations].—E. & M. J. Sept. 16 1916; p 511; pp 4; 25c.

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—*Quebec Mining Industry—A Review of the First Half of 1916*. [Brief accounts of operations at various properties].—Canadian Mg. Inst. Bull. Sept. 1916; p 796; pp 4; 50c.

(II) NON-METALS**(A) FUELS****Coal Fields and Mining**

Cameron, W. E.—*The Ipswich Coal Field, Queensland*.—Queen. Govt. Mg. Jnl. Aug. 15 1916; p 371; pp 1*; 35c.

Crankshaw, H. M.—*Mining Methods Employed in the Anthracite Field*. [A description of the stratigraphy and details of methods of underground operation and mining].—Coal Age Sept. 1916; p 452; pp 4*; 20c.

Gray, F. W.—*Nova Scotia Coal Production*.—Canadian Mg. Inst. Bull. Sept. 1916; p 801; pp 2; 50c.

Loftus, N.—*New Theory for Coal Formation*. [Says that coal was formed from the decomposition of carbon dioxide, which gas was near the earth's surface before mountains were made].—Coal Tr. Bull. Sept. 15 1916; p 41; pp 1½; 25c.

Pearce, William.—*Consumption of Coal in the Prairie Provinces*. [Details for provinces, prices, etc., are included. Considerable of the information is tabulated].—Canadian Mg. Inst. Bull. Sept. 1916; p 790; pp 5½; 50c.

Powell, J. W.—*The Season of Explosions*. [Treats on the danger of winter as a time when most mine explosions occur].—Coal Age Sept. 16 1916; p 458; pp 2¼; 20c.

Reed, Frank.—*Coal Mining Under the River Waikato and Lake Hakanoa, New Zealand*. [Abst. from the annual report of the government].—Coll'y Guard. Sept. 1 1916; p 399; pp 2½*; 35c.

Tompkins, Norton.—*Explosive Gas in Coal Mines*. [Information gained while studying evidence in regard to Bath thermal springs].—Coal Tr. Bull. Sept. 15 1916; p 48; pp 3; 25c.

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description of the storage plant is given].—Coal Tr. Bull. Sept. 15 1916; p 35; pp 1½; 25c.

—*Iowa State Mine Inspectors' Report for the Biennial Period Ending Dec. 31, 1915*. [Reviews operations by counties, giving mine production and new equipment installed at mines, with accidents in the district in tabulated form].—State Mg. Bur. Report; pp 112.

—*Mechanical Equipment at Point-No-Point*. [Details of coal, water and steam handling at the Essex plant of the Public Service Electric Co., New Jersey].—Pract. Eng. Sept. 15 1916; p 771; pp 15¼*; 20c.

—*New South Wales in 1915*. [Reviews the production of metals in the country].—Mg. Jnl. Sept. 2 1916; p 596; pp 2; 35c.

Petroleum

Cox, Thomas.—*Methods and Costs of Producing Crude Petroleum in California*. [Details are given, with both tables, description and curves].—West. Engg. Sept. 1916; p 347; pp 6½*; 25c.

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—*Pipe-Line Transportation of Petroleum*. [Full financial, cost, construction and operation accounts of various pipe lines in U. S. are given].—U. S. Federal Trade Commission Report; pp 467*.

III. TECHNOLOGY**MINES AND MINING****Prospecting**

Brothers, Charles S.—*Mining and Prospecting in National Forests*. [Discusses the law affecting prospecting in national forests].—Mg. World Sept. 16 1916; p 493; pp 1¼; 10c.

Dunstan, B.—*Queensland Mineral Deposits, Australia*. [A detailed description of nature of occurrence, production, prospects and methods of concentration of asbestos ores].—Queen. Govt. Mg. Jnl. Aug. 15 1916; p 372; pp 3½*; 35c.

Shafts and Shaft Sinking

Reifsneider, L. B.—*Underground Mining in Cuba*. [A method which does not interfere with operations above in surface mining. The stopes are filled after being worked out].—E. & M. J. Sept. 16 1916; p 509; pp 2¾; 25c.

Sayre, E. A.—*Comparison of Two Methods of Shaft Sinking Through Soft Material*. [Abst. of a paper read before the A. I. M. E.].—Engg. & Cont. Sept. 20 1916; p 259; pp 5¼*; 20c.

Tunnels and Tunneling

Tillson, B. F.—*Hammer Drill Records at the Franklin Mines, New Jersey*. [From a paper read before the A. I. M. E. Results obtained in drifting, stoping, raising, etc., are given, with costs].—Comp. Air Sept. 1916; p 8123; pp 2½; 20c.

Mine Gas

Tompkins, Norton.—*Explosive Gas in Coal Mines*. [Information gained while studying evidence in regard to Bath thermal springs].—Coal Tr. Bull. Sept. 15 1916; p 48; pp 3; 25c.

Ventilation

Crankshaw, H. M.—*Mining Methods Employed in the Anthracite Field*. [A description of the stratigraphy and details of methods of underground operation and mining].—Coal Age Sept. 1916; p 452; pp 4*; 20c.

Supports: Timbers, Props, Stowing

Crankshaw, H. M.—*Mining Methods Employed in the Anthracite Field*. [A description of the stratigraphy and details of methods of underground operation and mining].—Coal Age Sept. 1916; p 452; pp 4*; 20c.

Sayre, E. A.—*Comparison of Two Methods of Shaft Sinking Through Soft Material*. [Abst. of a paper read before the A. I. M. E.].—Engg. & Cont. Sept. 20 1916; p 259; pp 5½*; 20c.

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— *Hoist Recorder for Mine and Elevators*.—Mg. World Sept. 16 1916; p 501; pp 1*; 10c.

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Transport

— *Pipe-Line Transportation of Petroleum*. [Full financial, cost, construction and operation accounts of various pipe lines in U. S. are given].—U. S. Federal Trade Commission Report; pp 467*.

Haulage and Conveying

Crankshaw, H. M.—*Mining Methods Employed in the Anthracite Field*. [A description of the stratigraphy and details of methods of underground operation and mining].—Coal Age Sept. 1916; p 452; pp 4*; 20c.

Green, Ravul.—*Actual Costs of Mine Haulage by Horses and Compressed Air*. [Abst. from the Canadian Mg. Inst. Bulletin. In the comparison detailed costs are given].—Comp. Air Sept. 1916; p 8116; pp 2; 20c.

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Storage

— *Coal Storage Plant on the Monongahela Innovation for River Operators that Is Arousing Keen Interest*. [A description of the storage plant is given].—Coal Tr. Bull. Sept. 15 1916; p 35; pp 1½; 25c.

Accidents

Powell, J. W.—*The Season of Explosions*. [Treats on the danger of winter as a time when most mine explosions occur].—Coal Age Sept. 16 1916; p 458; pp 2½; 20c.

— *"Air Blasts" in Mines* [Treats on these occurrences in foreign countries, principal among which is India].—Comp. Air Sept. 1916; p 8108; pp 2; 20c.

— *Iowa State Mine Inspectors' Report for the Biennial Period Ending Dec. 31, 1915*. [Reviews operations by counties, giving mine production and new equipment installed at mines, with accidents in the district in tabulated form].—State Mg. Bur. Report; pp 112.

Labor and Management

— *Iowa State Mine Inspectors' Report for the Biennial Period Ending*

Dec. 31, 1915. [Reviews operations by counties, giving mine production and new equipment installed at mines, with accidents in the district in tabulated form].—State Mg. Bur. Report; pp 112.

— *Welsh Miners' Wages, England*. [A general discussion of the same with wages given at various times].—I. & C. Tr. Rev. Sept. 1 1916; p 246; pp 1*; 35c.

Production

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Gray, F. W.—*Nova Scotia Coal Production*.—Canadian Mg. Inst. Bull. Sept. 1916; p 801; pp 2; 50c.

Matley, H. A.—*Canadian Metal Trades and Preparedness*. [Deals with the production and market prices of lead and copper in Canada. Separate reviews of provinces are given].—Canadian Mg. Inst. Bull. Sept. 1916; p 783; pp 7; 50c.

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— *British Columbia Annual Report of the Minister of Mines for 1915*. [Reviews metal production in general for the province and in detail for operating companies].—Mg. Engg. & Elect. Rec. Aug. 1916; p 76; pp 3½; 35c.

— *Iowa State Mine Inspectors' Report for the Biennial Period Ending Dec. 31 1915*. [Reviews operations by counties, giving mine production and new equipment installed at mines, with accidents in the district in tabulated form].—State Mg. Bur. Report; pp 112.

— *New South Wales in 1915*. [Reviews the production of metals in the country].—Mg. Jnl. Sept. 2 1916; p 596; pp 2; 35c.

— *Pipe-Line Transportation of Petroleum*. [Full financial, cost, construction and operation accounts of various pipe lines in U. S. are given].—U. S. Federal Trade Commission Report; pp 467*.

Accounts and Bookkeeping

Young, George J.—*Elements of Mining*. [In an elementary way each different operation and department of mining is taken up such as haulage, prospecting, blasting, drilling, etc.].—McGraw-Hill; books; pp 628*; \$5.

Mining Costs

Green, Ravul.—*Actual Costs of Mine Haulage by Horses and by Compressed Air*. [Abst. from the Canadian Mg. Inst. Bulletin. In the comparison detailed costs are given].—Comp. Air Sept. 1916; p 8116; pp 2; 20c.

Reifsneider, L. B.—*Underground Mining in Cuba*. [A method which does not interfere with operations above in surface mining. The stopes are filled after being worked out].—E. & M. J. Sept. 16 1916; p 509; pp 2½*; 25c.

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E. Results obtained in drifting, stoping, raising, etc., are given, with costs].—Comp. Air Sept. 1916; p 8123; pp 2½; 20c.

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Mining Miscellany

Eaton, S. Ford.—*Driving a 1200-Ft. Raise*. [A 10 by 20-ft. raise advancing at from 68 to 128 ft. per month. Methods employed and reasons for using the same are given].—E. & M. J. Sept. 9 1916; p 461; pp 3¾*; 25c.

Miller, Benjamin Le Roy; Singewald, Joseph T., Jr.—*Some Impressions of the Mining Industry in South America*.—Teniente Topics June 1916; p 11; pp 2½; 35c.

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MILL AND MILLING

Sampling

Young, George J.—*The Selection of a Method for Ore Treatment*. [On methods of testing and investigating new ores for refining treatment].—Met. & Chem. Engg. Sept. 15 1916; p 297; pp 2½; 35c.

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Belchic, George; Neal, Roy O.—*Surface Tension of Oil-Water Emulsions—A Flotation Theory*. [The surface tension of emulsions acid, alkaline and neutral are given for varying amounts of different kinds of oils as determined by the capillary method].—Mg. World Sept. 16 1916; p 487; pp 3*; 10c.

Gregory, S.—*Agreement Between Minerals Separation and the Inspiration-Ancón Companies*. [Gives the final conclusions arrived at as a result of the lawsuit in regard to flotation equipment].—M. & S. P. Sept. 16 1916; p 424; pp 2; 20c.

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Pearce, Jackson A.—*Flotation Tribulations*. [The results of operations and investigations made in the Idaho Springs district, Colorado].—M. & S. P. Sept. 16 1916; p 427; pp 4*; 20c.

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Dunstan, B.—*Queensland Mineral Deposits, Australia*. [A detailed description of nature of occurrence, production, prospects and methods of concentration of asbestos ores].—Queen. Govt. Mg. Jnl. Aug. 15 1916; p 372; pp 3½*; 35c.

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now used. The possibilities of flotation are also reviewed].—Met. & Chem. Engg. Sept. 15 1916; p 319; pp 2½; 35c.

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Cyaniding

Clevenger, G. H.; Morgan, Harry.—*Atmospheric Decomposition of Cyanide Solutions*. [Detailed results, tabulated data, description and curves relating to the loss of cyanide resulting from the atmosphere].—M. & S. P. Sept. 16 1916; p 413; pp 12*; 20c.

—*Decomposition of Cyanide*. [A general talk on the subject].—M. & S. P. Sept. 16 1916; p 407; pp 1; 20c.

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Mill Miscellany

Young, George J.—*The Selection of a Method for Ore Treatment*. [On methods of testing and investigating new ores for refining treatment].—Met. & Chem. Engg. Sept. 15 1916; p 297; pp 2¾; 35c.

METALLURGY

Electrometallurgy

Addicks, Lawrence.—*The Metal Tie-Up in Electrolytic Refining*. [A very complete description of the operation of electrolytic refining and results obtained at different stages in the process].—Met. & Chem. Engg. Sept. 15 1916; p 305; pp 8*; 35c.

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POWER AND MACHINERY

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Findlay, D. C.—*Electrification of a Modern Cement Plant*. [A description of the Oregon Portland Cement Co.'s plant].—Jnl. of Elect. Power & Gas Sept. 16 1916; p 218; pp 2*; 35c.

—*Surface Plant at Brodsworth Main Colliery, England*. [Turbines using mixed pressure steam are used. Hoist, boilers, compressed air, etc., are described].—Coll'y Guard. Sept. 1 1916; p 401; pp 1½*; 35c.

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Steam and Steam Engines

Hirshfeld, C. F.; Ulbricht, T. C.—*Steam Power*. [An up-to-date treatise of an elementary nature dealing with engines and accessories to be used as a text in colleges, though it is of no value to operators].—John Wiley & Sons; book; pp 420*; \$2.

—*Mechanical Equipment at Point-No-Point*. [Details of coal, water and steam handling at the Essex plant of the Public Service Electric Co., New Jersey].—Pract. Eng. Sept. 15 1916; p 771; pp 15¼*; 20c.

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IV. MISCELLANEOUS

Miscellaneous Costs

Cox, Thomas.—*Methods and Costs of Producing Crude Petroleum in California*. [Details are given with both tables, description and curves].—West. Engg. Sept. 1916; p 347; pp 6½*; 25c.

Richards, Frank.—*Some Notes on Belting*. [Abst. from Practical Engineer. Reviews faults in this method of power transmission and gives remedies for the same].—Comp. Air Sept. 1916; p 8099; pp 3½*; 20c.

Sheldon, Walter H.—*Uniform Cost Systems*. [A general discussion of ideas now in practice in cost work].—National Lime Mfg. Assn. Bull. 18; pp 8;

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Testing

Belchic, George; Neal, Roy O.—*Surface Tension of Oil-Water Emulsions—A Flotation Theory*. [The surface tension of emulsions acid, alkaline and neutral, are given for varying amounts of different kinds of oils, as determined by the capillary method].—Mg. World Sept. 16 1916; p 487; pp 3*; 10c.

Benedicks, Carl.—*A New Thermo-Electric Method of Studying Allotropic Changes in Iron or Other Metals*. [Abst.

from a paper read before the British Iron & Steel Inst.].—Met. & Chem. Engg. Sept. 15 1916; p 337; pp 3; 35c.

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Hicks, W. B.—*Simple Tests for Potash*. [In general the test consists of flame coloration peculiarities].—American Fertilizer Sept. 16 1916; p 30; pp 1¾; 25c.

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Ore and Metal Markets; Prices-Current

New York, Oct. 5, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Oct. 4 were as follows:

		New York. Cents.	London. Pence.
Sept. 28.....	69 1/2	32 7/8	
29.....	69 1/2	32 15/16	
30.....	69 1/2	32 7/8	
Oct. 1.....	69 1/2	32 7/8	
2.....	68 3/4	32 3/4	
3.....	68 3/4	32 3/4	
4.....	68 3/4	32 9/16	

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York—1916			London—1915	
	High.	Low.	Avg.	High.	Avg.
January	57 1/2	55 1/2	56.775	48.890	26.875
February	57	56 1/2	56.755	48.477	27.000
March	60 1/2	56 1/2	57.935	49.926	27.080
April	73 1/2	60 1/2	64.415	50.034	31.375
May	77 1/2	68 3/4	74.27	49.915	34.182
June	68 3/4	62 3/4	65.02	49.072	31.038
July	65	60	62.94	47.519	29.870
August	67	25	64	47.178	31.25
September	69 1/2	67 3/4	.....	48.68	32.18
October .....	.....	.....	.....	49.385	.....
November .....	.....	.....	.....	51.713	.....
December .....	.....	.....	.....	55.038	.....
Year .....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Business in copper last week was very extensive, despite the fact that it was mostly from domestic users. Producers and dealers took orders for 50,000,000 to 75,000,000 lbs. Negotiations were continued on the new allied inquiry for 200,000,000 lbs. copper. Demand has shown no cessation. Consumers who first reckoned that they were playing a safe game by covering first quarter requirements have now come into the market for second quarter needs. Some users who were dilatory in ordering for the first quarter are now paying 1@1 1/2 cts. more than they would have paid if they had heeded the warnings that a tremendous foreign order was pending.

It is really necessary to discuss the copper situation in superlatives rather than in current fact. The situation is almost to a stage where current business will be infinitesimal and still producers will be rushing smelters to capacity to fulfill their contractual obligations. Despite the strenuous efforts to increase refinery capacity the completion of additions has not added materially to the output. Over the month of September the actual refining capacity available was equal to a production of 175,000,000 lbs., but the important producers estimate the output at 165,000,000 lbs. Shortage of labor and inability to secure material for replacement of breakdowns are factors that cannot be overcome. Several plants in the west were closed for six days in September because of breakdowns and difficulty in securing parts. In the east three of the larger refiners had trouble in obtaining a full complement of workers. Thus, while it is probable that the new year will open with a refining capacity of 190,000,000 lbs. a month, it is not the belief of refiners that the output will reach that figure unless a startling change in labor and other conditions take place, developments that are not looked for.

Copper held very strongly at the advanced prices. Dealers and small resellers are cognizant of the inherent strength of the situation and are therefore less disposed to make concessions. Thus spot electrolytic sold at 29 1/2 cts., while October and November sold at 28 3/4 @ 29 cts. and December at 28 1/2 cts. Producers had no metal this side of December, for which month they also took business at 28 1/2 cts. Electrolytic for the first quarter sold at 27 1/2 cts. and for the second quarter at 27 cts. Spot casting copper advanced to 27 @ 27 1/4 cts., while for November producers of casting copper

asked 26 3/4 cts. and did not offer for December. Prime lake copper for November and December sold at 28 1/2 cts. cash.

Some private foreign consumers have recently figured in the market for copper to be shipped in November and December, but the majority of the producers are unable to accept orders for this early delivery. Now that the details attendant upon the allied order have been settled it appears that munition production on the other side has been expanded remarkably to consume the amount of copper that has been purchased. There are some producers who believe that before the end of the first quarter of next year the allies will be in the market for another block of copper to supplement the purchase just made.

The London market advanced steadily in standard and electrolytic copper. Last week electrolytic advanced £3 10s to £140, while standard moved up £2 10s in spot and £2 in futures. The fortnightly statistics received Tuesday show the total visible supply in Europe to be 10,371 tons, as against 11,668 tons on Sept. 15.

Quotations for copper per pound in New York for the week ended Oct. 4 were as follows:

(For Fourth Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
Sept. 28.....	28 1/2 @ 29	28 1/2 @ 29	26 1/2 @ 26 3/4
29.....	28 1/2 @ 29	28 1/2 @ 29	26 1/2 @ 26 3/4
30.....	28 1/2 @ 29	28 1/2 @ 29	26 3/4 @ 27
Oct. 1.....	28 1/2 @ 29	28 1/2 @ 29	26 3/4 @ 27
2.....	28 1/2 @ 29	28 1/2 @ 29	26 3/4 @ 27
3.....	28 1/2 @ 29	28 1/2 @ 29	26 3/4 @ 27
4.....	28 1/2 @ 29	28 1/2 @ 29	26 3/4 @ 27

Quotations for copper per ton at London for the week ended Oct. 4 were as follows:

	Standard Spot.	Futures.	Electrolytic.
Sept. 28.....	£117 10 0	£114 0 0	£139 0 0
29.....	118 10 0	115 0 0	140 0 0
30.....	118 10 0	115 0 0	140 0 0
Oct. 1.....	119 0 0	115 10 0	140 0 0
2.....	119 10 0	116 0 0	140 0 0
3.....	119 10 0	116 0 0	141 0 0
4.....	120 0 0	116 0 0	141 0 0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior—1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	28.00	28.00	28.75	17.758
October .....	.....	.....	.....	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

Month.	New York—Electrolytic—1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	28.00	28.75	17.705
October .....	.....	.....	.....	17.859
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

Month.	New York—Casting Copper—1916			London—1915	
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.766
February	27.00	24.12 1/2	26.031	102.760	63.392

March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	25.50	27.00	26.40	116.10	68.560
October	.....	.....	.....	.....	72.577
November	.....	.....	.....	.....	77.400
December	.....	.....	.....	.....	80.400
Year	.....	.....	.....	.....	.....

Tin.—Improved demand gave strength to the tin market last week, with sellers reporting a good turnover at higher prices. Large users were in the market for first quarter needs and quite a little covering was done in that direction, although at this writing sellers are less anxious to do business for the first quarter. Active absorption of the limits from the Straits acted to stimulate the eastern market and also that at London. The situation is gradually working towards a premium on futures over spot, a condition that the tin trade considers normal, but which has not prevailed in some time. The deliveries of tin in September amounted to 4025 tons, of which 3350 tons came from the Atlantic and 675 tons from the Pacific. The stocks and landing on Oct. 1 amounted to 4769 tons, this being a slight increase over the stocks and landing on Sept. 1. The deliveries are considered good, but the views as to the stocks and their effect on the market are varied. Straits tin on the spot advanced to 39½ cts., while spot Banka moved up to 38½ cts. Straits tin for November and December delivery sold at 39½ cts., while for the first quarter of next year business was done at 39½ cts. Singapore advanced £2 15s to £177 last week, while Straits tin at London advanced £4 2s 6d to £175 10s.

Quotations for tin per pound at New York and per ton at London for the week ended Oct. 4 were as follows:

	New York		London		Singapore, shlpments.
	Spot.	October.	Straits, spot.		
Sept. 28.....	39¼c	39¼c	£174 12 6		£175 10 0
29.....	39¼c	39¼c	175 10 0		177 0 0
30.....	39¼c	39¼c	175 10 0		177 0 0
Oct. 2.....	39¼c	39¼c	175 5 0		178 10 0
3.....	39¼c	39.30c	175 15 0		178 15 0
4.....	39¼c	39½c	176 17 6		179 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.386
September	39.50	38.00	39.50	33.13
October	.....	.....	.....	33.077
November	.....	.....	.....	39.375
December	.....	.....	.....	38.755
Year	.....	.....	.....	38.664

Lead.—Business in lead has continued on a good scale with the position of the metal very strong. Canada, Russia and Japan have placed large orders for October delivery and generally the situation is shaping for higher prices. The A. S. & R. Co. still adheres to its price of 7 cts. New York, but it is likely that an advance will be announced shortly. The producers are well sold up over October; in fact, some of them have no lead at all to sell for that month. Sales of about 5000 tons for export were noted last week. Domestic users have been actively covering needs over October. Independents did a good business for October at 7.10 cts. New York. Spot lots, which are very scarce, sold up to 7.25 cts., New York dealers being the sellers. For November delivery sellers are quoting 7.05 cts. New York and in some cases 7 cts. New York. The month of September was the best that the lead trade has had for a long time and the strength of the market is such that even the haphazard selling methods of some of the producers who have recently taken over the sales end of the business will not be likely to affect the market. Canadian ammunition makers have evidently taken some extensive contracts, as their inquiries for November and December lead are large. London advanced £1 5s in spot and £1 in futures last week, but has been easier this week.

Quotations for lead per pound at New York and per ton at London for the week ended Oct. 4 were as follows:

		New York		London	
		Indpts.	A. S. & R. Co.	Spot.	Futures.
Sept. 28.....	7.25c	7.00c		£31 10 0	£30 0 0
29.....	7.20c	7.00c		32 0 0	30 10 0
30.....	7.20c	7.00c		32 0 0	30 10 0
Oct. 2.....	7.15c	7.00c		31 10 0	30 10 0
3.....	7.10c	7.00c		31 15 0	29 10 0
4.....	7.10c	7.00c		31 15 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York				London	
	1916		1915. Avg.	1916. Avg.	1915. Avg.	
	High.	Low.				
January	6.20	5.50	5.926	5.730	31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	22.010
April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	6.75	6.88	5.875	29.760	25.750
July	6.85	6.25	6.37	5.738	28.035	25.611
August	6.70	5.95	6.32	4.750	30.260	22.150
September	7.10	6.70	6.88	4.627	31.25	22.953
October .....	.....	.....	.....	4.612	.....	23.932
November .....	.....	.....	.....	5.152	.....	26.240
December .....	.....	.....	.....	5.346	.....	28.884
Year .....	.....	.....	.....	4.675	.....	23.099

Lead Ore.—The production for the week ending Sept. 30 was about the same as during the previous week, prices were slightly down and the majority of the ores sold at \$74 per ton, though some few lots went at as high as \$76. The week's production in the Missouri-Kansas-Oklahoma district was 1,524,845 lbs. and the year's production to date was 77,797,107 lbs. These amounts had respective values of \$55,010 and \$3,242,021.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.60
September	78.00	65.00	72.50	48.25
October	.....	.....	.....	51.80
November	.....	.....	.....	63.00
December	.....	.....	.....	71.375
Year	.....	.....	.....	53.34

Zinc Ore.—In the Missouri-Kansas-Oklahoma district during the week ended Sept. 30, though prices remained at the same level at which they have been for the past number of weeks, namely \$65 to \$45, sales were much larger and the ore seemed to be more in demand. The production during the week was announced at 13,969,700 lbs. and the total for the year at 492,856,820 lbs. The week's and year's production was valued at \$395,638 and \$21,234,440.

Calamine.—The largest production during the week came from the Aurora camp and the demand for the ore remained fairly firm at from \$40 to \$45. The production for the week of 1,682,895 lbs. was some higher than during the previous week and was valued at \$27,993. The year's production to date was 24,017,130 lbs., valued at \$802,673.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	58.75	60.25
September	65.00	45.00	55.00	76.75
October	.....	.....	.....	82.40
November	.....	.....	.....	92.50
December	.....	.....	.....	87.00
Year	.....	.....	.....	102.95

Spelter.—Speculative buying of spelter by large dealers has furnished the bulk of the recent activity in this metal. Dealers believe that spelter at present prices represents a very profitable purchase, figuring that consumers who are neglecting to cover will readily pay higher prices when they enter the market. Dealers have bought heavily for last quarter and first quarter deliveries. To a certain extent the tremendous copper business is regarded as assuring an active and large

demand for spelter. Spot prime western advanced to 9.45 cts. New York and 9¼ cts. St. Louis, while brass special sold at 10% @ 11 cts. St. Louis for spot. Prime western for the fourth quarter sold at 9½ cts. St. Louis, but prices were advanced to 9¼ cts. St. Louis. For the first quarter business at first was done at 9 cts. St. Louis, but on the continued buying producers advanced their quotation an eighth cent. A few foreign orders for brass special and higher grades were noted. Consumers, as previously noted, are not inclined to purchase spelter for forward delivery. They feel that the metal has little chance of advancing sharply, but dealers by their actions in taking round lots, are giving vent to a belief that higher prices will prevail. The London market has been a nominal affair, the prices remaining at £52 for spot and £46 for futures for a number of days.

Quotations for spelter per pound at New York and per ton at London for the week ended Oct. 4 were as follows:

		New York.		London.	
		Spot.		Spot.	Futures.
Sept.	28.	9.25c	£52 0 0	£46 0 0	0 0
	29.	9.30c	52 0 0	46 0 0	0 0
	30.	9.30c	52 0 0	46 0 0	0 0
Oct.	2.	9.45c	52 0 0	46 0 0	0 0
	3.	9.70c	52 0 0	46 0 0	0 0
	4.	9.70c	54 0 0	48 0 0	0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York—			London—		
	1916	1915		1916	1915	
	High.	Low.	Avg.	Avg.	Avg.	Avg.
January	19.42½	17.30	18.801	6.519	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	13.98	15.825	89.507	67.326
June	13.62½	11.25	12.72	22.625	67.410	100.320
July	10.75	8.75	9.80	20.803	53.00	98.150
August	9.75	8.37½	9.11½	16.110	56.00	68.259
September	9.70	8.12½	9.22	14.493	51.30	64.400
October				14.196		64.196
November				16.875		88.240
December				16.675		89.153
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Scarcity of supplies and an improved demand have resulted in an advance in quicksilver selling, agents putting the price up \$2 a flask to \$77 per flask. Some domestic users have had great difficulty in securing spot lots. Powder makers have been in the market for forward supplies.

Antimony.—Dullness continues with prices shaded to 11 cts. for spot. Chinese importers are striving to curb the reaction, but domestic producers are stimulating orders by concessions.

Aluminum.—There has been a fair demand for aluminum, but sellers as a rule report that the amount of business done is unsatisfactory. Prices are nominally unchanged and it is felt that concessions could be obtained. No. 1 virgin ingots are quoted at 61@63 cts. per lb. in carload lots, while No. 1 remelted is held at 59@61 cts. and No. 12 alloy at 47@49 cts. Sheet aluminum for prompt shipment is quoted at \$85@100 per 100 lbs. in the outside market, while 1917 contracts are quoted at \$40.

Sheet Lead.—Makers of explosives have been active buyers of sheet lead and prices have again been advanced a quarter cent, full lead sheets going up to 9 cts. f. o. b. mill and cut sheets to 9.25 cts. f. o. b. mill.

Zinc Sheets.—Leading makers continue to quote 15 cts. base for zinc sheets. Demand is quite active and the recent activity in spelter may be the basis for higher prices on sheets.

Platinum.—An advance of \$5.00 an ounce has been made in platinum by leading refiners, hard platinum being advanced to \$91 an ounce and soft to \$96 an ounce.

Pig Iron.—Activity in steel making grades of pig iron continues unabated, while foundry grades are becoming more active with higher prices. The average price on Bessemer iron in September was \$21.9346, as against \$21 in August,

while the basic iron average was \$18.63, against \$18 in August. Sales of basic iron have been made at \$19 valley, while bessemer has sold at \$22 valley, these prices now being the minimums. Foundry iron prices have gone up 50 cts. to 75 cts. in various districts.

Ferromanganese.—English makers continue to quote \$165 seaboard for 80% ferromanganese, but have taken no business, although domestic producers who are quoting the same price have secured some sizable orders. The growing popularity of domestic ferromanganese is a cause of concern to English makers and further price concessions may soon appear.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.	1.75	to	2.00
Muriatic, 20 deg.	2.00	to	2.25
Nitric, 36 deg.	.06¼	to	.06½
Nitric, 40 deg.	.06¼	to	.07
Alcohol—U. S. P., gal. grain.	2.70	to	2.72
Denatured, 188 proof, gal.	2.68	to	2.70
Wood, 97 p. c.	.70	to	.72
Alum—Powdered, lb.	4.60	to	4.65
Lump, lb.	.04	to	.06
Ground, lbs.	4.10	to	4.12½
Ammonia—			
Muriate, white grain, lb.	.10	to	.10½
Muriate, lump	.17	to	.18
Arsenic—White, lb.	.06	to	.06¼
Red, lb.	.60	to	.65
Barium Chloride—Ton	110.00	to	115.00
Nitrate, kegs, lb.	.13½	to	.15
Bismuth—Metallic, lb.	3.15	to	3.25
Subnitrate	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.	4.50	to	5.00
Borax—100 lbs., car lots.	7.75	to	8.00
Coke—Connellsville furnace	3.25	to	3.50
Foundry	3.50	to	3.75
Copperas—Spot, lb.	1.50	to	2.00
Ferromanganese	165.00	to	.....
Ferrosilicon, 50%			85.00
Ferrotitanium, per lb.	.08	to	.12½
Fuller's Earth, 100 lbs.	.80	to	1.05
Glaucous Salts, bags.	.50	to	.75
Calcined			2.50
Iron Ore—			
Bessemer, old range, ton.			4.45
Bessemer, Mesabi			4.20
Non-Bessemer, old range.			3.70
Non-Bessemer, Mesabi			3.55
Lead—Granulated, lb.	.147½	to	.15¼
Brown sugar	.11½	to	.12
White crystals	.15½	to	.15¾
Broken, cakes	.14½	to	.15
Powdered	.17	to	.17½
Litharge, American, lb.	.09	to	.09½
Mineral Lubricants—			
Black summer	.13½	to	.14
29 gr., 15 c. t.	.14	to	.15
Cylinder, light, filtered, gal.	.21	to	.26
Neutral, filtered, lemon, 29 gr.	.37½	to	.38
Wool grade, 30 gr.	.19½	to	.20
Paraffin—High viscosity	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto	.22	to	.24
Benzine, 59 to 62°, gal.	.28	to	.28½
Nickel Salt, double.	.07¼	to	.08¼
Single	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.	.15	to	.18
Refined, bbl.			.12
Platinum—Oz. ref.	91.00	to	96.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.			32.00
Muriate, 80 to 85%, basis 80%, ton.	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%	400.00	to	450.00
Hard salt, man., 12.4% actual potash.	Nominal		32.00
Potassium—			
Bichromate	.39	to	.40
Carbunate, cal. 96 to 98%	1.30	to	1.35
Cyanide, bulk, per 100%	.75	to	1.00
Chlorate	.45	to	.50
Prussiate, yellow	.60	to	.62½
Prussiate, red	1.75	to	2.00
Salt peter—Crude, lb.	.12	to	.14
Refined	.28	to	.28½
Soda—Ash, 48% (43% basis), bbl.	3.12½	to	3.65
Strontia Nitrate, casks, lb.	.32	to	.35
Sulphur—			
Crude, ton	28.50	to	29.00
Roll, 100 lbs.	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.	.13½	to	.14
Crystals bbls., lb.	.29½	to	.30
Oxide, lb.	.44	to	.46
Zinc Chloride	.10¼	to	.11¼

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest						Paid in 1916	Total to date	Latest	
						Date	Amt.							Date	Amt.
Acacia, g.	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,915	\$1	\$.....	\$98,916	Sept. '01	\$0.01
Adams, s. l. c.	Colo.	80,000	10	.....	778,000	Dec. 18, '09	.04	Golden Star, g.	Ariz.	400,000	5	.....	120,000	Mar. 15, '10	.06
Adventure, c.	Mich.	100,000	25	50,000	50,000	July 20, '16	.50	Gold Fr. g.	Nev.	922,000	1	.....	92,111	Oct. 16, '09	.10
Alhambra, c.	Mich.	200,000	25	1,200,000	5,250,000	July 10, '16	3.00	Goldfield, c.	Nev.	3,569,148	10	.....	23,999,831	Oct. 31, '16	.10
Alaska Goldfields, c.	Alaska	250,000	5	.....	403,250	Jan. 10, '15	.15	Good Hope, g. s.	Colo.	600	100	.....	941,250	Jan. '08	.25
Alaska Mexican, g.	Alaska	180,000	5	.....	3,507,381	Nov. 28, '15	.10	Good Sp. Anchor, z. s.	Nev.	550,000	1	33,000	119,765	June 15, '16	.01
Alaska Mines Sec.	U. S.	800,000	25	.....	90,000	Nov. 1, '06	.....	Grand Central, g.	Utah	600,000	1	.....	1,545,200	Dec. 23, '16	.02
Alaska Treadwell, g.	Alaska	200,000	25	250,000	15,780,000	May 39, '16	.50	Grand Gulch, c. s.	Nev.	239,845	2.50	17,730	19,187	Sept. 6, '16	.03
Alaska United, g.	Alaska	180,200	5	54,000	2,045,270	Feb. 28, '16	.30	Granite, g.	Alaska	430,000	1	17,200	17,200	May 10, '16	.02
Allouez, c.	Mich.	100,000	25	450,000	650,000	July 15, '16	2.00	Gwin, g.	Cal.	100,000	10	.....	481,500	Feb. '06	.25
Amalgamated, c.	Mont.	1,538,829	100	.....	103,444,983	Aug. 30, '15	3.77	Hazel, g.	Cal.	900,000	1	.....	1,114,000	Jan. 5, '16	.01
Am. Sm. & R. com	U. S.	600,000	100	2,500,000	31,433,333	Sept. 1, '16	1.50	Hecia, s. l.	Idaho	1,000,000	0.25	1,110,000	4,855,000	Sept. 20, '16	.16
Am. Sm. & R. pf.	U. S.	600,000	100	2,625,000	57,421,384	Sept. 1, '16	1.75	Hercules, c.	Idaho	1,000,000	1	1,930,000	12,600,000	Sept. 18, '16	.20
Am. Sm. Sec. A. pf.	U. S.	170,000	100	765,000	11,435,938	July 1, '16	1.60	Hidden Treasure, g.	Cal.	30,000	10	.....	487,452	Sept. '00	.10
Am. Sm. Sec. B. pl.	U. S.	300,000	100	1,125,000	16,635,000	July 3, '16	1.25	Holy Terror, g.	S. D.	600,000	1	.....	172,000	Jan. '00	.01
Am. Zinc, L. & Sm	Mo.	192,120	25	2,756,180	3,805,000	Aug. 1, '16	1.50	Homestake, g.	S. D.	351,160	100	1,463,266	37,174,994	Sept. 25, '16	.65
Anacoda, c.	Mont.	2,331,250	50	11,666,250	175,911,271	Aug. 28, '16	2.00	Hope Dev.	Cal.	600,000	1	.....	5,000	Dec. 31, '15	.01
Annie Laurie, g.	Utah	25,000	100	.....	439,561	Apr. 22, '05	.50	Horn Silver, l. s. z.	Utah	400,000	1	40,000	5,152,000	June 30, '16	.05
Argonaut, g.	Cal.	200,000	1	55,000	1,695,000	Sept. 26, '16	.07%	Imperial, c.	Ariz.	500,000	10	.....	300,000	June 24, '07	.20
Arizona, c.	Ariz.	.....	.....	521,164	30,212,164	Apr. 1, '16	.....	Inspiration, c.	Ariz.	920,687	20	3,091,233	3,091,233	July 31, '16	2.00
Atlantic, c.	Cal.	100,000	25	.....	990,000	Feb. 21, '06	.50	Inter'l Nickel, com.	U. S.	1,673,384	25	7,948,674	33,451,411	Sept. 1, '16	2.00
Atlantic, c.	Cal.	84,819	5	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, pf.	U. S.	89,126	100	401,067	5,748,518	Aug. 1, '16	1.60
Bagdad-Chase, g. pf	Mont.	250,000	1	1,354,648	Nov. 1, '07	.04	Intern'l Sm. & Ref	U. S.	100,000	100	.....	4,100,000	May 2, '14	2.00	
Bald Butte, g. s.	Mich.	100,000	25	7,950,000	Dec. 31, '13	2.00	Interstate-Callahan	Idaho	464,999	10	2,092,455	4,649,900	Sept. 30, '16	1.50	
Baldwin, c.	Mont.	40,000	5	60,000	60,000	June 1, '16	.07%	Iowa, g. s. l.	Colo.	1,666,667	1	.....	270,167	Dec. 31, '15	.00%
Beck Tunnel, c.	Utah	1,000,000	0.10	.....	940,000	Nov. 15, '07	.02	Iowa Tiger, g. s. l.	Colo.	3,000	1	.....	25,179	Jan. 15, '16	.60
Big Four Expl.	Utah	400,000	1	100,000	110,000	Sept. 4, '16	.05	Iron Blossom, l. s. g.	Utah	1,000,000	1	260,000	2,750,000	July 30, '16	.16
Boards of Trade, z.	Wis.	120,000	1	.....	78,000	Jan. 15, '11	.05	Iron Cap pld. c.	Ariz.	33,481	10	6,422	29,803	July 1, '16	.35
Bonanza Dev.	Colo.	300,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Clad, g.	Colo.	1,000,000	1	.....	60,000	Nov. '06	.05
Booth (Reorganized)	Nev.	993,395	5	349,949	349,949	June 26, '16	.05	Iron Silver	Colo.	500,000	20	.....	5,050,000	Dec. 31, '16	.10
Boss, K.	Nev.	40,500	1	.....	40,850	Dec. 10, '14	.10	Isabella, g.	Colo.	2,250,000	1	.....	742,600	Mar. '01	.01
Boston & Colo. Sm.	Colo.	15,000	10	.....	402,350	Oct. '02	.75	Isle Royale, c.	Mich.	150,000	25	150,000	300,000	July 31, '16	1.00
Boz & Mont. Con.	Mont.	100,000	25	.....	63,225,000	May 15, '11	4.00	Jamison, g.	Cal.	390,000	10	.....	378,300	Jan. '11	.02
Breco, l. s.	Colo.	200,000	25	.....	220,000	Dec. 15, '13	.10	Jerry Johnson, g.	Colo.	2,500,000	10	.....	187,500	Nov. 5, '14	.00%
Brunswick Con. g.	Cal.	300,000	1	.....	203,315	Sept. 15, '16	.06	Jim Butler, g.	Nev.	1,718,020	1	343,604	515,406	Aug. 1, '16	.10
Bullion-B. & Champ	Utah	100,000	10	.....	2,768,400	July 11, '08	.10	Joplin Ore & Spelter	Mo.	400,000	5	62,000	62,000	July 22, '16	.04%
Bunker Hill Con. g.	Cal.	200,000	1	45,000	898,000	Sept. 4, '16	.07%	Jumbo Ext. g.	Nev.	1,550,000	1	194,000	684,998	June 30, '16	.05
Bunker Hill & Bull	Idaho	327,000	10	1,318,000	18,019,000	Sept. 5, '16	.10	Kendall, g.	Mont.	600,000	6	50,000	1,655,000	Apr. 3, '16	.10
Butte All. & S. C.	Mont.	75,000	10	814,662	1,084,119	Apr. 10, '16	10.50	Kenefick Zinc	Mo.	200,000	.....	60,000	80,000	June 20, '16	.10
Butte-Ballaklava, c.	Mont.	250,000	10	.....	125,000	Aug. 1, '11	.60	Kennecott, c.	Alas.	2,730,920	10	11,300,000	16,200,000	Sept. 30, '16	1.50
Butte Coalition, c.	Mont.	1,000,000	15	.....	4,700,000	Dec. 1, '11	.20	Kennedy, g.	Cal.	100,000	100	.....	1,801,000	June '00	.05
Butte & Superior, z.	Idaho	272,697	10	7,076,734	13,196,758	Sept. 30, '16	6.25	King of Arizona, g.	Ariz.	200,000	1	.....	398,000	Aug. 1, '06	.12
Cañadon, l. s. c.	Ariz.	2,605,000	1	708,350	1,586,011	Sept. 5, '16	.03	Klar Piquet, z.	Wis.	20,000	1	.....	157,500	Dec. 12, '15	.25
Calumet & Ariz. c.	Ariz.	641,923	10	3,849,622	26,897,847	Sept. 26, '16	2.00	Knob Hill, g.	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%
Calumet & Hecla, c.	Mich.	100,000	25	6,000,000	134,250,000	Sept. 22, '16	20.00	La Fortuna, g.	Ariz.	250,000	1	.....	1,200,500	Oct. '02	.01%
Can. Bldg. g.	Colo.	1,750,000	25	113,584	10,243,981	Jan. 1, '16	.17%	Lake View, g.	Utah	500,000	.05	60,000	114,800	June 2, '16	.01
Cardiff, l.	Utah	600,000	25	375,000	500,000	Sept. 19, '16	.25	Last Dollar, g.	Colo.	1,500,000	1	.....	180,000	Feb. 23, '03	.02
Carls, z. s. c.	Utah	600,000	25	.....	60,000	Dec. '06	.01	Liberty Bell, g.	Colo.	133,551	5	.....	1,762,795	Jan. 31, '16	.05
Centennial, c.	Mich.	1,000,000	1	190,000	100,000	Sept. 1, '16	1.00	Lightner, g.	Cal.	102,255	1	.....	331,179	June '06	.05
Centennial Eureka, c.	Utah	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Linden, z.	Wis.	1,020	10	.....	11,200	Dec. 31, '15	3.00
Center Creek, t. z.	Mo.	100,000	10	70,000	665,000	Sept. 1, '16	.16	Little Bell, s. l.	Utah	800,000	1	15,000	75,000	Apr. 22, '16	.05
Central Eureka, g.	Cal.	100,000	1	.....	799,152	Mar. 5, '06	.05	Little Florence	Nev.	1,000,000	1	.....	430,000	Jan. '08	.03
Century, g. s. l.	Utah	1,000,000	25	44,000	302,067	Feb. 15, '16	.06	Lost Packer	Idaho	50,000	1	.....	37,500	Oct. 23, '13	.25
Champion, c.	Mich.	100,000	25	5,610,000	15,610,000	Sept. 8, '16	6.40	Lower Mammoth	Utah	1,000,000	1	.....	67,000	Dec. 15, '15	.01
Chief Con.	Utah	892,960	1	132,323	483,596	Aug. 2, '16	.05	MacNamara, g. s.	Nev.	734,576	1	.....	46,500	Apr. 23, '06	.12
Chino Copper C.	N. M.	998,980	5	6,002,355	11,700,377	Sept. 30, '16	2.25	Magma, c.	Ariz.	240,000	5.00	350,000	600,000	Sept. '16	.10
C. K. & N. E.	Colo.	1,431,900	10	.....	171,828	Nov. 5, '04	.01	Mammoth, g. s. c.	Utah	400,000	10	60,000	2,380,000	June 30, '16	.05
Chit. K.	Alaska	100,000	1	.....	115,000	Feb. '04	.06	Manhattan-Big 4, g.	Nev.	762,400	1	.....	30,248	Aug. 15, '11	.02
Chit. K.	Alaska	100,000	1	.....	90,000	Jan. 1, '13	.10	Mary McKinney, g.	Colo.	1,309,252	1	25,067	1,169,306	July 28, '14	.02
Chit. K.	Alaska	100,000	1	.....	60,000	Dec. '03	.30	Mary Murphy, g. s. l. z.	Colo.	370,000	5	25,067	93,186	May 1, '16	.07
Chit. K.	Alaska	100,000	1	.....	425,900	Feb. 23, '16	1.00	Mass Con. c.	Mich.	100,000	.5	100,000	100,000	Aug. 15, '16	1.00
Chit. K.	Alaska	100,000	1	.....	2,600,000	Mar. 15, '13	.03	May Day	Utah	800,000					

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1915	Total to Date	Latest						Paid in 1915	Total to Date	Latest	
						Date	Am.							Date	Am.
Petro, g. s.	Utah	600,000	\$ 1	\$	\$55,000	Aug. 9, '06	\$0.04	Success.	Ida.	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03
Pharmacist, g.	Colo.	1,600,000	1	91,500	91,500	Feb. 1, '10	.00%	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Sept. 30, '16	1.00
Phelps, Dodge & Co	U. S.	450,000	100	9,000,000	57,371,527	Sept. 30, '16	8.00	Superior & Pius, c.	Ariz.	1,499,792	10	10,318,568	10,318,568	Dec. 21, '16	.35
Pioneer, g.	Al'ska	5,000,000	1	2,041,526	2,041,526	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	9,420,000	9,420,000	July 23, '07	4.00
Pittsburg, I. z.	Mo.	1,000,000	1	20,000	20,000	July 15, '07	.02	Tamarack-Custer. .	Idaho	2,000,000	1	106,675	106,675	Aug. 30, '16	.02
Pittsburg-Idaho, l.	Ida.	1,000,000	1	249,104	249,104	July 15, '13	.04	Tennessee, c.	Tenn.	200,000	25	5,206,250	5,206,250	Apr. 15, '16	.76
Pitts Silver Peak. . .	Nev.	2,790,000	1	840,600	840,600	Dec. 1, '14	.02	Tightner.	Cal.	100	100	160,000	160,000	Jan. 3, '14	. . . . .
Platteville, l. z. . . .	Wis.	600	60	179,500	179,500	June 15, '07	10.00	Tomboy, g. s.	Colo.	310,000	5	3,861,555	3,861,555	June 30, '16	.24
Plumas Eureka, g. . .	Cal.	150,625	10	2,831,294	2,831,294	Apr. 5, '01	.06	Tom Reed, g.	Ariz.	909,555	1	2,555,934	2,555,934	Sept. 5, '16	.01
Plymouth Con.	Cal.	240,000	5	289,300	289,300	Aug. 10, '16	.24	Ton-Belmont, g. . . .	Nev.	1,600,000	1	582,500	582,500	July 1, '16	.12%
Portland, c.	Colo.	3,000,000	1	10,447,080	10,447,080	July 20, '16	.03	Ton-Extension, g. s.	Nev.	1,272,501	1	413,650	413,650	July 1, '16	.15
Prince Con. s. l. . . .	Nev.	1,000,000	2	300,000	300,000	Sept. 5, '16	.05	Tonopah, g. s.	Nev.	1,000,000	1	450,000	13,450,000	July 21, '16	.15
Quartzite, g. s.	Nev.	100,000	10	375,000	375,000	July 31, '07	.20	Tonopah Midway, g	Nev.	1,000,000	1	250,000	250,000	Jan. 1, '07	.05%
Quicksilver, p. f. . . .	Cal.	43,000	100	1,931,411	1,931,411	Apr. 3, '03	.50	Tremblis.	Cal.	200,000	2.50	234,000	234,000	Apr. 28, '15	.02
Quip, g.	Wash.	1,600,000	1	67,000	67,000	Feb. 1, '12	.01	Tri-Mountain, c. . . .	Mich.	100,000	25	1,100,000	1,100,000	Oct. 30, '12	3.00
Quincy, c.	Mich.	110,000	25	1,210,000	22,987,500	Sept. 25, '16	4.75	Tuolumne, c.	Mont.	800,000	1	495,525	495,525	Apr. 15, '13	.10
Ray Con. c.	Ariz.	1,671,279	10	2,743,748	7,322,875	Sept. 30, '16	.75	Uncle Sam Con. s. .	Utah	500,000	1	470,000	470,000	Sept. 20, '11	.05
Red Metal, c.	Mont.	100,000	10	1,200,000	1,200,000	Apr. 1, '07	.40	Union Basin, z. . . .	Ariz.	835,350	1	167,070	167,070	Nov. 16, '15	.10
Red Top, c.	Nev.	1,000,000	1	128,175	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	50,000	100	6,125,000	6,125,000	Aug. 5, '07	1.75
Republic, g.	Wash.	1,000,000	1	85,000	85,000	Dec. 28, '10	.01%	United, c. com. . . .	Mont.	450,000	100	211,527	211,527	Oct. 15, '07	.60
Richmond, g. s. l. . .	Nev.	64,000	1	4,453,797	4,453,797	Dec. 23, '00	.01	United, z. l. pf. . . .	Mo.	19,555	25	40,000	40,000	Dec. 21, '12	.01
Rocco-Home, l. a. . .	Nev.	300,000	1	162,600	162,600	Dec. 22, '06	.02	United Copper, c. s.	Wash.	1,000,000	1	440,435	440,435	Jan. 1, '10	.04
Rochester Id. & L.	Mo.	4,900	100	190,846	190,846	July 1, '12	.50	United (Crip. Ck.) .	Colo.	4,009,100	1	3,749,000	3,749,000	Sept. 30, '16	18.00
Round Mountain, g.	Nev.	689,018	1	363,964	363,964	Aug. 25, '13	.04	United Globe, c. . .	Ariz.	23,000	100	11,000,000	11,000,000	Sept. 23, '10	5.00
Sacramento, g.	Utah	1,000,000	5	308,000	308,000	Oct. 22, '08	.00%	United Metals Sell.	U. S.	50,000	10	33,722,000	33,722,000	Sept. 9, '16	1.50
St. Joseph, l.	Mo.	1,409,466	10	1,761,830	12,029,729	Sept. 20, '16	.75	United Verde, c. . .	Ariz.	300,000	10	500,000	500,000	Jan. 1, '16	.50
St. Mary's M. L. . . .	Mich.	160,000	25	2,403,099	6,880,000	Sept. 18, '16	2.60	United Verde Ext.	Ariz.	1,000,000	50	414,075	414,075	Oct. 9, '03	1.50
Schoenh'r-Wal'nal	Ida.	10,000	10	90,000	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo.	59,188	100	1,775,930	1,775,930	July 15, '16	1.00
Scratch Gravel. . . .	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,455	100	7,590,745	7,590,745	July 15, '16	3.50
Seven Tro. Cn. g. s.	Nev.	1,443,077	1	86,076	252,532	Apr. 1, '15	.02%	U. S. R. & M. com	USMx	351,115	60	18,084,366	18,084,366	July 15, '16	.85%
Shannon, c.	Ariz.	300,000	10	750,000	750,000	Jan. 30, '13	.15	U. S. R. & M. pf.	USMx	486,350	60	462,179	462,179	Sept. 30, '16	.25
Shattuck-Ariz. c. . .	Ariz.	350,000	10	1,225,500	4,200,000	July 20, '16	1.25	Utah, c.	Utah	1,624,490	10	9,825,000	9,825,000	May 29, '16	.75
Silver Hill, g. s. . . .	Nev.	108,000	1	88,200	88,200	June 24, '07	.05	Utah-Apex, a. l. . . .	Utah	529,200	5	1,285,492	1,285,492	Aug. 15, '16	.60
*Silver King Coal'n	Utah	1,250,000	5	562,500	14,147,485	July 1, '16	.15	Utah Con. c.	Utah	300,000	6	10,000	10,000	May 29, '16	1.00
Silver King Con. . . .	Utah	637,582	1	127,516	942,373	July 22, '15	.10	Utah M. & T. f. . . .	Utah	750,000	1	207,600	207,600	Apr. 23, '10	.04
Silver Mines Expl.	N. Y.	100,000	100	250,000	250,000	June 16, '10	2.00	Utah-Missouri, z. .	Mo.	10,000	1	3,397,500	3,397,500	July 25, '16	.03
Sioux Cons. l. s. c.	Utah	745,389	1	872,105	872,105	July 20, '11	.04	Victoria, g. s. l. . .	Utah	250,000	1	649,486	649,486	May 15, '16	.02%
Skidoo, g.	Cal.	1,000,000	5	365,000	365,000	Oct. 2, '14	.01	Vindicator Con. g.	Colo.	1,600,000	1	1,050,000	1,050,000	July 1, '16	.05
Smuggler, a. l. z. . . .	Colo.	1,000,000	1	2,235,000	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g. . . .	S. D.	500,000	1	40,000	40,000	June 28, '16	.10
Snowstorm, c.	Idaho	1,600,000	1	1,169,610	1,169,610	Oct. 13, '01	.01%	West Hill, c.	Colo.	10,000,000	1	400,000	400,000	July 1, '16	.02
Socorro, c.	N. M.	377,342	6	56,599	136,070	Aug. 1, '16	.05	West End Con. . . .	Nev.	1,788,486	1	53,403	53,403	Jan. 15, '16	.05
South Eureka, g. . . .	Cal.	299,981	1	167,920	1,409,754	Aug. 15, '16	.07	West Hill, c.	Wis.	20,000	1	8,000	8,000	June 29, '16	.20
South Hecla.	Ida.	500,000	1	39,450	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal.	200,000	10	60,000	60,000	Aug. 25, '16	.10
So. Swansea, g. s. l.	Utah	900,000	1	287,500	287,500	Apr. 3, '04	.01%	Wilbert, c.	Ida.	1,000,000	1	30,000	30,000	Oct. 4, '16	.15
Spearfish, g.	S. D.	1,600,000	1	165,600	165,600	Jan. 7, '09	.01	Wolverine, c. . . .	Mich.	60,000	25	8,760,000	8,760,000	Apr. 1, '16	6.00
Standard Con. g. s.	Cal.	178,394	10	5,274,408	5,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,674	15	1,597,685	1,597,685	Apr. 31, '12	.05
Standard, c.	Ariz.	425,000	1	69,600	69,600	Sept. 8, '06	.50%	Work, g.	Colo.	1,500,000	1	2,127,685	2,127,685	June 30, '16	.07
Stewart, l. z.	Idaho	1,238,362	1	2,043,297	2,043,297	Dec. 31, '15	.05	Yak.	Colo.	1,000,000	1	167,600	167,600	Jan. 1, '13	.01
Stratton's Crip. Ck.	Colo.	2,000,000	1	300,000	300,000	Sept. 6, '08	.02%	Yellow Aster, g. . .	Cal.	100,000	10	1,181,759	1,181,759	Sept. 1, '16	.02
Stratton's Ind.	Colo.	1,000,000	5	5,028,556	5,028,556	Dec. 23, '06	.12	Yellow Pine, z. l. s.	Nev.	1,000,000	1	1,693,008	1,693,008	Sept. 1, '16	.19
Str's Ind. (new) g.	Colo.	1,000,000	.30	160,000	691,250	Jan. 31, '16	.16	Yosemite Dredg. . .	Cal.	24,000	10	102,583	102,583	July 15, '14	.10
Strong, c.	Colo.	1,000,000	1	2,275,000	2,275,000	July 9, '06	.02								

Corrected to October 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675.00.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization						NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					
				Paid in 1916	Total to Date	Latest		Paid in 1916	Total to Date					Latest					
						Date	Am.							Date	Am.				
Ajuchitlan.....	Mex...	60,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabilas.....	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00				
Amistad y Concordia s	Mex...	9,600	50		429,358	July 15, '08	1.28	Le Roi No. 2, g.....	B. C.	120,000	25		1,527,320	Dec. 15, '15	\$0.24				
Amparo, s. g.....	Mex...	2,000,000	1	300,000	2,322,176	Aug. 10, '16	.05	Lucky Tiger.....	Mex...	715,337	10	379,129	3,642,520	Sept. 10, '16	.03				
Bartolo de Medina Mill	Mex...	2,000	25		103,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont...	2,247,692	1	202,293	4,010,061	July 1, '16	.03				
Batopilas, s.....	Mex...	446,268	20		55,870	Dec. 31, '07	.12%	Mexican, l. pf.....	Mex...	12,500	100		1,018,750	May 1, '12	3.50				
Beaver Con., s.....	Ont...	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.....	Mex...	240,000	10		660,000	Mar. 10, '05	.25				
Boleo, g.....	Mex...	120,000	20		721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex...	180,000	6		1,478,500	June 26, '14	.96				
British Columbia, c.....	B. C.	591,709	5		615,399	Jan. 6, '13	.15	Minas Pedrazzini.....	Mex...	1,000,000	1		497,600	Jan. 23, '11	.06%				
Buena Tierra.....	Mex...	330,000	6		160,390	Jan. 30, '15	.24	Mines Co. of Am.....	Mex...	900,000	10		4,958,600	July 25, '13	12%				
Buffalo, Ont.....	Ont...	1,000,000	1		2,787,000	July 1, '14	.06	Miner Corp. of Canada	Can...	2,075,000	1		1,037,500	Mar. 30, '16	.12%				
Canadian Goldfields.....	Can...	600,000	0.10		237,099	July 15, '14	.01%	Montezuma, l. pf.....	Mex...	5,000	100		402,500	Nov. 15, '12	3.60				
Cananea Central, c.....	Mex...	600,000	10		360,000	Mar. 1, '12	.60	Montezuma M. & Sm.....	Mex...	500,000	1		100,000	July 20, '09	.04				
Cariboo-Cobalt.....	Ont...	1,000,000	1		295,000	Sept. 1, '15	.09	Mother Lode.....	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11				
Cariboo-McKinney, g.....	B. C.	1,250,000	1		56,250	Dec. 1, '09	.00%	Nalca, s. l.....	Mex...	100	300		3,190,000	Oct. 11, '09	\$283				
City of Cobalt.....	Ont...	600,000	1		138,375	May 15, '09	.01	N. Y. & Hond. Rosario.	C. A.	200,000	10	220,000	3,970,000	July 28, '16	.50				
Cobalt Central, s.....	Ont...	4,781,600	1		192,845	Aug. 24, '09	.01	Nipissing, s.....	Ont...	1,200,000	5	900,000	7,430,000	July 20, '16	.25				
Cobalt Lake, s.....	Ont...	3,000,000	1		465,000	May 29, '14	.02%	North Star, s. l.....	B. C.	1,300,000	1		633,000	Feb. 1, '12	.62				
Cobalt Silver Queen.....	Ont...	1,000,000	1		160,000	Dec. 1, '09	.03	Paloma, g.....	Mex...	30,000	100		99,400	Dec. 1, '12	.00%				
Cobalt Township, s.....	Ont...	199,282	6		1,042,259	Aug. 20, '14	.24	Panuco.....	Mex...	10,000	100		7,465,000	Nov. 4, '09	5.00				
Coniagas, s.....	Ont...	800,000	5	400,000	8,240,000	Aug. 5, '16	.25	Panoles, s. g.....	Mex...	120,000	20		6,451,687	Sept. 30, '13	1.25				
Con. Mfg. & Sm., g. & c.	B. C.	55,050	100	420,617	2,740,654	July 1, '16	2.60	Peregrina, pf.....	Mex...	10,000	100		328,656	Sept. 1, 1	3.50				
Crown Reserve, s.....	Ont...	1,999,957	1		6,102,408	July 15, '15	.03	Peterson Lake.....	Ont...	2,401,820	1	84,064	340,287	July 1, '16	.01%				
Dolores.....	Mex...	400,000	5		1,374,865	July 24, '11	.22%	Pinguico, pf.....	Mex...	20,000	100		790,000	Apr. 15, '13	.30				
Dome Mines, s.....	Ont...	400,000	10	600,000	1,000,000	Sept. 1, '16	.50	Porcupine Crown.....	Ont...	2,000,000	1	180,000	600,000	July 2, '16	.03				
Dos Estrellas, (El Oro)	Mex...	300,000	0.50		15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.).....	Mex...	5,000	15		963,360	Apr. 1, '16	1.00				
El Favor.....	Mex...	3,500	1		210,000	Apr. 30, '14	.01	Rambler Cariboo.....	B. C.	17,500	100	70,000	498,000	Aug. 15, '16	.10				
El Oro, g. & s.....	Mex...	1,147,600	1		9,136,492	July 1, '13	.24	Rea Mines, Leasing.....	Ont...	200,000	1		12,750	Feb. 20, '15	.06%				
El Rayo, g. & s.....	Mex...	260,020	2		140,410	Apr. 24, '11	.16	Right of Way.....	Ont...	1,685,500	1	16,855	6,650,614	June 15, '16	.00%				
El Triunfo, c.....	Mex...	2,000,000	1		20,000	Aug. 28, '11	.01	Rio Plata.....	Mex...	374,518	5		345,744	Feb. 1, '13	.05				
Esperanza, s. g.....	Mex...	450,000	5		12,521,250	Dec. 31, '15	.10	San Francisco Mill.....	Mex...	6,000	25		445,086	Oct. 15, '08	1.00				
Granby Con., c. g. & s.	B. C.	149,986	100	749,926	6,350,311	Aug. 1, '16	2.00	San Rafael.....	Mex...	2,400	25		6,799,260	Jan. 11, '12	2.00				
Greene-Cananea, c.....	Mex...	474,411	100	2,431,045	6,686,850	Aug. 28, '16	2.00	San Toy, s. l.....	Mex...	6,000,000	1.00		51,400	July 14, '13	.01				
Greene Con., c.....	Mex...	1,000,000	10	2,500,000	12,844,000	July 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex...	1,500,000	5	364,500	2,819,772	June 16, '14	2.4				
Greene Gold-Silver, pf.	Mex...	300,000	10		194,871	Mar. 28, '07	.40	Sa. Ger'y Guadalupe, g.	Mex...	60,000			3,866,000	Mar. 27, '09	1.25				
Guanajuato Con.....	Mex...	540,000	5		600,000	Oct. 8, '06	.07%	Sa. Maria del Par.....	Mex...	9,600	12%		866,000	Jan. 2, '13	2.50				
Guanajuato Dev., pf.....	Mex...	10,000	100		274,356	Jan. 1, '11	.30	Sonora Superior.....	Ont...	478,844		756,214	1,687,420	Sept. 15, '16	.30				
Guggenheim Explorat.....	Mex...	833,732	25	10,713,456	40,327,760	Apr. 3, '16	11.85	Soneda, s. l.....	Mex...	960	20		4,439,840	Oct. 17, '11	8.00				
Hallebury, s.....	Ont...	50,000	1		50,000	Apr. 6, '11	.60	Sorresra, g. s.....	Mex...	19,200	20		3,979,240	Jan. 5, '11	34.00				
Hedley.....	B. C.	120,000	10	180,000	2,003,520	Sept. 30, '16	.50	Standard, s. l.....	B. C.	2,000,000	1	450,000	2,250,000	Sept. 10, '16	.02%				
Hinds Con., g. & s. l.	Mex...	5,000,000	1		88,000	Feb. 27, '08	.02	Temiscaming & Hud. Bay	Ont...	7,761	1		1,940,250	Nov. 10, '14	3.00				
Hollinger.....	Ont...	4,000,000	5	1,440,000	5,610,000	Sept. 8, '16	.05	Temiskaming, s.....	Ont...	2,500,000	1	75,000	1,534,156	July 22, '16	.03				
Humbulo, c. g.....	Ont...	1,000,000	5	450,000	375,000	Feb. 27, '11	1.00	Zeblunian, c.....	Mex...	3,000	100		1,955,000	Jan. 1, '09	1.60				
Kerr Lake, s.....	Ont...	600,000	5		6,870,000	Sept. 15, '16	.25	Thorp-Cakes.....	Ont...	581,500	5	198,311	2,657,500	July 13, '16	12%				
La Blanca.....	Mex...	140,000	20		2,776,700	Mar. 2, '16	.05	Threlway, s.....	Ont...	1,000,000	1		1,061,988	July 1, '09	15.00				
La Republica, s.....	Mex...	400,000	5		110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.....	Ont...	1,416,690	1		656,386	Oct. 20, '13	.05				
La Rose Con., s.....	Ont...	1,498,627	5	224,793	5,611,913	July 20, '16	.05	Yukon, f.....	Y. T.	3,500,000	5	757,500	8,370,610	Sept. 30, '16	.07%				

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Pinos Altos District, Grant County, New Mexico

CLIFFORD C. BLOOD.

Grant county, New Mexico, produces more kinds of minerals than any district in the southwest. Copper, gold, silver, zinc, lead, manganese and many others in smaller quantities are listed in the output. More copper and more silver is shipped from this county than any in the state. The recent sales of the Carlisle mines in the Steeplecock district, the Austin group in the Burro mountains and the Silver Cell in the Pinos Altos mountains are examples of the activity. The town of Pinos Altos, almost in the center of the district from which it takes its name, is 9 miles from

the earliest ranches in the county were those now incorporated in the holdings of the Silver Cell Mining Co. Early in the 80s the Dimmicks acquired title to the property. Clinton Dimmick, while herding cattle just outside the ranch property, one day picked up a slab of rock which was very heavy. Taking it home he and his brother made an examination and found it full of native silver. The Dimmicks worked the property themselves, sinking on the site of the first discovery, and although there has been several lessees of the property they steadfastly refused to let it go until



HOIST AND POWER PLANT, SILVER CELL.



THE SILVER CELL PROPERTY.

Silver City, northwest. The Chino Copper Co.'s Santa Rita mines are northeast, and the Phelps-Dodge Burro mountain holdings are southeast. Unique is the Pinos Altos district in that although surrounded by some of the richest copper mines in the country, there is little copper found in its confines. Still more unique is the Silver Cell property, when it is understood that the Pinos Altos district being primarily a gold district, yet the Silver Cell is almost totally high-grade silver. It is a mile south of Pinos Altos and 8 miles from the railroad at Silver City.

Pinos Altos was the first county seat of Grant county before its more prosperous neighbor took that honor, and in the early days played no inconsiderable part in the affairs of this part of the state. Two of

this year, when they sold their holdings to the present owners.

The property includes six patented claims, known as the Silver Cell group and comprising the Silver Cell, Climax, Mangus, Keystone, Black Terrier and Wedge. They were surveyed on Feb. 14, 1900, by Charles E. Chester. The two patented homesteads of 160 acres each, joining the group of claims, and themselves highly mineralized, make the property 440 acres in extent.

The region is probably of Archaean era, being a complex of highly metamorphic rocks containing feldspar, with a sort of hornblende schist regularly intruded in diorite granite. It is of granite porphyry formation. Dikes containing quantities of iron py-

rites range through the district in a general northeast-southwest direction. The ore veins follow the guidance almost parallel to the porphyry. Ligulas of granite thrust into the metamorphics is a feature of contacts. There are evidences, though not conclusive, of an early glacial period. West of this district there seems no accounting for the surface conditions except by the theory of an early river bed in Mesozoic or even Paleozoic age. This is not substantiated.

The veins, though not of the latest structural period, are probably of the Tertiary age. They are well defined in places and in others almost hidden. One of two reasons must account for the station, either the fact of an earlier glacial period, or a formation not later than the Tertiary. They vary in width on the surface from mere rays to 2 ft. and widen greatly with depth. Both the hanging and the foot walls are granite porphyry, the foot wall frequently gneissoid. No replacement of the wall rock is noticeable and careful tests have found no value outside the regular course of the vein matter.

The Various Ores.

Silver in native state, locally known as wire silver, occurs in vugs, breccias and chimneys, the latter much more numerous. Huge lumps are usual. The chimneys persist with depth and generally follow the mode of the veins in widening. Slabs of almost pure metal varying in width from a half-centimeter to 6 centimeters are sometimes found contiguous to the foot wall and conterminous to the eruptive. This is also found permeated through the whole fissure to a greater or less extent. The aggregation found in vugs ranges around 90% actual weight in silver.

Native silver sulphide, commonly called silver glance, is the second ore of value on the property for 300 ft. under the surface. It has a dark, lead-gray color and bright metallic lustre. It is always intermixed with the wire silver, with cones and cemented breccias of white and dark granite, flint and spar intruded with the ore. It is a very perseverent formation and distressing to the driller.

Pyrargyrite is a dark red silver ore, known as Ruby silver, a sulphide of antimony and silver, and is the value-giving ore of the property. On the 400 level pyrargyrite is seen easily to carry the value of the workings. This ore is reputed never to be found except in true fissure veins.

Proustite is a cochineal red or scarlet variety, being a sulphide of arsenic and silver. It is found in quantities.

Stromeyerite, sulphide of silver and copper, carries almost the only copper found on the property. It has a metallic lustre, comes in compact masses, and is steel gray to greenish in color. Only a few times has any of this valuable ore been recognized.

Stephanite is a combination of silver, antimony and sulphur, is an iron-black orthohombic mineral, commonly called brittle silver because of its propensity to crumble. On this property stephanite con-

tains so much sulphur as to change its color to yellow and is confounded with iron pyrite by those not familiar with the district. It is found in large masses in certain portions where the fissures widen.

Sternbergite is a sulphide of silver and iron, dark brown in color, and found in tabular crystals and laminae; remote from pyrargyrite, but near the argentite and free silver.

Cerargyrite, native silver chloride, or, as it is generally known, horn silver, is found in large quantities west of a certain wide porphyry dike which cuts through a corner of the property. It is white to pale yellow in color, but darkens on exposure to light.

Tellurides and bromides are not found. Some gold is washed in the canyons and in creek beds, color being found all over the property. Assays in the silver veins have found values from 50 cts. to several dollars, there being more gold value on the 400 level



200-FT. SHAFT ON SILVER CELL.

than nearer the surface. So far no attention has been paid to any gold found.

The veins are true fissures, probably several thousand feet in depth. At the 450 level on the Silver Cell vein, there is no evidence of it pinching out, but on the contrary is almost twice the width as on the surface. Every indication points to great depth.

I have tried in this short article to give a comprehensive perception of the Pinos Altos district in general, and the Silver Cell property in particular.

The Silver Cell Mining Co. is capitalized at \$300,000, par value \$1 per share. The present majority stockholders own three-quarters of the entire property, which they bought from the Dimmicks. The present officers and directors are: Tragedias de la Peña, president; Oscar Franke, vice-president; Hilario Losoya, secretary-treasurer and general manager.

Don Señor de la Peña is ex-governor of Sonora, and was one of the most influential factors in the old regime of Mexico, having held several cabinet positions as well. Oscar Franke is a son-in-law of Señor Peña, and is a mining man of high ability. Don Hilario Losoya is ex-governor of Durango, and a member of the Losoya family in that state.

Separating Metals from Flue and Bag House Dust

Metals such as bismuth and tellurium and cadmium are often contained in flue and bag house dust in sufficient quantities to pay to reclaim them. A process developed by R. H. Stevens, Salt Lake, Utah, for doing this, as well as separating the arsenic acid contained in the materials treated from cadmium, has been assigned to the U. S. Smelting, Refining & Mining Co. The diagram herewith shows the component parts of the process in their proper relation.

The ore, furnace products, flue or bag house dust is first roasted to a dead roast for the purpose of converting all cadmium sulphide into cadmium oxide, of volatilizing all volatile arsenic compounds, and of converting all non-volatile arsenic compounds into their corresponding arsenic acid compounds. The material is then ground or pulverized to any desired mesh. The pulverized material is then placed in a solution tank.

Dilute sulphuric acid is run into the tank and the solution and material are agitated until all the available sulphuric acid is consumed. The solution is then drawn off into containers. The material is treated with fresh dilute sulphuric acid one or more times to dissolve more of the cadmium. To dissolve the remaining cadmium, the material is then treated with a stronger solution of hot sulphuric acid. This strong acid is drained off and used for making weaker acid for treating fresh material. The material is finally washed with water. This water is usually added to the strong acid solution for diluting it to the proper strength for treating fresh material.

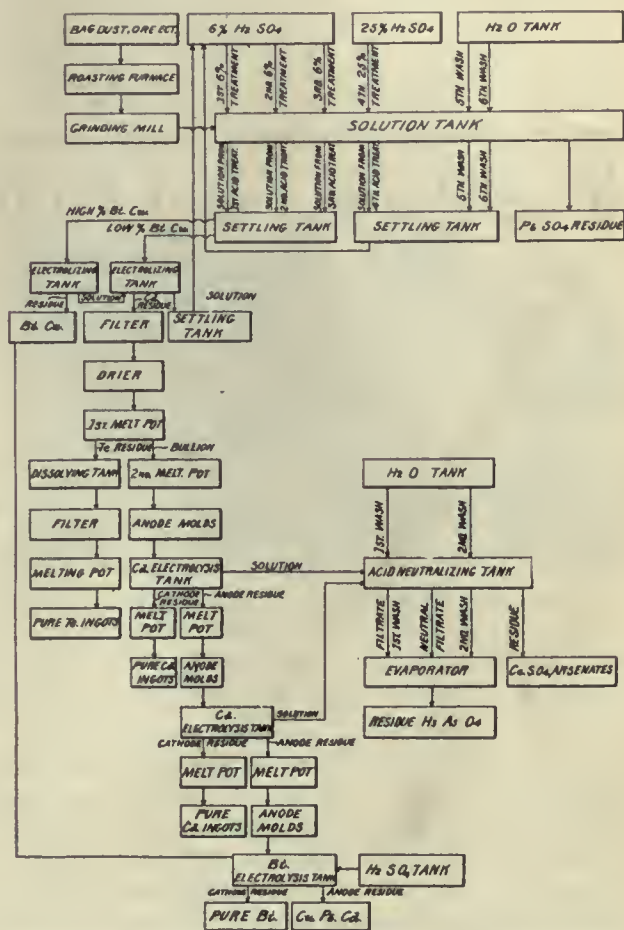
The clear solution containing the cadmium is led into electrolyzing tanks. If the solution contains any considerable amount of copper, bismuth, tellurium and the like, it is electrolyzed at a voltage preferably from 1.8 to 2.1 volts until most of the bismuth and copper are deposited on the cathodes, leaving the cadmium in the solution. The sulphuric acid solution obtained by treating the ground material with sulphuric acid, or in case copper, bismuth, tellurium and the like are present, the same sulphuric acid solution, after it has been electrolyzed to remove these metals, is led into an electrolyzing tank or tanks which are provided with easily removable false bottoms. The electrolysis is carried on at a voltage from 2.2 to 3.4 with a current density of from .01 to .05 ampere per square inch until the cadmium is deposited from the solution.

The cadmium will be deposited upon the cathode in a coherent form, or will be partially deposited on the cathode in a coherent form and partially fall from the cathode in a non-coherent form to the false bottom, or practically all fall from the cathode in a non-coherent form to the bottom, depending upon the composition of the solution.

The solution resulting from the cadmium electrolysis is treated for the separation of the arsenic acid contained in it. The cadmium from the cathode

or from the false bottom or both is filter-pressed and dried, after which it is melted under dry sodium hydroxide and powdered charcoal at a temperature of about 400 degrees centigrade. The arsenic and tellurium which may be present with the cadmium are dissolved in the fused sodium hydroxide. The flux formed by the sodium hydroxide and the tellurium and arsenic is dissolved in water and a current of air is blown through the solution, which causes the tellurium to be precipitated in a metallic state. The precipitate is washed, dried and cast for marketing.

The cadmium bullion which is drawn off from be-



STEVENS' PROCESS TREATING FLUE AND BAG-HOUSE DUST.

neath the sodium hydroxide flux is cast into anode plates preparatory to a further electrolytic purification. Metallic copper or metallic cadmium plates are used as cathodes, and the electrolysis is carried on in a solution of cadmium sulphate, sulphuric acid and a soluble salt of sulphocyanic acid, preferably an alkaline sulphocyanate. The solution is electrolyzed at approximately 0.4 volt with a current density at approximately five amperes per square foot.

The solution is preferably agitated during electrolysis so that a coherent coating of cadmium is formed on the cathode. By this process, pure cadmium is deposited on the anode, while copper, bismuth

and lead which may be contained in the impure cadmium bullion remain in the anode sludge.

The sulphocyanate prevents the copper from going into solution with little or no consumption of the sulphocyanate. The lead is prevented from going into solution by the sulphuric acid. The solution must contain a small amount of free sulphuric acid or the cadmium will not be deposited on the cathode in a coherent form.

The acidity of the solution is preferably maintained by placing in each end of the electrolyzing tank an insoluble anode and a copper or cadmium cathode. These electrodes are connected to an independent circuit of about 2.5 volts in which the current is regulated so that sufficient cadmium will be precipitated to maintain the proper acidity of the solution.

Some provision must be made to maintain the proper acidity, because more cadmium is dissolved at the cadmium bullion anodes than is required by the

electric current. The refined cadmium deposited on the cathodes is melted under sodium hydroxide or paraffin and cast for marketing. The anode sludge contains quite a proportion of cadmium so that it is remelted and cast into anode plates, and more of the cadmium is electrolytically refined.

The sludge resulting from the second refining process will be comparatively low in cadmium and high in copper, bismuth and lead. To separate the bismuth, this sludge is again remelted and cast into anode plates and is electrolyzed in a bath of bismuth sulphate, sulphuric acid, and a soluble salt of sulphocyanic acid, preferably an alkaline sulphocyanate, together with sufficient glycerol to clarify the solution. The remelted sludge forms the anode, and a metallic copper plate forms the cathode. The electrolysis is carried on at a voltage of about 0.4 volt at a current of approximately three amperes per square foot. The bismuth is deposited in a pure state at the cathode.

The Present and Future Supremacy of Metals.

Kirby Thomas, of New York, consulting mining engineer for some of the largest metal mining companies in the country, was in Chicago this week, and in an interview insists that the greatest problem that confronts the mining men of America today is that of present and future world supremacy.

"Before the war," said Mr. Thomas, "prices were made for us by Germany. Today England is trying to assume the control which lapsed at the beginning of the war. Temporarily prices are being made in this country, and the problem that confronts us is how to retain that control of world metal markets after the war. And that is the question which I hope will receive the careful consideration of the American Mining Congress when it meets in Chicago in November.

"It is a critical period in the mining industry, for today the industry is confronted with the problem of expansion incident to phenomenal prices—war prices, and a unique and irregular market, due also to the war. I say 'unique and irregular' because the warring countries pay us phenomenal prices one day and on the next day they want no more of the product. It is a case of prices moving up and down, and rapidly, at that. Then, too, the political aspect of the mining industry is vitally affected by the prospect of the foreign trade horizon of the United States, which means an acute problem after the war. With these fundamental factors at work the industry had to meet wage increase and increase in cost of material by improved processes, by better equipment, by decided improvement in mining efficiency.

"So you see that the questions which will come for solution before the American Mining Congress are broad and fundamental. No session ever held is, in my opinion, quite as important as will be this one at Chicago. And the most important problem of all is the question of control of the metal market. Are

we going to change from Germany to England? Will England be a more trying master than was Germany? And why, pray, change masters? Why, indeed!

"We can and we must be a world power in the mining industry. Clinging to this problem like a Siamese twin is that other question, 'What's going to happen to American mining interests abroad, in Mexico, in Canada, in Colombia, in Peru, in Chile?' Ask Washington.

"Today three-quarters of the mining engineering heads of the world come from England and America—and America leads England in this respect. Why, Russia has been calling for them as fast as they crop up. I just sent a man to Peru and another to Brazil.

"I asked this question: Should we be confined to sending out only our brains and keep our money at home. It depends on Washington. Protection of American capital invested abroad is what is needed. Capital is, as you know, timid. It will not go where it does not feel secure, where there is the slightest doubt about its return. When it goes out it wants not alone a 'God-speed-you' but an 'Au Revoir' from its own government. That is what English capital gets when it goes abroad. Of course, talent is never timid. Brains go where there is the greatest demand for them and the best pay. But what does that little return in payment for brains amount to compared to the enormous returns that come from the free and protected investment of millions upon millions in capital.

"And another fundamental problem which I will not discuss in detail is the tariff need of the mining industry.

"But above and beyond all I hope the Congress will discuss as comprehensively and thoroughly as possible the problem of building for the future upon the present abnormal demands for metal."

Gypsum and Lime Industry in Central Montana

O. W. FREEMAN.

Montana possesses pure and very extensive gypsum, lime and clay deposits, but has always been of minor importance in the production of gypsum, lime and cement products. The output has not been stimulated by the great markets close to those states leading in the production of these substances, but now with the increase in the demand from the northwest, the great reserves of plaster and construction materials in Montana will be utilized in increasing amounts.

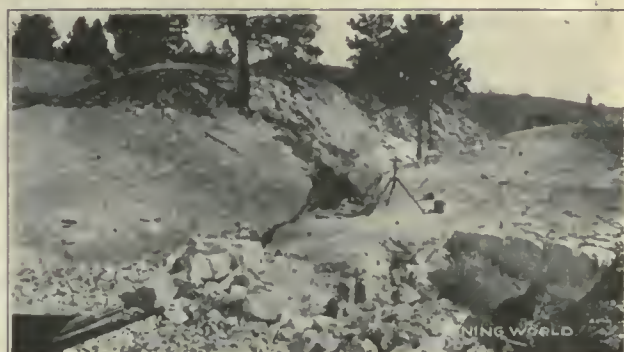
A small gypsum mill was operated for several years in southern Montana at Bridger, near Red Lodge, in Carbon county; but being several miles from a railroad could not produce and ship plaster of paris very cheaply and has been closed for some time. Another mill was operated successfully near Armington, southeast of Great Falls, for several years, on a gypsum deposit 25 to 30 ft. thick, but this mill has

The South Moccasin mountains are a small group in central Fergus county; about a mile south of them a dome uplift has occurred, probably the result of an igneous intrusion, and the overlying Cretaceous shales and sandstones have been removed by erosion, exposing the gypsum-bearing Jurassic strata. Spring creek has cut a valley through the southern part of this dome and both the great Northern and the Chicago, Milwaukee & St. Paul railroads have here built along the north side of the valley, their tracks coming within 50 yds. of the gypsum outcrops. Spur tracks have been completed and the shipping facilities are excellent.

The Hanover Gypsum Co. owned about 1000 acres on this dome, most of which is believed to be underlain by gypsum. Gypsum outcrops a few rods from the mill. The top bed is 7 to 11 ft. thick, and has been



HANOVER GYPSUM CO.'S MILL NEAR LEWISTOWN.



25-FT. GYPSUM OUTCROP IN MONTANA.

also been closed for several years. Near Great Falls a small mill of about 100-tons capacity has been operated for some time past, and until this summer was the only mill in operation in the state. Some gypsum has been quarried and shipped from Limespur in Jefferson county. Recently the Hanover Gypsum Co. has built a 400-ton modern plant on its property, 7 miles west of Lewistown, in central Montana, which is now the largest in the state.

Gypsum occurs in central Montana in two ways. First as selenite crystals disseminated throughout the black Bearpaw and Claggett shales of Cretaceous age; these crystals are of many different sizes and forms and are often twinned, and while abundant in the bad lands where erosion has carried away the shales in which they are found, are of no commercial importance. Second, as beds of gypsum rock and of disintegrated gypsum, or gypsite, which are the source of the commercial products. The age of the chief gypsum beds is believed to be Jurassic, and they were probably the result of evaporation of sea water, and consequent deposition of the gypsum from solution. Some gypsum beds, however, are late carboniferous, possibly in part Permian or Triassic.

disintegrated to form gypsite, which is either at the surface, or under slight cover, and will be worked by quarry methods. This bed is underlain by a few feet of limestone, which in turn is underlain by a bed of pure white gypsum 15 to 30 ft. thick, which will be mined, the limestone affording a good roof. Both the main quarry and the mine are about 1000 ft. from the mill, and the rock from them is loaded on the same track, which has a grade of $2\frac{1}{2}\%$, and is carried to the mill by gravity; mining costs should then be low. A third gypsum bed underlies the others, but it has not been explored much by drilling, and will not be mined at present. In summer the gypsum will come entirely from the quarry, but in winter much of it will be mined.

In the mill the gypsum first passes into a 24 by 36 Ehrsam jaw crusher that has a capacity of 1 ton per minute, and crushes the material to a 4-in. size. A rotary crusher of equal capacity next reduces this to a 1-in. size, after which it goes to the storage bins. The crusher building is separate from the rest of the mill, and an underground conveying belt carries the crushed gypsum from the bins, first over a rotary drier and then through a cylindrical drier 6 ft. in

diameter and 40 ft. long. The dried gypsum is then elevated to bins, from which it next goes to the Raymond pulverizing mill, which grinds it into a fine powder. It is then lifted by a Cyclone elevator and blown into the large calcining kettles, where most of the water of crystallization is driven off, thereby changing the gypsum into stucco or plaster of paris.

Besides various manufactured plasters, made by mixing with hair or fibre, the company makes plaster board, land plaster, gypsum tile and crushed gypsum for use as a retarder in Portland cement. The mill has a present capacity of 300 to 400 tons daily, but there is room for more calcining kettles, and by their installation the capacity of the mill could be easily doubled, as the capacity of the rest of the machinery is in excess of present requirements. About 30 men are employed at the plant, which represents an investment of about \$150,000. The Hanover gypsum is exceptionally pure and many carloads of crude have been shipped to other companies who wish to increase the percent of their product.

The company's property, after only a few days' operation, was sold the last of July, 1916, to Charles Boettcher and associates, who control the Three Forks Portland Cement Co. This concern is at present operating the sole cement plant in Montana, at Trident, a few miles from Three Forks. It is the intention to start work very soon on a new cement plant at Hanover, near Lewistown, which will cost approximately \$1,000,000.

Limestone outcrops in the South Moccasin mountains less than 2 miles away and is so situated that quarrying will be cheap and easy; transportation will be by tramway, and surveys have already been made. Very extensive beds of Cretaceous shales are also found within a short distance of the plant. With these favorable factors cement should be manufactured at a reasonable cost. Railroad extensions east from Lewistown are now being constructed, which will enable the new plant to supply plaster and cement to the Dakotas, as well as northern and eastern Montana.

The United States Gypsum Co. has just announced that it will immediately start work on a gypsum plant of several hundred tons daily capacity at Heath, about 10 miles east of Lewistown. Three hundred acres have been leased which contain exceptionally pure gypsum. It is estimated there is at least 7,000,000 tons easily available on this tract. Two miles south of Forest Grove pure thick beds of gypsum outcrop extensively. The Chicago, Milwaukee & St. Paul branch east from Lewistown passes close to both these deposits. Pure beds of gypsum outcrop extensively. The Chicago, Milwaukee & St. Paul branch east from Lewistown passes close to both these deposits. Pure beds of gypsum over 20 ft. in thickness occur in the foothills of the Big Snowy mountains, as on the East Fork of Spring creek, and near Irene, on the south side of the Snowies. A small amount of pure white gypsum has been produced in the foothills southeast of Moore,

but practically no work has been done on any gypsum deposits near the Big Snowy mountains. The gypsum found on the southwest side of the Snowies is exceptionally white and pure, and being found only a few miles from the railroad, might be utilized at a profit. Quantities of excellent gypsum in beds 20 to 30 ft. thick occur on Alaska Bench, east of the Snowies and near the N Ranch, northwest of Tyler. These deposits are, however, a long way from the railroad. They both appear to be of Upper Carboniferous age. Northwest of the Little Belt mountains a great gypsum bed outcrops where Jurassic rocks occur; this bed is very thick and pure, as near Kibbey, 30 miles from Great Falls. Farther south, to the southwest of the Little Belts, the gypsum beds become thin and impure. Large deposits of gypsum also occur in eastern Montana, and north of the Missouri river near the Bearpaw mountains and elsewhere. With such large reserves available, the manufacture of gypsum products in the near future will probably be restricted chiefly to those localities where railroads are close to the gypsum properties, the more important of which have been briefly mentioned.

The major part of the Little Belt and Big Snowy mountains in central Montana are composed of limestone, varying in composition from a dolomite to a very pure limestone, free from magnesium. A very considerable part of the nearby Judith, North Moccasin, South Moccasin and Little Rocky mountains are also composed of limestone. Limestone is found in easily accessible and inexhaustible quantities. The limestone is chiefly of Carboniferous age, and being harder than the soft overlying sandstones and shales, it outcrops in prominent cliffs that in most cases rise abruptly from the plains. Quarrying is cheap and simple, and where found near railroads, as in the Little Belts and South Moccasins, might be sold at a profit to the smelters for flux. The plains about the mountains are chiefly composed of Mesozoic and Tertiary formations, which are largely composed of shale, much of which would make good brick and cement materials. As in the case of gypsum, however, there is so much lime and clay that their utilization depends more on convenience to railroads than on the extent of the deposits themselves. Considerable lime formerly was burnt in small home-made kilns, especially in the Judith mountains, but after the advent of the railroad these small producers were unable to compete with foreign producers and were gradually abandoned. A modern limekiln should prove successful, and would be able to cheaply supply the nearby markets. Only a little lime, as near Helena, is made in Montana at present. Over 300 billion tons of coal, varying from lignite to bituminous, are found in central and eastern Montana, so fuel will always be cheap and plentiful. Electric power, mostly generated at Great Falls, can also be secured at reasonable rates.

Central Montana contains such large deposits of easily worked clay, gypsum and limestone, that there is no question but that with the increasing settlement

of the northwest several gypsum, lime and cement plants will be started to supply at least the local demands for such construction materials. There is also little question but that, barring accidents, their operation should prove commercially profitable.

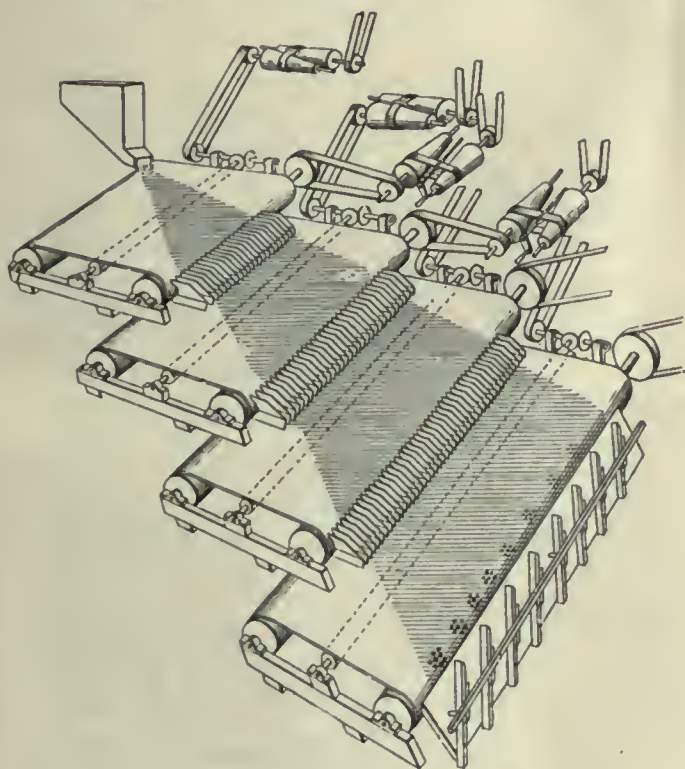
Sizing and Classifying Ores.

Three important features are embodied in a new type of sizing machine.

(1) The sizing units are independently operated and adjustable.

(2) The sizing surfaces consist of a number of separate units, each unit doing only a portion of the sizing, and the last one in the series completing the operation and separately delivering the sized products.

(3) Means for transferring the particles from one sizing surface to the next succeeding one in ap-



A NEW ORE SIZER AND CLASSIFIER.

proximately the same condition in which they left the surface, and at a higher point on the next succeeding surface than would be the case were the particles allowed to take their natural path of travel from one sizing surface to the next. It was found by experimenting that when extremely close sizing is required, for instance, such as is necessary to prepare certain kinds of ore pulp for the separation of their various constituents upon the usual form of concentrating or separating units, that the sizing can be better accomplished on a number of separate units, as each unit acts upon the material independent of the other, and the speed of the moving deck, its speed of vibration and its inclination can be independently controlled, thus obtaining a closer and more accurate adjustment for the work to be accomplished.

The device which carries out these ideas has been patented by H. M. Sutton and W. L. and E. G. Steele, all of Dallas, Tex. The accompanying illustration shows the method of operation, where the general trend of the ore stream is clearly defined. The aprons not only revolve but are vibrated at the same time, and, being on an incline, the coarser, heavier particles tend to move toward the lower side.

At the edges of the deck frames toward which apron travels are deflecting baffles so disposed as to receive and deliver the sized particles from one sizing surface to the next lower one in a manner to prevent their racing or bouncing.

U. S. Bureau of Mines Publications.

The following bulletins have been issued by the U. S. Bureau of Mines:

Bulletin 105. Black damp in mines, by G. A. Burrell, I. W. Robertson, and G. G. Oberfell. 1916. 92 pp.

Bulletin 116. Methods of sampling delivered coal, and specifications for the purchase of coal for the Government, by G. S. Pope. 1916. 64 pp., 5 pls., 2 figs.

The following technical papers have been issued:

Technical Paper 102. Health conservation at steel mills, by J. A. Watkins. 1916. 36 pp.

Technical Paper, 151. Coke-oven accidents in the United States during the calendar year 1915, compiled by A. H. Fay. 1916. 18 pp.

Technical Paper 159. Production of explosives in the United States during the calendar year 1915, with notes on coal-mine accidents due to explosives, and list of permissible explosives, lamps, and motors tested prior to June 1, 1916, compiled by A. H. Fay. 1916. 24 pp.

Technical Paper 161. Construction and operation of a single-tube cracking furnace for making gasoline, by C. P. Bowie. 1916. 16 pp., 10 pls.

Illinois Methods of Preparing Bituminous Coal.

An extensive study of the methods employed in the preparation of bituminous coal at Illinois mines has been made by the Engineering Experiment Station of the University of Illinois. The data and information which have required several years to compile have been tabulated and analyzed by Professor E. A. Holbrook and are now published as Bulletin 88 of the Engineering Experiment Station.

The results are subdivided into (a) Evolution of present preparation practice, (b) standard types of tipples or preparation plants, (c) impurities and breakage of coal, making preparation necessary, (d) sizing and sizes of Illinois coal.

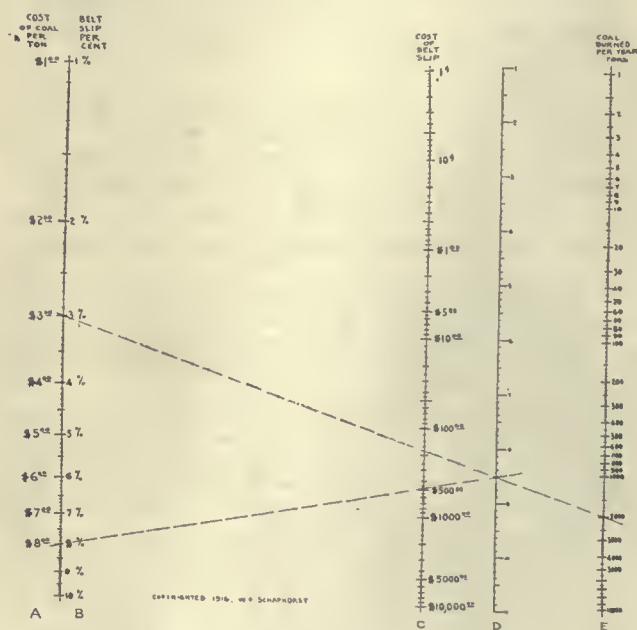
A record is presented of the yearly production of the different sizes of coal in Illinois over a period of 35 years, agreements between operators and miners as affecting preparation are discussed, and requirements for standardization are studied.

Nowadays in nearly all mines winzes and ore chutes in the floors of drifts are protected by gates to prevent men from falling into them.

A Cost Computer for Belt Slips.

Because of the fact that cost of belt slips is not given enough attention, this alignment chart has been devised which covers nearly every factory in the world in which all power developed is distributed to machines via belts. The vast majority of power plants for mills, shops and factories burn less than 10,000 tons of coal per year—the limit of the chart. The chart is built on the recognized rule: "Each per cent of belt slip costs 1% of the power." One per cent of the power, of course, represents approximately 1% of the coal pile. That is why the cost of coal and the cost of belt slip is so intimately linked.

For example, let us take a factory where the slip



COST CHART FOR BELT SLIPS.

of the main belt is 4%, and the slip of the smaller belts beyond the engine and main belt an additional 4%. The total slip is therefore 8%.

Let us further assume that 2000 tons of coal are burned per year in this factory, and that the cost of the coal is \$3 per ton. What is the cost of the belt slip per year? First join the \$3 (column A) with the 2000 tons (column E). Note the point of intersection in column D. Now join that point of intersection with the 8% slip (column B). The resulting cost is found at the intersection with column C and is \$480 per year.

These figures are not exaggerated in order to make them emphatic; \$480 per year is a serious enough loss to attract the attention of any factory, mill or other superintendent. There should be no slip at all. Slip is usually easy to stop. If it cannot be stopped there is something wrong with the design of the drive and alterations should be made.

The slip has not been carried beyond 10% because no factory would tolerate that amount, year in and year out. There is no question but that total slip

reaches and even passes 10% in many a plant, but it is usually noticeable, and after much squealing and running off, the belt is "fixed" in some way or other to reduce slip.

As will be noted, the limit of the chart is \$10,000. This would be the cost of belt slip where 10,000 tons of coal are burned per year; where coal costs \$10 per ton; where slip is 10%, and where all power is transmitted through belts. That, of course, would be an exaggerated case.

A straight edge may be used in computing with this chart, a rule or steel square, or anything else that is straight. A black thread is very handy, for when stretched tight a thread is straight, and as you can see on both side of the thread at once, it is quickly spotted in place.

Discovery of Lapis Lazuli—Important if True.

A unique and important discovery has just been made of lapis lazuli, or lazurite, about 100 miles west of El Paso, over the El Paso Southwestern railroad, in the northwestern part of Tres Hermanas (Three Sisters) mountains, 12 miles northwest of Columbus, in southern New Mexico. This is practically the first discovery of this rare and precious stone in quantity ever made in the United States, as only small deposits have been found in one other place in California. In this newly discovered vein there is believed to be an inexhaustible quantity of it, which can be mined from the very surface.

The discovery was made by W. J. Holmes, a mining man of El Paso, who, while operating a zinc mine in these mountains, chanced to notice some specimens in the cabin of an old negro prospector. Holmes, who had lived in San Francisco and had seen the lazurite rock in the famous lapidary of Kincaid that came from Russia, some 20 years ago, instantly recognized it and began prospecting for the vein, which he finally discovered last week.

The vein occurs in a fissure in granite, having a northwest-southeast strike, showing on the surface a width of 1 to 5 ft. and a strong outcrop of over 1000 ft. in length. Along the surface of the claim are large boulders of the rock scattered around, some of them weighing half a ton each, all of which are colored and banded or seamed with a beautiful blue color. Samples of the rock have been tested in the local assay offices and laboratories, and others have been polished, with the result that the rock is pronounced to be lapis lazuli. A claim has been located by Mr. Holmes, Claude A. Brown and Fred E. Cunningham of El Paso on the vein, which is named the Lapis-Lazuli Ultramarine mine. The owners are arranging to start development work at once.

The principal mineral products of Peru are copper, petroleum, coal and lead, their importance being in the order named.

Delaware Judge's Decision Favoring Minerals Separation, Ltd.

As mentioned in last week's issue of Mining and Engineering World, Judge Bradford of the U. S. District Court of Delaware has rendered a decision, in the suit of Minerals Separation, Ltd., vs. Miami Copper Co., favoring the plaintiff in two claims and holding invalid a third. Former attempts of the Minerals Separation, Ltd., to secure injunctions in western courts against the use of its process on the ground of infringement were unsuccessful.

We append an abstract of Judge Bradford's decision:

The court holds that "under the processes shown in the three patents a signal advance has been made in the art of ore concentration in point of simplicity, economy and efficiency and in their practice large commercial success has been realized." . . . He then cites other practices which, "however, were far from commercially successful, being wasteful of water, of power and of a considerable proportion of the metallic particles in the slimes which were carried up to the surface and were lost with the gangue.

"Without pausing at this point to consider other processes of ore concentration disclosed in the prior art hereinafter discussed an important and, indeed, vital difference between water or gravity concentration under such processes and concentration under the processes of the patents in the suit is that while in the former the metallic particles after being separated from the gangue in the ore pulp sank to the bottom, in the latter the metallic particles coated with an extremely thin film of oil became attached to air bubbles in the ore pulp and the bubbles with the attached metallic particles rise to the surface, forming a mineral froth of such coherency and permanency as to afford full opportunity for its removal from the surface for further treatment of the metallic particles. The ore pulp in the process of each and every one of the three patents in suit consists of a mixture of water and crushed or pulverized ore, together with one or more other ingredients.

"In each the agitation of the pulp coupled with the introduction of air into it develops and distributes throughout the mixture small bubbles of air which attach themselves to the metallic particles to the exclusion of the gangue and rise with them and form metallic air froth on the surface readily removable therefrom, the gangue particles sinking to the bottom and being disposed of as refuse."

Judge Bradford in his opinion says that "the first patent in suit is what is known as an air flotation process in which the frothing agent consists of an oil or other immiscible substance, or material of an oily nature and the bubbles and metallic particles become attached to each other through affinity between the bubbles and the metallic particles enhanced by the coating of the latter with an extremely thin film of oil. The old water processes of ore concentration were in some features gravely objectionable.

"Under those processes it was desirable to avoid very fine grinding of the ore as being calculated to cause the fine particles containing metal to escape with gangue particles and be lost. In these processes there were two things to be avoided: first, the crushing or grinding of ore to such a degree of fineness as to lead to the loss of metallic particles through their escape; and, secondly, too coarse crushing or grinding whereby particles of ore containing both metal and gangue might, with the gangue preponderating, too readily be carried to the surface and lost with the other gangue particles.

"The defendant admits that the air bubbles collect the metallic particles and the oil or other modifying agent in the mixture gives permanency to the mineral froth; that the attraction of the air bubbles for the metallic sulphide par-

ticles leads to the separation of those particles from the gangue so that in the absence of oil or other modifying agents in the pulp facilitating the formation of air or other gas bubbles, no process of concentration employing such bubbles is possible. . . . But there is an accentuated difference of opinion between the parties on the point of preferential affinity of oil for metallic particles as compared with the gangue.

"One of the principal questions in the case is whether patentable invention was involved in the discovery that the minute proportion of 0.1% of oil to the ore was sufficient for commercially successful operations in ore concentration. On this question I had some doubt during presentation of the case. But this doubt has since been removed. . . . There was, I think, patentable invention in the discovery made in March, 1905. Prior to that time there had been no suggestion in the art that the proportion of 0.1% of oil to ore or any other fraction of 1% of oil to ore, would or might result in successful concentration. The statutes provide for patenting new and useful inventions and discoveries, but a bare discovery unaccompanied by the exercise of any invention in utilizing or reducing it to practice would not justify or support a monopoly in the discovery. In the present case, however, the facts disclose not a bare discovery, but a discovery coupled with invention in usefully applying it. In such cases patents may properly be granted. The defendant lays stress upon the proposition that the reduction in the amount of oil in the process for the concentration of ore did not and could not involve patentable invention, but only an ascertainment of the proper degree in which oil should be used, which was readily discoverable by any one competent to conduct or superintend a process of ore concentration; and, further, that motives of economy would naturally have suggested a reduction in the quantity of oil to the extent of its excess over what was necessary for the accomplishment of the purposes of the process.

"But if such a reduction was obvious why is it that it was never made prior to the discovery in question. No one today understands how the use of only 0.1% of oil operates to secure the mineral froth of the first patent in suit. This is testified to by experts and admitted on both sides. . . . I perceive no escape from the conclusion that the discovery was patentable. To decrease the amount of oil used in an old process, so long as the characteristic mode of operation and result of such process are preserved, even though in less degree, does not as a general rule involve invention.

"The defendant contends that a substantial increase in the amount of oil involved used will not affect the nature or efficiency of the process of the separation, but will only add to the cost of carrying it on with an unnecessary amount of oil. But this position is in conflict with the decided weight of the evidence and with the showing of the experiments conducted by Higgins immediately prior to the time of discovery. It is satisfactorily proven that the process of first patent in suit depends upon the selective affinity of the air bubbles in the mixture for oil coated metallic particles, that the affinity is strongest when the film of oil surrounding the metallic particles is so thin as to be imperceptible to the senses, and that with any substantial increase in the quantity of oil on the metallic particles the character of the process is changed and its efficiency diminished for some reason as yet unrevealed.

"A great advance in the art of ore concentration has resulted from the process of the first patent in suit in efficient recovery of slimes. With the use of that process ore may be so finely ground as to insure the thorough separation of the metallic particles and gangue and great savings effected. The profit so saved in a single year from the output of the principal porphyry copper mines, including the defendant's, has been estimated by one of the expert witnesses as more than \$17,000,000.

"The defendant contends that there is nothing new in the employment of only a fraction of 1% of oil relative to the

weight of the ore in the process of the first patent in the suit. On the whole, I am satisfied that the first patent in suit must be sustained as to claims 1 and 12, but not as to claim 9. The two former are definite, specifying and limiting the amount of oil to be used; claim 1 mentioning 'a small proportion' . . . amounting to 'a fraction of 1% on the ore' and 12 'a fraction of 1% of oil on the ore.' Claim 9 mentions 'small quantity of oil.'

"On the question of infringement of the first patent I have no doubt. It was practically admitted by counsel for the defendant in opening the defense that it had infringed the three patents in suit by its operations at Miami within four months next before the filing of the bill. The defendant in its operations also used the minute proportion of oil mentioned in the first patent in suit. It does not use acid in its process, but this fact is immaterial so far as the question of infringement is concerned for the reason that it appears both from the claims and the description of that patent that the use of acid is optional. In the plaintiff's process the separation is effected through the rising of air bubbles to which are attached the metallic particles through the mixture to the top and the formation of a froth or scum on the surface, which can by simple means be removed with the contained metallic articles. In the defendant's process the separation is effected through the rising of air bubbles to which are attached the metallic particles through the mixture to the top and the floating away into a launder of either the original bubbles to which the metallic particles were first attached or succeeding and oncoming bubbles which have caught and buoyed up to the surface the metallic particles escaping from the bursting bubbles. The defendant contends that since its abandonment of its original infringing process at Miami it has not and does not infringe for the reason that it does not in its process produce the coherent and permanent froth of the process of the first patent. It appears from the evidence, it is true, that the bubble froth in the defendant's process is not as coherent and permanent as the froth of the process of the patent; but both are mineral froths and that of the defendant is sufficiently permanent to effect through air flotation an efficient separation of the metallic particles from the rest of the mixture. The defendant further insists that its process lacks violent agitation . . . but the description (of the patents) nowhere mentions 'violent agitation.'"

Regarding the third patent involved the court says: "I do not find any element of patentability in the process of this patent."

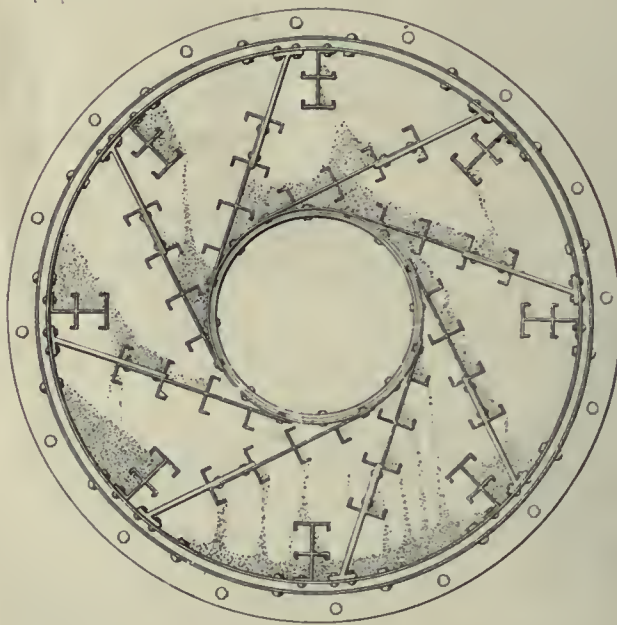
A decree was issued late last week by Judge Bradford staying an injunction obtained by Minerals Separation, Ltd., against the Miami Copper Co. pending appeal to the Circuit Court of Appeals, and the filing of a bond for \$250,000 by the Miami Copper Co. The former sought to enjoin the latter from continuing certain alleged infringement operations.

Leaching Copper.

At the Nevada-Douglas plant a somewhat new idea has been inaugurated in the way of hydrometallurgy. The original intention was to treat ores by the use of sulphuric acid as a leaching solvent, making the sulphuric acid from the gases obtained by roasting the sulphide. During experiments, however, it was found that the gases conducted directly from the furnaces into the leaching tanks proved to be a better solvent than sulphuric acid, besides saving time and expense. To manufacture sulphuric acid would cost from \$6 to \$12 per ton. Using the gases in place of the acid saves this expense. The gases are much more difficult to confine than the sulphuric acid solution and some trouble was at first encountered by leaking tanks, but the fault has now been remedied.

Drier for Finely Divided Materials.

It is claimed that paint materials, chemicals and the like are effectively and quickly dried in this revolving, cylindrical apparatus developed by W. V. Meyer, Chicago. It is in effect two cylinders, one within the other, mounted at a sharp incline so as to revolve on roller supports. A gas jet is directed through the interior of the inner cylinder, from the



REVOLVING CYLINDRICAL DRYING APPARATUS.

lower end, while the material to be dried is run in at the upper end and between the two cylinders. In between the cylinders are a large number of shelves having longitudinal ribs which retard the progress of the material on its passage through, and constantly lift it, throwing it upon the heated surface of the inner cylinder.

The litigation pending in the Utah courts between the Koering Cyaniding Process Co. of Detroit and the Wasatch Utah Mining Co. has been settled out of court. The mining company has settled, and in doing so has agreed to every demand made by the Koering people. This matter never should have been made a subject for litigation. The Koering Co. fulfilled every part of its agreement. On the other hand, the mining company, in order to cover up certain shortcomings, endeavored to repudiate its agreement. The whole trouble, it is claimed by the best of authorities, was that the mining company did not have sufficient ore for the plant to work on.



A 10,000-FT. METAL WATER FLUME IN COLORADO.

Remarkable Metal Flumes Built in the West

Some remarkable metal flumes are being built in sections at Denver, Col., at the Hardesty Sheet Metal Plant. One of these has a diameter of 8 ft. 4 ins. and a length of 2400 ft., the average height of structure being 30 ft. It has concrete inlets and outlets and the approximate cost of structure was \$30,000, and was built for the Upperhanover Water Users' Association of Warland, Wyo. Some of the bents are 52 ft. in height.

A remarkable flume suspended on wooden truss was installed on the Greeley Poudre Canal at Greeley, Co., with a span of 70 ft. and a diameter of flume of 5 ft. Another metal flume on a steel structure was erected by the Twin Falls Canal Co. at Twin Falls, Ida. This flume is 14½ ft. in diameter and 300 ft. long.

A most interesting flume has been installed for U. S. Indian Service at Albuquerque, N. M. This is

a small flume, erected on steel, having concrete piers, which were cast in corrugated pipe. A great flume, 9 ft. in diameter and 10,000 ft. long, was installed in the Trinchera Irrigation District at Blanco, Col.

These flumes are used as short cuts across gulleys and low places, and are cheaper than detouring around the head of the draw, on grade with the canal, and have the advantage of shortening the canal, saving grade, eliminating seepage and preventing breaks. They are much cheaper and more durable than any kind of siphon construction, and have the additional advantage of being open, which prevents clogging with weeds, etc.

These flumes are semi-circular and have greater carrying capacity. In many places instead of the old, obsolete method of making an extensive and expensive earthen fill, with the canal at the top, liable to break at any moment, with seepage losses cutting down the



METAL WATER FLUME IN NEW MEXICO FOR U. S. INDIAN SERVICE.

supply of water, a metal flume is used to cross the low ground.

The drawing shows the details of construction of the Hess type of metallic flumes, also developed at Denver. In many instances the metallic flumes are attached to concrete head walls. It is only necessary to groove the concrete head wall section of a width and depth required to take the bed of the flume sheet, and set one anchor bolt at each end of groove and then fit cast shoes over these bolts under cross bar. When nuts are tightened down on cross bar, the shoes force the bevel bar collar into place, holding it securely and before attaching metal flume section to concrete it is necessary to fill the groove with fibre cement or oakum, then place flume section and register the bevel



SHOWING METAL FLUME UNDER CONSTRUCTION.

bar collar in the flume section groove. The shoes are placed over the ends of the bevel bar, the cross bar placed and then the nuts are tightened on the anchor bolts until bevel bar fits snugly in place.

This method gives absolutely water-tight joint, at the same time permits of adjustment should any part become loosened. Thus the first flume section becomes an expansion joint, and removes all danger of the flume being torn away from concrete through expansion and contraction. In cases where it is necessary to install both head walls before flume is assembled, the distance center to center of grooves in concrete must coincide very closely with exact length of flume; the groove in one head wall where last sheet is to be placed may be made 4 to 5 ins. in width to allow for any error of measurement. In such cases it is necessary to leave out anchor bolts and provide hole in concrete depth of anchor bolt and of diameter equal to width of groove. The last sheet is placed as above and then anchor bolts are adjusted to register with bead on outside of flume sheet and finally the anchor bolt is sealed with cement and after allowing the cement to set the above procedure follows.

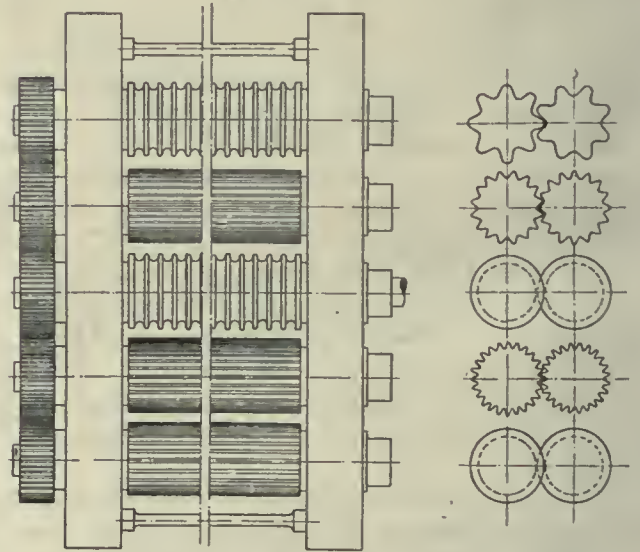
These metal flumes are sometimes used as canal lining to prevent seepage and washouts. Metal lining will not crack or corrode under the action of alkali and is consequently more durable and dependable than concrete. Many miles of concrete canal linings have been replaced with flume lining, which in such cases has been used without any supporting structure. The flume is placed in the excavation,

with a slight back fill on the sides to prevent overturn. The only lumber required is for cross carriers to act as spreaders and complete the joint, or timbers may be run parallel with the edges of the flume, with an occasional spreader across the flume to prevent the earth from springing the lining at the top.

Preparing Waste Metal for the Smelter.

In order to make waste metals again fit for smelting, it is necessary to disintegrate them and separate from them any such coating as enamel with which they may have been covered. This has usually been done by passing the waste through rolls, in such a manner as to bend it, and also to pass it through intermeshing cutting disks which cut the metal into strips.

Both operations of removing enamel and disintegrating the metal, can now be performed by one machine, which literally crumples and tears the metal to pieces. This consists of two intermeshing trains of rolls with fluted surfaces, one above the other. A plan and end view are shown. Part of the rolls have their flutings extending lengthwise and part have



METHOD OF PREPARING WASTE METAL FOR SMELTING.

flutings at right angles. In passing between the two trains the metal is crumpled and torn in every direction and the enamel removed at the same time.

The machine has been patented by Alfred De Back of Essen-on-the Ruhr, Germany, and assigned to the Goldschmidt Melting Co. of New York.

Important sources of secondary lead are skimmings, drosses, old metal, and alloys, as babbitt, solder and type metal. The recovery of lead by refining these metals constitutes, according to the U. S. Geological Survey, an integral part of the lead industry. This business is mostly carried on at small refineries scattered over the United States, but the large smelters and refineries working primary lead frequently find it advantageous to incorporate material from secondary sources.

What the Mining Companies are Doing

Copper Production in September.

Following is a list of some of the larger copper producers, with figures of production for previous months and years:

MIAMI COPPER.

	1916.	1915.	1914.	1913.
January	3,592,468	1,807,928	3,136,069	2,934,670
February	3,934,220	2,441,719	3,162,958	2,691,343
March	4,236,791	2,958,922	3,287,749	2,929,103
April	4,114,338	2,976,218	3,210,451	2,217,630
May	4,729,228	3,634,100	3,224,657	1,836,128
June	4,516,395	2,756,992	2,997,171	2,727,457
July	4,310,000	4,084,863	3,107,843	2,780,470
August	4,698,795	4,039,517	1,993,104	2,952,759
September	4,331,367	4,081,444	2,103,616	2,651,939
October		4,094,957	2,318,527	2,821,300
November		4,075,194	2,265,829	3,984,184
December		3,880,205	2,498,036	3,340,692
Total		41,832,059	33,296,010	32,867,666

BRADEN COPPER CO.

	1916.	1915.	1914.	1913.
January	4,556,000	2,586,000	2,426,000	1,484,000
February	2,842,000	2,728,000	2,362,000	1,178,000
March	5,406,000	2,522,000	1,801,000	1,472,000
April	4,166,000	2,496,000	2,720,000	1,338,000
May	3,882,000	2,364,000	2,480,000	1,148,000
June	2,258,000	2,542,000	662,000	1,808,000
July	2,760,000	2,890,000	1,332,000	1,046,000
August	2,616,000	2,858,000	4,532,000	1,672,000
September	2,970,000	3,222,000	3,130,000	1,332,000
October		3,726,000	2,078,000	2,006,000
November		3,684,000	2,402,000	1,592,000
December		3,826,000	2,298,000	2,122,000

INSPIRATION COPPER.

Month—	Pounds.	Month—	Pounds.
September	11,850,000	April	10,122,686
August	11,450,000	March	9,549,762
July	11,300,000	February	7,921,662
June	10,500,000	January	6,354,815
May	10,400,000		

EAST BUTTE COPPER.

Month—	Pounds.	Month—	Pounds.
September	1,760,100	April	1,501,000
August	1,849,120	March	1,306,900
July	1,893,120	February	1,277,160
June	1,639,560	January	1,060,000
May	1,517,000		

CHILE COPPER CO.

	Pounds.
January	2,066,782
February	3,144,480
March	3,536,796
April	3,702,327
May	3,664,000
June	3,610,000
July	3,574,000
August	3,020,000
September	4,038,000
Total	30,401,385

ARIZONA COPPER CO.

	1916.	1915.	1914.	1913.
January		3,632,000	3,474,000	3,100,000
February	2,414,000	3,200,000	3,062,000	3,000,000
March	3,610,000	3,540,000	3,281,000	3,200,000
April	5,140,840	4,200,000	3,570,000	3,100,000
May	4,900,000	3,516,000	3,092,000	3,200,000
June	4,800,000	3,674,000	3,742,000	3,000,000
July	4,100,000	3,390,000	3,300,000	2,600,000
August	4,500,000	3,600,000	3,738,000	1,800,000
September	4,150,000	*1,552,000	2,408,000	1,880,000

*Strike.

Standard Silver-Lead, B. C.

The financial statement of the Standard Silver-Lead Mining Co. for the month of July shows as follows:

Receipts—	
Preliminary settlements for 429 tons of silver-lead ore and concentrates	\$ 47,775
Zinc sales, including back settlements	63,890
Impress	211
Boarding house	4,696
Total	\$116,572
Less final settlements for May and zinc penalties for February and March	17,028
Net receipts	\$ 99,544
Disbursements—	
Ore production, including mining, tramming, milling, shipping, marketing, power, general expense, salaries, taxes, etc.	\$ 28,521

Boarding house	3,607
Development	3,591
Construction	3,628
Aylard tunnel	1,812
Store supplies	872
Home office expense	904

Total disbursements\$ 42,935

Cash statement—	
Net profit for July	\$ 56,609
Balance on hand July 1	289,772

Total	\$346,381
Dividend No. 44	50,000

Balance July 31.....\$296,381

Recapitulation—	
Cash in banks	\$219,209
Ore shipped but not settled for	122,678

Total	\$341,887
Vouchers payable and payroll	45,506

Balance July 31.....\$296,381

Shattuck-Arizona.

Following is the production figures given out by the Shattuck-Arizona Mining Co. for September, as compared with previous months:

	Copper lbs.	Lead, lbs.	Silver, ozs.	Gold, ozs.
September	1,566,446	233,800	26,928	419
August	1,699,575	253,143	30,542	508
July	1,397,445	171,091	22,525	314
June	1,416,080	61,889	24,636	367
May	1,383,963		25,865	326
April	1,366,830	130,570	19,849	353
March	1,594,330	714,379	32,187	393
February	1,523,137	499,155	27,139	630
January	1,565,224	267,853	30,369	514
Total 9 months	13,543,030	2,334,880	240,040	3,827

Alaska United Gold Mining Co.

Returns for the month of August of the Alaska United Gold Mining Co. shows as follows:

	R. B. Claim.	700 Claim.
Tons ore crushed	24,654	25,235
Tons concentrate saved	590.99	446.81
Estimated gross value of free gold	\$26,705.25	\$24,821.70
Estimated gross value of concentrate	27,026.50	25,346.70
Estimated total production	\$53,731.75	\$50,168.40
Estimated total realizable value	53,194.44	49,666.72
Operating expenses	33,254.17	54,989.45
Estimated operating profit	\$19,940.27	*\$ 5,322.73
Construction expenses	7,925.18	6,559.97
Estimated net profit	\$12,015.09	*\$11,882.70
Other income	3,730.00	
Yield per ton of ore milled	2.18	1.99

Alaska Mexican.

The Alaska Mexican Gold Mining Co. reports for August as follows:

Tons ore crushed	15,959.01
Tons concentrate saved	346.53
Estimated gross value of free gold	\$15,959.01
Estimated gross value of concentrate	14,579.20
Estimated total production	\$30,538.21
Estimated realizable value	30,232.83
Operating expenses	16,461.08
Estimated operating profit	\$13,771.75
Construction expenses, etc.	4,606.09
Estimated net profit	\$ 9,165.66
Other income	3,730.36
Yield per ton of ore milled	2.32

*Loss.

Granby Con. Co., British Columbia.

Granby Con. produced in the fiscal year ended June 30, 42,198,083 lbs. of copper, 487,845 ozs. of silver and 44,848 ozs. gold from 1,897,251 tons of ore. Ore reserves were estimated at 23,156,000 tons, of which 9,947,000 tons average 2 to 2½% copper; 3,718,000 tons from 1 to 1½% copper, and 9,491,000 tons less than 1% copper. The Anyox smelter produced 29,-

562,177 lbs. of copper. Smelting and converting cost \$1.804 per ton.

The cost to the company for producing copper during the year was 12.3 cts. per pound, while interest and extraordinary charges raised the cost to 12.98 cts. The average cost at the Anyox smelter was 8.54 cts., against 10.09 cts. in the previous year.

The company's balance sheet shows as follows:

Assets—	
Mine	\$15,123,568
Real estate, etc.	5,242,748
Shares of other companies.	575,643
Materials and supplies.	1,041,012
Metals and ores.	2,782,868
Cash	144,448
Total	\$24,910,288
Liabilities—	
Capital stock	\$14,998,520
Bonds	3,042,306
Accounts payable	280,775
Liquidator dividends	1,222
Surplus	6,587,471
Total	\$24,910,288

For the first time in its history Granby did a gross business exceeding \$10,000,000. Of this \$9,299,337 came from the sale of its own copper, the balance being derived from custom ores treated.

A feature of the year's operations was the low recovery of copper from ore treated, the average being 22.36 lbs. per ton, against 23.99 lbs. in the preceding 12 months' period.

Production and recoveries from the various holdings are shown in the following:

	1915-16		Lbs. copper.
	Tons ore.	Lbs. recovered.	
Phoenix	1,097,299	14.6	15,992,476
Hidden Creek	722,630	33.23	24,012,838
Alaska mines	66,617	32.90	2,192,796
Total company's mines	1,897,251	22.36	42,198,083
	1914-15		Lbs. copper.
	Tons ore.	Lbs. recovered.	
Phoenix	611,097	16.12	9,850,302
Hidden Creek	462,340	34.58	15,895,757
Total company's mines	1,073,437	23.99	25,746,059

*Including 10,705 tons from quartz mines which yielded an average of \$7.24 per ton in gold and silver.

J. P. Graves, one of the pioneers in Granby affairs and for years its general manager and one of the largest stockholders, has completely severed his connection with the company. Through the choice of Henry Bruere, former city chamberlain of New York, as his successor, the American Metal Co. representation on the board of directors was increased to two members.

Miscellaneous Company Notes.

The Rio Tinto Mining Co. has declared an interim dividend of 40s, compared with 35s 6 months ago, and 20s a year ago.

The Tonopah Extension results in August were as follows: Dry tons milled, 9247; ounces gold bullion produced, 1648.85; ounces silver bullion produced, 168,878; net profit, \$64,506.

John Hays Hammond and associates of New York have agreed to take controlling interest in a new corporation to take over Oro Belle Mines Co. at Hart, Cal., about 16 miles from Searchlight, Nevada county. Oro Belle has a shaft 850 ft. deep, with two veins.

Production and earnings of Goldfield Con. Mines Co for August shows as follows: Tons ore mined, 17,300; net, \$18,211. This compares with 26,700 tons mined in July, 29,000 tons in June and 32,400 tons in May. July net showed \$30,016; June, \$40,458, and May, \$52,500.

Judge Manton filed an order last week in clerk's office of U. S. District Court at New York allowing International and Intercontinental Mining & Refining Corporation, as holder of 9000 shares of capital stock of Ohio Copper Mining Co., to intervene in the foreclosure proceedings against Ohio Copper Co. Corporation seeks to have the order for the sale set aside and to prevent the levying of an assessment of \$2

a share on the stock which is proposed by the reorganization committee.

The Champion Copper Co., according to present estimates, is earning close to \$7,000,000 annually. A \$6.40 per share monthly dividend has been declared for several months past. A half interest in Champion is owned by the Copper Range Co.; the dividends which it receives from the former practically takes care of its own dividend requirements.

With the consent of all parties Judge De Courcy of the Supreme Court at Boston dismissed the cross bill between the Old Dominion Copper Mining & Smelting Co. and the New England Trust Co. This suit had reference to funds recovered from A. S. Bigelow which were some time since distributed to holders of Old Dominion "trust receipts."

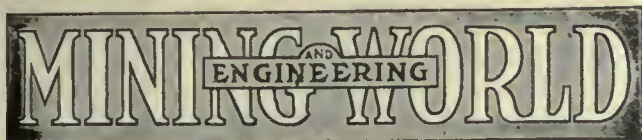
The Anaconda Copper Co. is reported producing at the rate of 340,000,000 lbs. of copper a year. With metal selling at 25 cts. a pound, the company would earn at the rate of \$23 a share. It is expected that in the current calendar year and in 1917 the profits will make a grand total of \$100,000,000. There is some reason for this expectation, since copper for delivery in the first half of 1917 is now selling at 27 cts. a pound.

It is understood that new interests will enter the management of the Tennessee Copper Co. According to the report stockholders will be offered the right to subscribe to new stock at about \$16 a share, on the basis of one new for each share now held. The company owes about \$2,000,000, including floating debt, of which approximately \$1,000,000 constitutes a liability due the Russian government. Additional funds will be raised by the proposed plan to give the company sufficient working capital. The status of the convertible bonds remains unchanged, holders of these securities will not be offered subscription privileges.

Utah Metal & Tunnel Co. is showing steady improvement. The present excellent financial situation was the result of discovering two rich ore bodies which soon added \$1,000,000 to the treasury. At the present time the company is earning better than \$1 per share on its 685,000 shares, and this after charging from \$20,000 to \$25,000 per month for development and an additional \$5000 for a flotation plant which is in process of installation. Financially the company is in good condition, with about \$500,000 in cash in the bank, besides \$175,000 due for metals sold but not yet delivered. The company has recently purchased \$125,000 of its bonds, leaving \$235,000 outstanding.

Inspiration will produce approximately 125,000,000 lbs. of copper this year and continued operations in 1917 should result in a production of 150,000,000 lbs. Net earnings for this year are placed at around \$22,000,000. Total recovery from all ores has gradually improved to about 80%, while an average yield of about 83% is anticipated. The recovery from sulphide ores alone has been not less than 90% and more often 93%. An average cost of production of less than 8½ cts. a pound is expected to be shown in report for the year 1916. Further mill improvements will lower this item. Exclusive of eastern expense, Inspiration has already produced copper for less than 8 cts. a pound.

The International Nickel Co. has set aside \$5,500,000 from cash on hand for construction of a refinery in Canada and extension of its smelters and other facilities. All this money will be spent in Canada. It has been realized by directors that present capacity of its plants is inadequate to meet demands for nickel. Consequently enlargement and new construction program will be begun immediately and will be rushed. This expenditure will eventually be capitalized and distributed to common shareholders in a stock dividend, following custom of the Nickel management. Capitalization of this investment would indicate that the stock dividend when authorized will amount to 10% or higher. Last previous distribution in stock was 10%, last year. On the basis of dividends of 24¢, or \$6 a share, International Nickel, at present figures, yields better than 12% on the investment. It has been the history of the company that dividends are on a steadily rising scale despite the fact of stock distribution in the interim.



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*Illustrated.

Copper Prosperity and Copper Share Prices.

In volume of business closed the month of September has established a record in the history of the copper trade. Orders for a total of 600,000,000 lbs. of copper were written into the books of copper producers. What this enormous total means is readily conceivable when it is contrasted with the present monthly refinery yield of 165,000,000 lbs. or with the prospect that the production of copper in the first half of next year will amount to approximately 1,000,000,000 lbs.

Out of the total of 600,000,000 lbs. it is reliably figured that 500,000,000 lbs. are for delivery in the first half of next year. This means that September business alone furnished orders for one-half of the output of the first six months of next year. Adding the business taken in August on which delivery is to be made in the first half of 1917 and it is readily apparent that as October opens the producers have disposed of 70 per cent or 700,000,000 lbs. of the 1,000,000,000 lbs. they hope to produce between January and June of next year.

With business still coming in at a rapid pace it is more than likely that on November 1 the producers will have firm orders in hand for 80 and possibly 90 per cent of the entire first half output. This is an achievement without parallel in the industry. These figures are *sufficient* to furnish a support for high prices.

Despite the fact that the copper properties are fairly reveling in prosperity, stocks are not selling at their fair worth, as shown in the table herewith. Properties are earning an unusually high rate at present with copper figured at 27 cts. a pound. But one company is earning less than 20% on the selling price of its stock as of Oct. 2, while one company is returning close to 40%. Anaconda, the largest producer, is yielding at the rate of 22% on the selling price of its shares, while Utah Copper returns 28%. Granby really makes the best showing, earning no less than 35% on its present share price of 92½. Calumet & Hecla, with its share price at \$580, is earning at the rate of 22%, while Kennecott, at \$55.75 per share, is earning at the rate of 24%. Inspiration, with its stock selling at 67¾, returns to holders of the stock no less than 26%. Wolverine, with its stock at 49, yields earnings of 40%.

The average earning power of the 23 companies mentioned below, with copper at 27 cts. per pound and stock selling as of Oct. 2, is 27%. According to reports made to Mining and Engineering World, the 23 companies disbursed no less than \$79,077,247 during the 9 months of the present year. A wonderful demonstration of the earning powers of American copper properties.

In the following table is given the earnings of 23 of the leading copper producers, with the selling price

of copper at 27 cts. per pound, and the per cent return on the selling price of stock as on Oct. 2:

	Earnings on 27- ct. copper per share.	Stock selling Oct. 2.	Per cent earnings on price of stock.	Dividends 9 mos. to Oct. 2.
Ahmeek	\$20.00	\$106.00	19	\$ 1,200,000
Allouez	16.00	69.50	20	450,000
Anaconda	22.00	96.37½	22	11,656,250
Calumet & Arizona.....	19.50	76.00	25	3,849,522
Calumet & Hecla.....	126.50	580.00	22	5,000,000
Chino	15.50	56.50	27	5,002,385
Copper Range	16.50	70.50	23	2,381,305
Granby	33.00	92.12½	35	749,926
Greene Cananea	13.25	50.25	26	2,431,045
Inspiration	17.50	67.37½	26	3,091,233
Isle Royale	9.75	34.75	28	150,000
Kennecott	13.75	55.75	24	11,200,000
Miami	11.00	39.50	28	3,175,234
Mohawk	27.50	93.50	28	1,700,000
Nevada Con.	6.75	22.50	30	4,498,778
North Butte	6.75	22.00	31	752,500
Old Dominion	17.75	70.50	25	1,377,000
Osceola	28.50	95.50	29	1,067,650
Quincy	30.75	91.00	33	1,201,000
Ray Con	7.75	25.75	30	2,749,748
Shattuck-Arizona	8.25	31.50	26	1,225,500
Utah Copper	27.00	95.63½	28	13,808,165
Wolverine	13.75	49.00	40	360,000
Average	\$22.35	\$ 90.98	27	*\$79,077,247

*Total dividends for the nine months of 1916.

Anent Dividend Statistics Published in These Columns.

Mining and Engineering World feels greatly encouraged in its work in giving to the world dependable statistics of the dividend payments of American mines and works, when such a representative paper as the *Denver Post*, through its mining editor, General Frank Hall, comments on same thus favorably:

We are presenting these compilations as they appear from month to month in Mining and Engineering World in order that the people may see what the mining industry is doing in the way of taking wealth from the mines and scattering it among the people. It is a great lesson to be studied by everybody who feels the impulse given to our country from one source of endeavor.

When we consider that the monthly dividend summary as published in these columns is republished regularly in from three to four hundred papers and magazines in this and foreign countries, and the favorable publicity given American mining thereby, we feel amply repaid for the very large amount of labor this work entails.

We also appreciate the honesty and fair-mindedness of a very large majority of publishers in properly crediting the source of these reports. As to others, we trust that the credit they receive for their enterprise (?) in presenting these figures to their readers as their own compilation will be, to a degree at least, sufficient to offset any twinges of conscience which may (?) arise from their discreditable pilfering.

Rescue and Recovery Operations in Mines After Fire and Explosions.

A work deserving much praise is that now being conducted by the U. S. Bureau of Mines, having for its object the education of miners in rescue and recovery operations after fires and explosions. The work is being conducted in all the mining centers of the country by means of public lectures illustrated with

lantern slides and moving pictures. First aid to the injured is taught by training miners in the use of rescue breathing apparatus and by lectures on rescue and recovery methods. All this instruction is furnished without cost to the miner.

It is the aim of the Bureau to extend this educational work, to train a large number of miners in the use of rescue breathing apparatus, to induce operators to establish rescue stations provided with breathing apparatus, and to keep crews of men trained to use the apparatus immediately when life may be saved.

A pamphlet, in handbook form, entitled, "Rescue and Recovery Operations in Mines After Fires and Explosions," by James W. Paul and H. M. Wolfelin, has been issued by the Bureau, which should be in the hands of every mine operator and superintendent in the country. It covers both coal and metal mines and has for its object the development of an organization at disasters, to show what materials ought to be on hand and how the authority should be placed. The pamphlet is the result of serious studies covering a period of considerable time on what the Bureau believes to be the best method in rescue and recovery operations in both coal and metal mines after fires and explosions. It outlines a method of procedure for the operators and miners to follow in such emergencies and explains just what part the Bureau of Mines is expected to take in such work.

Under terms of agreement entered into last year between the Anaconda Copper Mining Co. and the Inspiration Con. Copper Co. on the one hand and the Minerals Separation, Ltd., on the other, the two mining companies must be paying royalties of 4 cts. per ton on their ores handled by flotation. This appears plain from a reading of the agreement which was entered into in February, 1915. Prior to that time the Inspiration Co. had a license agreement with the Minerals Separation, Ltd., under date of April 10, 1913. The subsequent agreement, however, included the Anaconda Co., and if desired the Greene-Cananea Copper Co., Arizona Copper Co., Calumet and Arizona Mining Co., and Consolidated Copper Mines Co.

As a result of the steamship service started by the American Smelting & Refining Co., a cargo of approximately 5000 tons of copper was received last week by that company from Chile. These steamers will ply between South American ports and the United States and will handle the product from the Guggenheim properties in South America—Braden and Chile Copper companies. Braden formerly shipped practically all its blister copper to Europe, where it sold on the basis of "standard" prices on the London Metal Exchange.

The payroll of mining companies in the Lake Superior copper district is now close to \$2,500,000 monthly, the largest on record. Never was there a time in the history of the district when there was so many men at work, when the pay per man was anywhere near as large as at present, when industrial conditions were as prosperous as at present.

PERSONAL.

D. C. Jackling is inspecting the Butte & Superior property at Butte this week.

S. S. Pond recently inspected the property of the Yankee Con. Co. at Tintic, Utah.

J. V. Richards of Salt Lake, Utah, is making an examination at Yomocalla, Ore.

A. B. Shepherd of Pittsburgh, Pa., was in the Lake Superior iron country last week.

F. E. Marcy, consulting engineer, has opened offices in the Atlas building, Salt Lake City.

John G. Kirchen recently examined the holdings of the White Caps Mining Co. at Mahattan, Nev.

H. I. Wilson of Butte, Mont., recently inspected the Granite-Poorman mine, near Nelson, B. C.

F. E. Marcy, inventor of the Marcy ball mill, has established offices in the Atlas block, Salt Lake City.

A. G. Burritt of Salt Lake City, Utah, recently completed an examination trip through southern and eastern Idaho.

J. S. Schuyler, who recently inspected copper properties in British Columbia, will leave New York shortly for Chile.

R. E. Mace of Duluth, Minn., purchasing agent for the Oliver Iron Mining Co., was in Ishpeming, Mich., last week.

F. A. Knapp of Portland, Ore., has completed an inspection of the Portoma property in the Coeur d'Alene region, Idaho.

George A. Bethune of Kingman, Ariz., will make an inspection of the property of the Chloride Central Mines Co. at Chloride, Ariz.

Charles E. Van Barneveld, formerly chief of the department of mines at the Panama-Pacific exposition, was in Salt Lake City last week.

W. Earl Greenough has resigned as managing director of the Marsh Con. Mining Co., operating in the Coeur d'Alene district, Idaho.

W. F. Downs, chemical engineer, and Kirby Thomas, mining engineer, New York, are making an investigation of peat deposits in New Jersey.

H. J. Stander, flotation engineer, recently returned from a visit to Alaska and British Columbia. He will visit Denver, then to Arizona and later to Ontario.

H. L. Christensen has been appointed mill superintendent for the Alaska-Juneau Gold Mining Co. He formerly held a similar position with the Miami Copper Co.

E. P. Mathewson, general manager of the Washoe smelter of the Anaconda Copper Mining Co., has resigned to become general manager of the British-American Nickel corporation.

L. S. Ropes, mining engineer of Helena, Mont., who has been looking after the development of several groups of claims at Marysville, has been appointed consulting engineer for the Marysville Gold Mining Co.

J. G. Rutherford, formerly manager of the Motherlode Mine in the Sheep Creek district, British Columbia, and more recently in charge of the Molly group in the same camp, has accepted a position in the Cobalt camp, Ontario.

Edwin Higgins, chief mine inspector for the Industrial Accident Commission of California, has accepted the position of consulting and safety engineer for the California Metal Producers' Association. He will assume his new duties Nov. 1.

OBITUARY.

H. F. Robertson, for 2 years manager of the Empire Copper Mining & Milling Co. in the Little North Fork district, Idaho, one of the best known and experienced mining engineers in the Coeur d'Alenes, died recently from pneumonia. Mr. Robertson was about 43 years old. He was a graduate of the Massachusetts Institute of Technology.

Adolph J. Zang died in Denver, Colo., Sept. 28. He had long been identified with successful mining enterprises of the west, among which were the Vindicator Con., the Cresson Con. and the Rare Metals Ore Co. Deceased was 60 years of age and had lived in Denver about 35 years.

SCHOOLS AND SOCIETIES.

Canadian Mining Institute; Western Branch.—The special meeting of the western branch of the Canadian Mining Institute will be held in Trail Oct. 26, according to announcement from E. Jacobs, the secretary.

American Iron and Steel Institute.—The general meeting of the American Iron and Steel Institute, to be held in St. Louis Oct. 27 and 28, will open with an address by the president, Elbert H. Gary. Other speakers will be Clarence H. Howard, Dr. G. B. Waterhouse, James W. Fuller, Frank S. Witherbee and Arthur J. Boynton.

NEW PUBLICATIONS.

Triangulation and Primary Traverse in Washington, 1913-1915. By R. B. Marshall. Washington, D. C., U. S. Geological Survey. Bulletin 644-Q; pp. 10.

Description is given for the location of triangulation stations in the state and this is followed by tabulated data for survey work and computation, such as azimuth, back azimuth and distance.

Mining Developments and Water-Power Investigations in Southeastern Alaska. By Theodore Chapin and George H. Canfield. Washington, D. C., U. S. Geological Survey. Bulletin 642-B; pp. 55; illustrated.

A considerable advance in both copper and gold lode mining was noted in southeastern Alaska in 1915. The development consisted in the opening of large bodies of ore, in the installation of machinery and power developing plants and in the resumption of operations at a number of mines. It is these operations and the general revival which make up the text for this report.

Health Conservation at Steel Mills. By J. A. Watkins. Washington, D. C., U. S. Bureau of Mines. Technical Paper 102; pp. 36.

Though the title of this paper would infer that it is of little interest to the mining profession, this will be found an illusion. Things which tend to make a man less efficient in his work in the steel mill will be found equally as applicable to mines and plants about the mine. For example "fatigue as a cause of disability" and "noise as a cause of lowered efficiency" are dealt with as are other topics of a similar nature.

Economic Geology. By Heinrich Ries. John Wiley & Sons, Inc., New York. Book; pp. 856; illustrated. For sale by Mining World Co., \$4.

This is the fourth edition of this book and has been revised and brought as nearly up to date as possible. It is stated in the preface that statistics have been largely obtained from the U. S. Geological Survey and Canadian Department of Mines. The results of investigations which were too late to include in the text have been placed in the refer-

ence list. The book is divided into two parts, one treating on non-metallic minerals and the other on metallic deposits. The information given on each separate mineral is similar to that given in other texts on "economic geology," namely, the nature of the product, location and general mode of occurrence, some description of the districts in which the product is found, genesis and geology of deposits in general and some statistics on production.

Mineral Resources of the Upper Chitina Valley, Alaska. By Fred H. Moffit. Washington, D. C., U. S. Geological Survey. Bulletin 642-C; pp. 8; illustrated.

This area is located in the upper part of the well-known Copper River basin. Both geology and geography of the country are embodied in the bulletin. In reviewing the mineral resources it is brought out that both gold and copper have been found in the district, though neither has been produced as yet in paying quantities.

Elements of Mining. By George J. Young. McGraw-Hill Book Co., New York. Book; pp. 628; illustrated. For sale by Mining World Co., \$5.

The text is concise and of a more elementary nature, being of particular value to those who desire a general rather than detailed knowledge of mining and the data affiliated with it. The different subheads under mining are treated on separately. Specific data and descriptions are given and the different subjects are treated in a complete manner. Prospecting and drilling; drilling and blasting; transportation; drainage; ventilation; supports; open-pit and placer mining; development; underground methods; mine organization, operation and accounting; accidents and diseases and examination of mines and deposits are all dealt with.

TRADE PUBLICATIONS.

Flooring for Plants. Ayer & Lord Tie Co., Chicago. Booklet; pp. 15; illustrated.

On every other page of the booklet views are shown of plants with floors made of A. & L. interior wood block flooring. In a concise manner the descriptive contents of the booklet brings out the features of this kind of flooring and gives a general review of its nature. Among some of the features it is noted that this type of flooring does not tire workmen so as to reduce their efficiency so quickly as other classes of flooring.

Fuel Oil Appliances. W. S. Rockwell Co., New York. Bulletin No. 31; pp. 27; illustrated.

There is an insert showing the plan in general for an oil burning plant and this includes the handling of the oil from the tank car to the storage tank and then through the pump and blower to the furnace. Among the headings noted in the bulletin are the following: A Word About Oil Burners; Rockwell Oil and Gas Burners; Burner Plates; Fuel Oil Pumps and Systems; and miscellaneous other descriptions of equipment used in connection with this method of firing.

Fans for Mechanical Ventilation, Etc. Clarage Fan Co., Kalamazoo, Mich. Catalog No. 5; pp. 24; illustrated.

The fans are of the multi-blade wheel type and it is stated in the contents of the catalog that they show high efficiency and that those carried in stock will work against a head of 5 ins. The fans are briefly illustrated and described and 10 pages are given to the reproduction of capacity tables. A separate table is given for each class of fan and the tables include volume, outlet velocity, static pressure, R.P.M. and B.H.P. A dimension table is also given with a lettered dimension drawing.

The Caterpillar Tractor. The Holt Manufacturing Co., Peoria, Ill. Booklets; pp. 31; illustrated.

In the booklet, "Hauling with a Holt Caterpillar," a comparison is made between haulage with caterpillars and horses. Following this is general talk and information regarding the machine, its uses and advantages. Illustrations are given of the tractor in practical use, and among some

of its advantages it is brought out that the machine will haul over any kind of roads. It is also shown by illustration and description how the machine in traveling resembles a railroad engine, which lays its track as it goes and picks up the track from behind as it travels to make the track for travel ahead. The other booklet contains information of a similar nature, but in addition there are drawings and descriptions bringing out the construction of the machine in a more complete way.

Large Piping Material and Fittings. The M. W. Kellogg Co., New York. Catalog; pp. 87; illustrated.

The first 33 pages of the catalog are confined to listing the company's product. Separate tables are given for different kinds of pipe, all of which are suitable for different purposes. Ordinarily a drawing with dimension lines lettered is given with each table and prices are included. The pipe herein considered is of welded steel with flanged joints, and it is announced that the company handles the complete design of piping systems on request. The concluding 54 pages is in general a text on up-to-date piping practice. Curves, tables, illustrations of installations, description and specific information of use in designing pipe work, mostly for steam plants, is dealt with.

INDUSTRIAL AND TRADE NOTES.

The Weigle Pipe Works, Denver, lately shipped 4000 ft. of 12, 10 and 8-in. riveted pipe, for placer mining operations, to P. A. Danaher, Helena, Mont.

Morse Brothers' Machinery & Supply Co., Denver, has purchased the equipment of the Cook Railway Signal Co., that city, consisting of motors, generators, batteries, laboratory and office equipment.

The Arizona-Hercules Copper Co., Ray, Ariz., lately gave the Mine & Smelter Supply Co. an order for three No. 86 Marcy ball mills, for installation in the former company's copper concentrating mill, being constructed after designs by Geo. O. Bradley, San Francisco. These ball mills weigh 50 tons each.

Denver Quartz Mill & Crusher Co., Colorado building, Denver, has received an order from Talkeetna Mining Co., Seattle, for one mill and feeder of that type, for installation at the latter company's mine at Knik, Alaska. This is the third mill of Denver Quartz Mill make which has been shipped to that part of Alaska. The order was transmitted by wire.

Plains Iron Works, Denver, Colo., recently built and shipped machinery for a sizing and screening plant for the Indian Creek Coal Co., Junction City, Colo. Another order just filled was for 20 heavy ore cars for the Hanover Bessemer Iron & Copper Co., near Santa Rita, N. M. Steel hoppers were built in these shops for the new sampler of the Portland Gold Mining Co., Victor, Colo., and about 50 centrifugal sand pumps are being made on orders from the Traylor Engineering Works, for pumping mill tailings and pulp. A large number of sheaves are being made for mine hoists.

While the other two members of the electrical "Big Three" have been enjoying record prosperity, Western Electric has not been sitting idly by. The company's previous biggest year's gross was \$77,000,000. This year sales will be not far from \$100,000,000. This refers to actual shipment of goods to customers. The incoming orders booked will be very much greater than \$100,000,000. While Western Electric has no war orders, it has felt the effect of the war by limitation of raw material supplies on the one hand and an abnormal demand for its products on the other. Directors recognize the fact that present conditions are entirely abnormal. At the same time the pressure is here and cannot be entirely ignored. As a result directors have authorized plant additions which will call for the expenditure of over \$1,000,000. Western Electric is now employing 23,000 people, the largest number in its entire career.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Valdez.

Nick Meekem and H. E. Hills are operating ground near the Teikhell roadhouse. They have recently taken good specimens from the property which run fabulously high.

Seward.

According to W. E. Edes, chairman of the Alaskan Engineering Commission, the first train will run from this city to Fairbanks in 1919. At present a little coal is being purchased by the Commission from Dick Doherty. He is working on the edge of the coal fields. The first coal hauled over the railroad was taken from there to Anchorage recently. In the near future, or before the end of the season, the railroad will be into the heart of the coal fields. In regard to progress this year from Matanuska Junction, toward Fairbanks, Mr. Edes says that it is probable that steel will be laid for a distance of 15 miles from the point where the road cuts off to the coal fields. Continuing, toward Broad Pass, there will be quite a big stretch of the line that will be cleared and graded, ready for the laying of the rails next spring.

ARIZONA.

Jerome.

The mine workings of the Jerome Victor Extension Copper Co. have been freed of water and the work of development is being pushed with three shifts. To avoid water troubles in the future, the big pump on the 700 level is to be lessened by the installing of a 250-h.p. electric pump. There is no question but the two pumps will adequately handle the present and any future flow that may be tapped. The directors, several of whom are actively identified with the large copper mine of the Lake Superior country, are lending financial and advisory support to the Victor Extension management and will supply additional machinery equipment as it is needed. The company has about \$125,000 in its treasury, accumulated from the sale of its stock at from \$1 to \$3 per share, and has placed its property in charge of George W. Salisbury, who for a number of years was a member of the engineering staff of the United Verde mine adjoining. Drifting is now going on on the 1200 level with the object of tapping the continuation of the United Verde ore bodies. No. 3 United Verde shaft has a depth of 1950 ft., and it is stated that the laterals on the 1650 and 1800 levels have been driven well toward the Victor Extension lines. It is also stated that the United Verde Co. will sink its new shaft—to be known as No. 6—to the east of the railroad depot at Jerome, and in the vicinity of the Victor Extension's boundary. It is to be a 3-compartment, and through its medium a large area of great prospective value will be developed. Operations on the 1200 level in Victor Extension workings will demonstrate the value of this area beyond the United Verde's lines. The drift on the 1200 level is out from the shaft 175 ft. and will be extended 75 ft. further. There a crosscut will be run about 30 ft. to tap, on its dip, the downward extension of the deposit exposed on the 700 level. The vein matter on the 700 level, although leached and considerably shattered, shows mineralization across a width of 30 ft.

Prescott.

For about a year the Verde River Copper Co., a corporation headed by Arthur L. Garford, of Ohio, has been developing the old Pfau group. A crosscut tunnel, recently com-

pleted, has been driven a length of 600 ft., and has intersected a number of ledges carrying very encouraging copper values. Near the face of the tunnel a ledge has been cross-cut that carries pay values in gold. Garford and his engineer will arrive at the property some time this month for the purpose of making an examination and deciding upon further development plans.

The Commercial mine in Copper Basin is shipping from 80 to 100 tons of copper ore daily, and the Loma Prieta mine, adjoining the Commercial, shows a strong body of copper ore.

A deal is practically closed for the transfer of the Alvarado group to a party of New York mining and business men. The property is located in the Congress country, and in past years was noted as a producer of high-grade silver-gold ore. To a depth of 500 ft. the ore offered no reduction problem which could not be solved by the reduction processes of 20 years ago. Below that depth, however, it became so base that mining at a profit became impossible and work ceased. It is now planned to open the ore bodies at greater depth and to establish an up-to-date mill for their reduction.

Globe.

E. R. Rice, for 4 years efficiency engineer for the Copper Queen and who drilled the Miami Southwestern for Payne-Weber interests, has been engaged to superintend drilling operations at the Inspiration Needles Copper Co.'s property.

Favorable development at the Old Dominion property has been the discovery of high-grade oxidized ore on the 16th level west, running from 8 to 10% copper. Old Dominion has had this oxidized ore body from the 9th level down, but the fact that it is of such high grade on the 16th is, of course, very significant. Incidentally, the strike should help Arizona Commercial, as any increase in shipments of oxidized ore from old Dominion will permit of treatment of larger tonnages of Arizona Commercial's sulphides at the Old Dominion smelter. Old Dominion continues to produce from 31,000,000 to 32,000,000 lbs. of copper per annum at a cost of less than 10 cts. Its smelter output has been running much in excess of this, but a very considerable tonnage of ore has been coming from United Verde Extension and Arizona Commercial.

Miami.

Profits approximating 5,650,000 will have accrued to Miami Copper Co. from operations during the first 9 months of this year—estimating September. This will be equal to \$7 per share, or more than sufficient to meet a full year's dividend requirements at the current \$6 rate. Surplus amounts to about \$5,000,000, which will have been augmented materially by the time the November payment of \$1.50 per share falls due. Profits for the six months ended June 30 totaled \$3,499,000. It is estimated that profits for the third quarter will approximate \$2,150,000, or 66 per cent of the net for the first six months. Miami has sold itself well ahead at high prices. Although not participating in the big copper sale, Miami has effected sales through the early months of 1917 at prices equalling and in some instances higher than the average to be paid on the big export contract.

Hayden.

Referring to Ray Hercules, a conservative estimate places the tonnage at upward of 10,000,000, on an average of 2½% or better in the Ray Hercules. Considerable native copper has been encountered in the shaft at a depth of approximately 675 ft. and sinking is progressing rapidly at the rate of about 5 ft. per day. Three churn drills are working. The directors do not give out any official figures, but have ordered equipment for a 2000-ton mill instead of 1000 as originally intended, and expect to be producing copper within a year.

The property end is looking fine and the directors are not inclined to pay any attention to the stock market end.

Phoenix.

A 16-h.p. Western engine hoist, mining cars, buckets and 350 ft. of cable have been unloaded at Wenden and were taken to the property of the Wenden Copper Co. this week. Twenty thousand feet of lumber have been delivered to the mine and work of erecting the head frame will begin soon. The first 50 ft. of the shaft will be completed by hand drilling, it is announced.

Oatman.

At a called meeting this week the stockholders ratified the recent sale of control of the Sunnyside mining property to those who control the United Eastern. By the terms of the deal the treasury is enriched to the extent of \$86,500 in cash and work will proceed on the same plan that made the Eastern mines. The purchasers are Seeley W. Mudd, Colonel D. C. Jackling, F. A. Keith, Philip Wiseman and C. H. Palmer Jr. The former management was composed of S. S. Jones, P. L. Mullen, W. H. Flanigan and L. C. Monks.

CALIFORNIA.

Grass Valley.

Connecticut capitalists, headed by Frank L. Rodgers, are interested in a syndicate which has taken under bond and option the Prudential and Norambagua gold properties. Both properties have produced rich ore and the Prudential has been opened to an approximate depth of 1000 ft. It is planned to extend drifts into the Norambagua from the Prudential shaft and operate the mines from a central point. The Prudential is equipped with a small mill and mine machinery.

Redding.

The Potosi mine at Muletown, 6 miles west of Redding, has been taken under bond by a company and work started, with A. S. Howe, superintendent. The mine has lain idle 45 years, although for a short time it produced some rich gold ore. It belongs to the estate of the late Senator Jones of Nevada.

The Mammoth Copper Co. has completed the tramline from its Stowell mine to the main haulage system, and the ore is going direct to the smelter. Construction of the \$350,000 electrolytic zinc plant near Kennett is proceeding. It is reported the plant will handle custom ore in addition to the product from the bag house and the Mammoth line. A small commercial unit embodying the process has been operated for several months at Winthrop by the Bully Hill Copper Co., and it is reported this corporation is perfecting arrangements for the building of a large plant next summer.

Oroville.

Arrangements have been made to operate the plant at the Banner group with electric power. Late developments in the property have been highly satisfactory, particularly in the South Banner. All the quartz is of good milling grade. Richard Phillips is manager.

Karl Brehme and associates of Los Angeles have applied to the Debris Commission for a permit to work placer ground near St. Louis by the hydraulic method. The new dam across Slate creek is rapidly nearing completion and will cost in the neighborhood of \$40,000. It is 30 ft. high and constructed throughout of reinforced concrete. Several companies in the district have applied for permission to hydraulic their holdings, and an abundance of water has been assured for the numerous projects.

Greenville.

The Southern Eureka Co. has arranged for resumption of work at the Southern Eureka and Wardlow mines. Rich quartz has been opened in both mines and as soon as sufficient profitable quartz is exposed arrangements will be made for installation of reduction facilities.

The Boyden and McMillan copper-gold claims have been acquired by Salt Lake capitalists and arrangements made for extensive work. The Ruby copper-gold mine is being worked

under the management of Lester Williams. Several other properties are receiving attention, due to the building of the Indian Valley railway through the district.

Jackson.

The strike situation continues unchanged. Little violence has developed and the companies continue to keep pumps active and repairs are going forward. The Miners' Union has issued a statement to the effect that recognition of the union will be waived provided the increased wage scale of 25 cts. daily is paid. As the union question was not mentioned in the original demand, operators have ignored the latest attitude of the men.

Placerville.

The Frog Pond quartz mine in the Garden Valley district has been taken over by N. H. Burger and associates of Placerville. The mine has produced much rich ore and is considered one of the best propositions in this section of the Mother Lode territory. The shaft will be deepened and extensive lateral developments prosecuted.

Sutter Creek.

Unwatering of the shaft at the Old Eureka continues to be steadily conducted, despite the strike and bad caves below the 600. The sawmill has been finished and construction of surface buildings is proceeding. The new hoist will soon be in position and the management is hopeful of starting active mine operations early in January.

At the Central Eureka everything is being placed in shape for resumption of shaft sinking as soon as the strike ends. It is planned to sink to a depth of 3400 ft. and crosscut to reach two veins believed to parallel the main ledge. Repairs to the shaft are being made with a small crew.

Porterville.

An improved demand for magnesite ores has stimulated developments in this vicinity and contracts have been signed for the delivery of 100 carloads of crude ore within 30 days. This is in addition to the regular output. The American Magnesite Co. and Tulare Mining Co. are arranging to augment the capacity of their calcining plants. This will increase the local output to 2 cars of calcined ore daily.

Goldstone.

Vigorous developments are proceeding at the Goodrick silver mine. The shaft is down 147 ft. and the ledge is 4 ft. wide with values running into high figures. Silver predominates, but there is a little gold and copper.

The gold mining companies are increasing activities. The United Goldstone Co. has started work on the Shamrock claim, where a good ledge is exposed near surface. Three claims have been leased to Ramsey & Schwartz of Santa Monica. Alexander & Hale have acquired the Goldstone Townsite group and started work. The custom mill is running and is reported to be making a good extraction. Motor trucks are delivering ore from numerous leases.

Callahan.

The McKeen ledge has been struck in the upper tunnel of the McKeen mine and is showing well with development. No. 2 tunnel is advancing rapidly and a raise has been driven to connect with No. 1 tunnel workings. Good ore is coming from both points. Plans have been made to equip the mill with heavier machinery. Twenty men are employed. W. L. Fraser is superintendent.

A deposit of chrome ore has been discovered near this point by H. A. Eaton, W. H. Gassoway, Alex. Parker and M. F. Barnum. The ore is of excellent grade and a road is being constructed to facilitate early shipments. Gold prospecting is very active in this section and some promising discoveries have been reported. Several companies are preparing for placer work.

Campo Seco.

In December, 1914, 31 ranchers in Jackson and Calaveras counties entered suit against Penn Mining Co., a copper smelter, for damage alleged to have resulted from smelter fumes to vegetation and stock. Ten of the cases were tried in May, in the U. S. District court at San Francisco; verdict was given defendant, at plaintiffs' cost. The remaining 21 cases have been dismissed without trial, and without payment of any damages.

COLORADO.

Cripple Creek.

The Dante mine is under lease to the Consolidated Gold Mines & Reduction Co. and Frank Cottier is in charge. He is arranging for the installation of an electric hoist. A 35-hp. hoist will be installed and an electric compressor will also be purchased. The lease covers a 5-year term.

An ore shoot has been opened by the Cripple Creek Deep Leasing Co. prospecting the granite-schist contact lying east of the shaft by drift from the 750 level. It has ore of \$20 to \$30 value. Assays showing a much higher gold content are of common occurrence, but the value as given is the shipping grade of the ore as mined.

The electric hoist at the Little Daisy has been taken to the Big Banta property, which is owned by the United Gold Mines Co., and has been secured under lease by the J. H. B. Leasing Co. Matt Edwards, Victor, superintendent for the company, has a force of men engaged laying an air line from the Ajax shaft. A new shaft house has been constructed and new headframe erected. Development work will commence as soon as the hoist is in place and connected with the power line. A trial shipment of low-grade ore shipped from the lease gave satisfactory results.

The Black Diamond claim of the Portland Gold Mining Co. has made its initial shipment under the leasing operations of F. Bishop and associates. The lessees have constructed a temporary ore bin. About 30 tons of ore was on the plat. They are sinking a new shaft on this block and everything taken out from grassroots down to the present depth of about 35 ft. has been ore. The Black Diamond cuts across both the Strong and W. C. Dillon, the last named owned by the Granite Gold Mining Co. and north of the Bishop discovery and higher up on the mountain, H. P. Jones and associates have also opened up ore on the same vein and have loaded out their trial shipment. Jones and partners are sinking a new shaft for the Granite Co. on their block of the Dillon claim.

A new electric hoist has been installed at the Last Dollar. The mine has been secured under a 5-year lease by Charles Walden, Victor. Active operations underground have been started.

Leadville.

On Sept. 29 the Mikado shaft, being retimbered by Contractor J. Nilson, was completed to within 40 ft. of the 900 or water level and the remainder was expected to be finished in a week or so. A new engine room 30 by 36 ft. and a compressor room 18 by 36 ft. are under construction. New machinery has been ordered for the property. The Denver & Rio Grande Railway Co. has started the work of grading for a switch which is to be put into the Mikado from the Greenback property, about 600 ft. away. This will be completed early enough to handle the heavy shipments of machinery that are to be delivered, including pumps, compressor and hoist.

The Lanyon Zinc Co. is now sinking a new shaft on the Dania ground. A power line has been brought to the property from the nearest branch, 1000 ft. away. A new plant of machinery has been installed. Work in the shaft has been under way for some weeks with a small force. The depth to which the shaft will be sunk has not been determined, depending upon the dip of the formations which shows small shoots of carbonate of zinc in the Silver King adjoining. These shoots are the objective of the work now in progress. Carbonate is exposed in both the By Chance and Silver King tunnels, but the veins dip under the tunnel levels. The surrounding territory has been little developed and offers a promising area.

Idaho Springs.

At the Portland mine a body of ore has been opened for 500 ft. for stoping on the 1950 level, and it is said to be richer than at higher levels. The ore in the 18th level has been broken down in the stope over 500 ft. in length. Little of the ore has been shipped. The main shipments have been from the levels above. The ore on the 1950 has not been

stoped, but the shoot has been opened and timbered. The company is now raising from the 19th to the 18th level for air and this winter will sink from the 19th to connect with the Roosevelt tunnel 100 ft. below. The Roosevelt tunnel breast is now about 1500 ft. from the Portland shaft and will be directly under it in March or April.

The Independence mill is going ahead steadily and by Jan. 1 will be ready for operation with a capacity of 1250 tons. In connection with this plant is the sampler plant, which will have a crushing capacity of 100 tons per hour. The plants have been delayed some by the inability of machinery companies to fill orders.

In the Bellevue mountain district the Tek Mining & Milling Co., under Manager Weber, has recently struck good ore. In driving the main tunnel to reach a cross vein they broke into a shoot that runs, by several assays: 3.08 ozs. gold and 7 ozs. silver, 10.20 ozs. gold and 11 ozs. silver, 20.06 ozs. gold and 11.70 ozs. silver. The ore carries considerable copper, running from 3 to 12%. The vein matter between walls averages 3½ ft. It is the intention to continue driving on the vein for 600 ft. to intersect with another cross lode which will be cut at 600 ft. in depth. The company has a 10-stamp mill and their own water power.

IDAHO.

Wallace.

The mill of the Empire Copper Mining Co., which owns and is operating the Empire Copper properties, on the Little North Fork of the Coeur d'Alene river, near Enaville, is to be increased from 150 to 300 tons daily capacity, according to Andy J. Devlin, vice-president and principal stockholder, who states that the additional machinery already has been ordered. The crusher department of the present plant has a capacity of 600 tons daily, and the mill was constructed so that additional units could be installed as necessity required. The mine and mill machinery is actuated by a 200-hp. electric motor, driven by current from the Washington Water Power Co.'s transmission lines, and recently a 22-drill compressor plant and a 250-ton filter press were installed. The latter reduces the moisture in the concentrates to approximately 10%, and has effected a material saving in transportation costs. In the last 14 months the company has developed its holdings, formerly known as the Horst-Powell group, from an insignificant prospect to a producing property; and now is shipping at the rate of 3 cars of concentrates weekly to Trail under a long-term contract at a freight and treatment charge of \$8.50. The mill recovery is about 91%, according to the management, and the product averages 18.5% copper. About \$100,000 have been expended in development and equipment, and the company now employs about 60 men.

Burke.

The Hecla Mining Co., which owns and is operating the Hecla mine, a mill of its own at Gem, and has the Union mill of the Federal Mining Co. at Wallace, under lease, has declared the regular monthly dividend, 15 cts. a share, or \$150,000, payable the 20th to stockholders of record the 4th. This will make the payments for the current year \$1,250,000, and will increase the grand total to \$5,005,000, or a half cent more than \$5 a share on the entire capitalization of 1,000,000 that has been disbursed to stockholders since dividends were inaugurated. In the first 10 months of 1916 the company will have apportioned to stockholders \$685,000 more than the total dividend payments in 1915, which were \$565,000, and for the year the company will take fourth place among Coeur d'Alene companies for disbursements—the Interstate-Callahan Co. ranking first, the Hercules second and the Bunker Hill & Sullivan Co. third. The Hecla surplus fund now is in excess of \$550,000, and, despite the fact that improvements to cost approximately \$100,000 have been authorized, it is anticipated that a substantial extra dividend will be declared in December. The company now is treating 450 tons of ore daily in its Gem mill and 300 tons a day in the Federal mill. An addition of 200 tons is being constructed at its own plant, and it is believed that when this is in service that the

Federal mill also will be retained, making the total daily production of milling ore alone not less than 950 tons. In addition the output of crude ore is considerable, and will be increased proportionately as the facilities for reducing the concentrating product are augmented. The total gross income of the company for the 6 months ended June 30, 1916, was \$1,082,587, and the net profit for the period was \$766,887, or \$205,135 more than for the entire year 1915. Production will be much greater for the last half of 1916, and it is probable that the net earnings for the 12 months will be not less than \$1,750,000.

Kellogg.

A special meeting of the stockholders of the Nabob Mining Co. was held on the 2nd and the capitalization was increased from 1,500,000 shares at \$1 each to 2,000,000 shares, ratifying a directors' resolution adopted several weeks ago. A New York syndicate, represented by H. T. Irvine of Spokane, is endeavoring to secure control of the company, according to current report, and it is said that an offer has been made for the increased capitalization and the 250,000 shares of treasury stock for a price considerably in excess of the prevailing quotations. No definite information in regard to the rumored deal can be secured, but it is believed that representatives of the syndicate have been actively buying the stock in the open market for some time.

The grading for the Bunker Hill & Sullivan smelter buildings has been completed and the concrete foundations placed. The O. W. R. & N. Co. is installing sidings to the site from its main line at Sweeny, just a short distance from Kellogg, and active construction will begin as soon as material, now in storage at Kellogg, can be delivered on the ground. It is anticipated that the plan will be finished and ready for service before July, 1917, provided equipment can be furnished by the manufacturers who have the contracts for supplying the machinery.

LAKE SUPERIOR.

COPPER.

Houghton.

Ahmeek has bought of the Denver Rock Drill Co. 20 more of its Dreadnought pattern, making 40 in all. This type of drill, which is similar to the other patterns of the single-man drill, with the exception that it is valveless, has been found particularly well adapted to the rock of this mine. The strip of profitable mineralization, when the Kearsarge conglomerate was opened by the crosscut, was 6 ft. wide. There has not been any opportunity to test it again, as only drifting is being done. The good ground is continuing in both drifts, and has carried from the very first considerable small mass copper.

LaSalle has made to the Ahmeek mill two shipments of rock, which is the overflow from the Franklin, where quite frequently three stamps are used for that mine's own rock, but it has not yet been stamped, as probably a large quantity is being awaited so as to avoid two or three "clean-ups" of the stamps and wash. It is understood that there is some improvement in the yield of refined copper from the LaSalle rock. The fourth stamp at the Franklin has to care for the LaSalle and the South Lake; consequently there is often an overflow.

Algolah's boiler, which was ordered in March, is now on the way to the property, where it will be put in place as soon as possible, and sinking will be resumed. The shaft, when the work had to be stopped, was down about 450 ft., and it was hoped that commercial quantities of the black oxide copper, tenorite, or of native copper, which some thought was indicated by the presence of the black oxide near the surface, would be encountered.

Calumet & Hecla will undoubtedly adopt the flotation process for the fines. Experiments have been carried on by H. C. Benedict, the mill metallurgist, or superintendent of the ore dressing department, for the company, but now it is said that an expert has been brought in from the west, where this process has been developed to a high degree of efficiency,

to aid in its adaptation. It is likely that the plant will be placed on the southern side of the mills, as the space at the northern side will be taken up completely by the large addition that will be made in the spring to the leaching plant, in which there will be installed, when it is finished, two very large leaching tanks and others later; houses are now being moved away for this purpose.

New Baltic has dug out its pit for the shaft about 12 ft. and it has about 35 to 38 ft. to go to reach the top of the ledge, judging from the depth of the overburden in the diamond drill holes that have been driven in this vicinity. A small hoist and a derrick have been placed in position and the work will move along rapidly.

New Arcadian is in quite a long stretch of rich rock on the 1050 level, a little over half way from the shaft to the New Baltic boundary, and the quality and quantity of the copper is about the same as that encountered on the 250 and 900 levels, both of which have been carried to the line; these facts augur well for this lode on that property. The shaft is down 1460 ft. toward the 1500 level, where a crosscut will be cut over to the New Arcadian lode, and also drifts driven on the lode that is partly in the shaft, and which on the levels above has been met with about 16 ft. behind the shaft. At the No. 2 shaft, which is down 150 ft. on the lode supposed to be the Old Arcadian, drifts have just been started in the foot wall, where there is 8 ft. of heavy shot copper. There are now nine drills at work on the property. Men are difficult to get and to hold here on account of the isolation.

Indiana, in the lode supposed to be the Butler, finds some commercial copper, but the most of it is light and flaky. An old trench was used and the lode has been entered for a depth of about 10 ft.; sinking has been suspended to put in the necessary timber. It is too near the top of the lode to tell much about its mineralization.

Lake is gaining slowly in its tonnage, as more men are being added, and now about 7000 tons are being hoisted monthly. The lower levels are at the present time looking better and are giving about the same yield as the upper—26 lbs. The shaft on the Knowlton lode is unwatered for the full depth, 600 ft., and now a hoist is being provided with other work that must be done preliminary to mining.

Adventure has ended the timbering of the shaft through the stretch of about 135 ft., of which the last 50 ft. was partly in rock and partly in quicksand, the latter having been very difficult to control, and is now down to the first level of No. 1, located on the hill. So far pumping has been employed for unwatering, but now the bailing tanks will be used. The water is not yet down far enough for an examination of the mineral contents. The occurrence of the copper here on the Knowlton lode is regular, but it is of low-grade and had run down at this shaft, when mining was stopped here in January, 1908, to 11 lbs., but even this would be profitable at the present prices with the improved methods of mining and milling. This was a first-class shaft, and it had reached the 13th level; its openings are quite extensive and it had installed electric haulage on the 10th level east. If this lode should not prove profitable, an examination can be readily made of the Butler and the other Knowlton and Evergreen lodes, which are making such a good showing at the nearby properties. The mill can be easily put into good condition.

Old Osceola's new ground at the southern end of the mine is "sweetening" the yield so that for this branch of the Osceola Con. the smelter returns are about 17 to 18 lbs. The 39th to the 42nd, inclusive, are all in this good territory, which means very much for the LaSalle; also, as some of these levels have been carried to the line, it is likely that some day one drift will be extended into the LaSalle.

Isle Royale's production last month was about 82,000 tons, which at 14 lbs. a ton, the selling price 26 cts., give as the earnings very nearly \$170,000, or at the rate of about \$2,000,000 yearly. A conservative estimate for the year is about \$1,500,000, or \$10 a share. When more men can be had the tonnage will rise.

Copper Range, on account of the high price of the metal and the impossibilities of securing deliveries of the material anywhere near the agreed upon time, has deferred the

placing of a contract for building the new Trimountain mill until next spring at least. The tonnage at these mines is now keeping up to the normal.

Quincy, which did not find the copper at the No. 9 shaft to be of commercial values, either in the shaft itself, which was carried down about 2400 ft., or in a drift that was carried over from No. 8 at about the 40th level, is now extending the 55th level and is about 500 ft. from No. 9 in a better ground. Several other levels are being driven in this direction. The mineralization seems to dip quite sharply to the north and the indications are that the profitable ore body is now being entered. When it is found there will be quite a large mine on this end of the property, as the depth is good.

Winona is getting some rich copper at King Philip shaft No. 1, which will aid greatly in raising the yield. All shafts are running night shifts.

Houghton Copper has so far 140 ft. of good ground opened up in its northern drift on the 12th, or bottom level. On account of being obliged to hoist the rock in the winze to the 6th, where it is trammed 250 ft. and then hoisted to the surface, only one drill can be used on this level and that has to divide its work between the drift and the west vein. Occasionally some spots of good copper are found in the latter, but both here and in the drifts on the 4th level, the copper is scarce. The stoping on the 6th level is in profitable ground. It would seem that the future of the mine is on the Superior lode at depth.

Flint Steel, located between the Michigan and old Lake Superior properties on the southwest and the Adventure and Mass on the southwest, and comprising the eastern half of the northeastern quarter, and the whole southeastern quarter of Sec. 11, together with the Sec. 12 entire, will begin unwatering its old workings right away. New York parties have taken option on this property from the Ferguson heirs, also of New York, and will give it a thorough exploration. It was last worked in 1875, 830,000 lbs. of refined copper having been obtained from a fissure vein; it had three connected shafts. It has the Evergreen and Knowlton series of lodes most advantageously situated. The fact that Flint Steel has the Butler lode, which at the Mass on the north and the Michigan on the south are finding good values on this lode, seem to make it a success at the start; then it has the advantage of the old shaft, which will aid greatly in the exploration, as it is probable that crosscuts can be driven easily. The work will be under the direction of Supt. Samuel Brady of the Michigan, who has made a thorough study of the lodes of this part of the Keweenaw series.

IRON.

Iron River.

Progress is now being noted at the Forbes, which is a Jones & Laughlin property, with C. T. Kruse as general manager, and E. Corey, mining captain. The new system of open stopes is being well carried out with safety to the employees and with respect to the interests of the fee owners as well as to the company's side. Both the settling plan and the open stopes are being observed and operated, some of the deposits not being such that the caving plan can be practiced profitably.

Negaunee.

Under Superintendent Jackson the Athens shaft is being pushed and is now down 2000 ft. The work of running crosscuts to the ore body will also be rushed and when things are completed the Athens will be one of the deepest properties in the iron fields.

Work is being rushed to get out as much ore as possible at the Iron Mountain Lake mine before the close of the season. About 25 men have been employed at the property during the summer and Manager Kruse is desirous of adding about 40 more. There is considerable ore on stock at the mine and Kruse will make an effort to ship most of it this season. The shaft sinking operations were suspended some months ago. It is thought they will be resumed this winter. A small force of men has been at the property this summer to keep it in condition for shipping operations.

The work of opening the Holmes mine, which was started this spring by the Cleveland-Cliffs Co., is progressing. The

headframe is being erected by the Worden-Allen Co. When completed it will be 145 ft. high. There will be three crushers in it, two of the No. 5 size and one of the No. 8 size, with crushing rolls included. Because of the fact that both soft and hard hematites will be mined there will be separate pockets and chutes. There will be railway tracks on both the east and west sides of the shaft, with six pockets on each side. The concrete for the bases of the crushers is now being placed. The crushers are on the ground. Exterior work on the office and engine house has been finished. Work on the shop building and boiler house has commenced and work will be started on the change house soon.

MISSOURI-KANSAS.

Webb City, Mo.

McDonald Bros. are developing a lease in the Prosperity camp and during their development have sunk eight drill holes, four showing a soft ground formation from 190 to 240 ft., and four others showing a run of sheet ground ore. In sinking the shaft it was found that the run of soft ground ore came in at 150 ft., which is 40 ft. higher than shown by the drill records. The shaft is now down 196 ft. and the ore taken out is believed will run from 10 to 15% zinc. Preparations are being made for the erection of a milling plant, to be completed by the time the underground is opened up.

G. A. Barnett of Joplin and J. W. Grounds of Kansas City are building a 150-ton mill on a lease in the Duenweg camp and 14 drill holes have been put down, 12 of them showing good ore at 130 ft. Four shafts have been put down, which show 20 to 35-ft. faces of silicate ore. Considerable drifting has been done, and preparations are made to keep the mill running steadily.

Joplin, Mo.

With the clearing up of power conditions in the Joplin field there has been a resumption of mining operations in a number of mining camps, which have been most severely affected for a lack of coal and the shutting off of the electric current. Barring a lack of water for milling purposes, there will be no reason for any mine now operating at the present time, except the difference in the cost of production and the prices being paid for ore, not providing a reasonable margin of profit necessary for operation.

Among those resuming is that of the A. W. C. group of mills west of Joplin. Four of the five properties in this group were started Monday. Part of the difficulty this company has had has been the lack of water. This has been remedied by pumping some adjoining ground. In the Belleville camp, west of Joplin, the Lucky George Mining Co. has been compelled to move its mill to a new site, owing to the caving ground. This property has a large modern plant, and had only gotten well under way when the caving ground threatened the mill and mining operations were abandoned temporarily. A new mill will be erected and operations resumed at an early date.

On the W. A. Campbell land at Belleville the Eaglewood Mining Co. is erecting a new 250-ton mill. The company has drilled five holes and sunk three shafts, opening up some excellent ore at the 70-ft. level. At a still lower level ore running as high as 20% has been discovered by drilling. It is expected that the company will be able to turn out concentrates by the first of November.

A new prospect has been opened up by the Goodrich Mining Co., operating a lease on the old Sherwood mine northwest of Joplin. The old Sherwood mine operated at the 80-ft. level, took out a very rich deposit of ore at that depth in one portion of the 40-acre tract. The Goodrich Co. sunk its shaft to the 100 level, and is now taking out ore estimated to run 12%. For the present the ore is being handled over hand jigs, outputting about 8 tons per week.

Graham, Mead & Co., operating on a 20-acre lease on the Campbell, southeast of Joplin, this week, made a rich strike of shallow zinc ore while deepening a shaft in order to obtain water for the silicate mine. The ore deposit was struck at

64 ft., and while the shaft is only 2 or 3 ft. into the ore, the ore so far taken out, it is believed, will run 12%. The ore occurs in soft ground and hand jigs will be used for cleaning it. Those interested in the mine are J. M. Graham, G. J. Graham, J. E. Walker, Harry Mead, Amos Freeman, Jack Ammerman, of Joplin, and J. M. Berriam, Coffeyville, Kan.

The Bonnie Bell Mining Co. lease at Thoms Station on the land of the Mexico-Joplin Land Co. is now getting the mine opened up and expects to be able to make a carload of concentrates weekly within 30 days.

A company, composed of Ed Lockhard, Roy Carney, R. Cox, A. G. Pickens and Lew Jones, obtained a lease upon the land of Mrs. S. B. Jones, southeast of Joplin, and the same day moved a drill rig upon it, which within the day struck a 7-ft. run of lead ore at 38 ft. level, and on the day following the company had sunk a shaft 7 ft. deep. The operators expect to have the shaft into the ore this week, and be regular producers the next.

Galena, Kans.

On the Paige land south of Galena the Double Lew Mining Co. has started the erection of 150-ton concentrating plant on a 12-acre lease just south of Wayland lease. The company has already produced approximately \$85,000 of ore since the first of the year, all of which has been cleaned over hand jigs. The ore to be handled is found at from 50 to 65 ft., two shafts being operated. The ore has been running about 10% and the concentrates are high-grade. Drills show the existence of ore down to 120 ft. Those interested in the company are: J. T. Wayland, O. H. Wayland, Walter Wayland, of Girard, Kan., and L. H. Phillips, of Galena.

MONTANA.

Butte.

Butte is soon to be made the headquarters for one of the largest and most thoroughly equipped "mines safety" stations of the federal bureau of mines. In this city will be located one of the new mine rescue cars of the government and between six and ten men of the federal bureau's staff will be stationed here. In co-operation with the Montana School of Mines an office for the men of the federal bureau will be established here. This will be used also by the bureau's representatives who are traveling through this section of the country.

The Lexington mine, a valuable zinc property located in the Walkerville district and for several years a highly profitable silver property, is to be sold at auction in this city Nov. 1. In the days of F. Augustus Heinze the Lexington belonged to the La France Copper Co. and a few years ago it was taken over by a concern known as the Atlantic Mines Co. The Atlantic Mines Co. was dissolved some time ago and the sale is for the purpose of making a final disposition of the assets. For some time the property has been under control of the Anaconda, who offered a sum equal to about \$12.50 a share for the property and it is understood this offer will be formally accepted at the sale Nov. 1. Heinze organized the La France in 1905 with a capitalization of \$7,000,000 and an authorized bond issue of \$2,000,000. The Lexington has a 3-compartment shaft, 1450 ft. deep, and is connected on the 600 level with the Alice mine. With its new zinc-treating properties at Anaconda and Great Falls the Anaconda will be in a position to treat the zinc ores of the Lexington at a good profit.

The mines of the Butte district yielded 30,960,000 lbs. of copper in September. Of this amount 29,400,000 lbs. was produced by the Anaconda and 1,760,100 by the East Butte. The monthly production of the Anaconda company for the year was as follows: January, 23,200,000 lbs.; February, 23,300,000; March, 26,600,000; April, 33,300,000; May, 30,000,000; June, 28,100,000; July, 28,200,000; August, 28,800,000; September, 29,400,000; total, 233,900,000 lbs. The following is the East Butte production by months: January, 1,060,000 lbs.; February, 1,277,000; March, 1,306,000; April, 1,501,000; May, 1,517,440; June, 1,639,560; July, 1,893,120; August, 1,849,120; September, 1,760,100; total, 13,803,340 lbs. Butte's total pro-

duction for the nine months is 247,703,340, or close to a quarter of a billion pounds.

Clinton.

Spokane men have formed a tentative corporation and taken a bond of \$30,000 for 2 years on the Klondike group of four claims 2 miles from Clinton, Missoula county, it is announced by Bob Mabry. It is proposed to develop a ledge giving large promise of copper and silver. "Preliminary work has been proceeding for several months on an option, the purpose being to determine the possibilities before investing," said Mr. Mabry. "Ore was exposed in the explorations of J. A. Weston and U. S. Swartz, from whom we purchased. We continued the investigations with a prospecting tunnel and a 40-ft. drift, the latter exposing a vein 5 ft. wide between granite that contains a streak 10 ins. wide having high values in copper and silver. The lower tunnel, in 300 ft., is within 100 ft. of the locality where the ledge should be cut. Samples from the face of the upper tunnel show values of \$60 to \$106.41. The latter is represented by 18.8% copper and 7.2 ozs. silver." The officers and stockholders are Dr. W. M. Newman, president; J. P. Dillard, secretary-treasurer; David Holzman, Samuel Edelstein, E. A. Moye, O. A. Broyles, J. P. Acoam and Mr. Mabry.

Troy.

Active mining operations will be begun about Nov. 1 by the Snowstorm Mines Con. Co., according to an official report received recently from President Leo Greenough by William A. Nicholls, president of the Spokane Stock Exchange of Spokane. More than 550 men now are employed constructing a mill, hydro-electric power station and a railway to connect the mines and mill and the shipping bins on the Great Northern tracks, near Troy. It is estimated that there now are approximately 400,000 tons of ore ready for extraction, assaying 7% lead, 8% zinc and 3 ozs. silver. "The concentrator has a capacity of 300 tons daily, but this can be increased to 500 by the addition of tables and tube mills," says the report. "Tests indicate that an extraction of 85 to 90% of the lead and silver may be expected, and, although the zinc ore is refractory, we are confident of an extraction of at least 40%. The ore will be reduced to slimes, and then treated by flotation. The greatest development has been done on the Banner & Bangle vein, which has been opened by six tunnels for 2500 ft., giving a vertical depth of 1100 ft., and all the faces are in ore. Tunnel No. 4 has been run on the vein for 600 ft., exposing 3 ft. of ore containing 13.4% lead, 11.2% zinc and 5 ozs. silver. Tunnel No. 5 has been run on the vein 1040 ft., exposing a body 3 ft. wide, containing 5.3% lead, 7.7% zinc and 2.6 ozs. silver, and tunnel No. 6 has been run on the vein for 2450 ft., exposing a body 2.2 ft. wide, containing 8.1% lead, 8.7% zinc and 3.8 ozs. silver. Power will be supplied by a hydro-electric plant at Lake creek. Water will be impounded by a 40-ft. dam and conveyed by a 200-ft. flume, from which a minimum of 2500 hp. may be developed. The first installation will generate 1500 hp. Power will be transmitted 1½ miles to the mill and 7 miles to the mine. A 17,000-ft. flume is under construction between Callahan creek and the mill. The water will be used for washing ore, fire protection, domestic purposes and for driving some of the machinery. Transportation between the mine and the mill will be provided by a railroad 5½ miles long. It is built on a 36-in. gage. Steam will be used at the outset, but electricity ultimately. The estimated cost of the construction, equipment and installation is \$450,000. The \$560,000 available should be sufficient for the operation until the property is on a paying basis. Part of this money was obtained from the treasury of the Snowstorm Mining Co. and the rest through the sale of stock and on long time notes. An option and a long time bond is held on the property, which is comprised of 25 mining claims, seven mill-sites, two power sites and five water rights, in addition to which the company has acquired 260 acres at Troy for a mill-site, and 220 acres for a power plant. The lease and bond calls for the payment of \$225,000, of which \$75,000 will be due Nov. 20, 1920, and \$150,000 a year later. A royalty of 10% will be paid on the net smelter returns."

Helena.

At a meeting of the Cruse Con. Mining Co., operating just west of Ft. Wm. Henry Harrison, in the Grass Valley

district, James J. Cruse, Edward Phelan, J. S. Scott, Claud G. Wilson, Wm. C. Sweeney, R. A. Weisner and L. S. Ropes were elected directors to act until the regular annual meeting of the stockholders in January. James J. Cruse, president; Ed. Phelan, vice-president and treasurer; R. A. Weisner, secretary. At a meeting of the directors it was decided to put on two shifts on the Looby shaft and to erect a new bunk house at the mine. Ore recovered in sinking this shaft, an incline on the vein, is more than paying for the costs of the work.

The vertical shaft of the Rock Rose Mining & Milling Co. on the Dandy claim is being sunk to the 200 level. From the surface to 150 ft. the shaft has carried a vein of quartz and pyrite with gold and silver values. At this depth the porphyry dike on the south of the shaft feathered out, bringing in another vein on its foot wall, joining the shaft vein. At this point lead and silver values came in, largely increasing the value of the ore. At the present bottom, this vein has a slightly southern dip, which has carried it outside the shaft timbers. The main vein of the Dandy lies to the north of the shaft, at the 100 level, being 23 ft. from the shaft, where it carried high values in lead, silver and gold. It is for the development of this that the shaft is being sunk, the south vein being an unlooked for asset. Evidence of oxidation and replacement are noted to the present depth. The formation is slates, diorite porphyry and hornstones, characteristic of the Marysville district, and in close proximity to the underlying monzonite, exposures of which occur in the Scratch Gravel hills, just to the north and in the Ten-Mile basin to the south. The district is attracting considerable attention, locally. The Rock Rose is controlled by the Cruse Con. Mining Co.

At the Carbon Hill, a mile west, the shaft is down 200 ft. on the inclined vein. Drifting will be commenced at this level. This vein dips to the west, whereas the Looby and other north-south veins of the eastern portion of the district have an eastern dip. The Carbon Hill is in the diorite porphyry. Silver, lead and gold are the values in this vein, some bunches being of exceptionally high grade. The Carbon Hill is at a higher altitude and leaching is in evidence to the present depth.

The outlook for the Grass Valley district is very bright, now that development in depth is being undertaken along definite lines. Lying but a few miles from and in sight of Helena, the district is favorably situated for economical mining. The Northern Pacific railway passes within from a half to 2 miles of all parts of the district, and electric power lines are within a few miles.

Marysville.

During the past summer several properties have been under investigation by eastern capital, this, in the way of prospecting, developing known veins and reopening old mines. The result has been the conclusion of negotiations upon all options investigated. Among these, the Annie Dillon, under the organization of the Marysville Gold Mining Co., has been taken over through its stock holdings, and becomes the organization and assignee for all options on the remaining groups. The groups, all of which have been assigned to Maurice Eisenberg of New York and by him to the above company, comprise the Honey Comb, five claims, the Blue Bird and Hickey, eight claims and mill site; the Spokane, three claims; the Lynch, two claims; the Mt. Pleasant claim and the Fountain Head claim. Work will be carried on during the winter developing and prospecting new territory. The Hickey crosscut is being pushed north into the Mt. Pleasant-Honey Comb territory, and work will be started on the Spokane, into the same, and the Blue Bird-Hickey territory, tapping these at from 550 to 750 ft. depth, in a distance of about 3500 ft. from the portal.

The St. Louis Mining & Milling Co. is preparing to make some alterations in its mill and equip with electric motors. With this completed operations in mine and mill will be resumed. The company has considerable ore available in the old stopes of the Drumlummon, some virgin ground to stope and considerable unprospected territory of exceptional promise, insuring continued operations.

The Golster and Shannon of the Barnes-King Development Co. have settled down to operation and development,

the Shannon delivering its ores to the Gloster mill over a 13,000-ft. aerial tram over the sides of Mt. Pleasant and Mt. Belmont.

Chas. Longmaid and associates have cleaned up their season's work, cyaniding the tailings from the old Penobscott mill, with satisfactory results. They expect to move their plant to the lower dams in Lost Horse gulch next season.

Tower and Templeman have their cyanide plant complete and in operation on the Bald Butte tailings. Owing to the late and unusually bad spring, they were greatly delayed in getting their machinery in, causing a late start.

Lessees have been assigned sections in the Bald Butte mine and the company has let a contract to drive a cross-cut on No. 4 tunnel level to intercept a strike of high-grade ore made on the surface during the past season. Should this develop sufficiently to justify, the mill will be started up, also handling lessees' ore.

NEVADA.

Goldfield.

Developments on the 300 level of the Great Bend have opened three shoots of good ore and the management is arranging for shipments. The first shoot is about 3 ft. wide and has been opened for 115 ft. It is of good milling grade. The second shoot is 14 to 25 ft. wide with seams of high-grade ore accompanying the leaner material. The third shoot was opened last week in the east drift. It averages 2 ft. wide and assays up to \$160 in gold and \$1.50 silver. Plans have been prepared for a flotation plant, and the shaft will be carried deeper and extensive lateral operations undertaken in virgin territory. The Great Bend is located in the Diamondfield section of the Goldfield district.

At an approximate depth of 930 ft. the shaft of the Silver Pick has entered shale after passing through an ore channel 30 ft. thick. Sinking continues to tap the ore channel in the shale-alaskite contact, recently indicated by the core drill. As soon as this point has been gained crosscuts will be extended to prospect both contact zones. Prospecting with the Calyx drill has been started about 800 ft. west of the shaft.

The shaft of the Cracker Jack is being retimbered to the 320 level and from this point drifts will be driven to seek the two veins developed near surface. Development of the rich shoot encountered at a depth of 120 ft. has been resumed. The mine is splendidly equipped for deep work. H. G. McMahon is manager.

The south drift from the 350 level of the Sandstorm-Kendall is advancing rapidly and is expected to intersect the Loftus-Davis shoot within 30 days. This shoot was one of the richest ever worked in the district, but was only worked to a depth of 70 ft. The Sandstorm-Kendall is the oldest mine in the district and was one of the first to claim recognition.

The Goldfield Con. has arranged to abandon the Mohawk shaft and production in future will be by way of the Combination and Clermont shafts. The new underground electric haulage system will facilitate ore deliveries to the shafts at low expense. During the past few weeks considerable rich ore has been uncovered in the Mohawk mine, averaging around \$125 gold. Developments in the deeper levels of the Laguna and Red Top are reported satisfactory, while new ground in the Mohawk and Combination is yielding good ore. New equipment for the flotation plant is expected to arrive shortly.

Manhattan.

Most of the equipment for the new reduction plant of the White Caps Co. is on the ground, or in transit, excepting the roaster, which is being constructed in the east. The management expects to have the plant in operation by Feb. 1, and is engaged in blocking out large reserves in the 310 level workings. Deepening of the shaft will commence in 30 days.

The Union Amalgamated Co. has arranged to deepen the main shaft to 625 ft. and to press extensive developments.

from the new level. Grading for the compressor has started. The mill is running steadily and if work on the 625 level proves satisfactory the plant will be moved to a point below the Bath mine. It is at present a mile from the property.

Tonopah.

The miners of Tonopah have filed a demand for a wage advance of 50 cts. per day, and the matter is being considered by the Mine Operators' Association. The men state increased living costs warrant the advance asked, together with the fact that the silver-producing companies are earning large profits.

The new station on the 1500 level of the Gypsy Queen has been completed and drifting to strike the vein opened in the winze from the 1350 level will soon commence. The drift is expected to also open the gold ledge which was encountered at a depth of 1470 ft., but development was prevented by an inrush of water. The work is being followed with much interest, particularly in view of the late discoveries of gold-bearing shoots on the 1400 level of the Belmont and 1050 workings of the Rescue Eula. Apparently the gold-carrying formation extends back of Mt. Oddie in the form of a crescent.

Pioche.

For the first time in 20 years the 1200 workings of the Yuba mine have been opened, the work being accomplished last week by the Meadow Valley Leasing Co. Ore of excellent grade is reported to be showing and it is believed the old producer will shortly take its place among the big yielders of Pioche. It has a productive record of \$5,000,000.

NEW MEXICO.

Mogollon.

September has been another excellent month for local operators. The Socorro Mining & Milling Co.'s properties produced 3300 lbs. of gold and silver bullion and the Mogollon Mines Co., operating the Last Chance mine, shipped 2700 lbs. for same period, a total of 3 tons of precious metal for the 30 days. In addition, each company shipped to smelter at El Paso high-grade concentrates in value about equal to the bullion product, latter going direct to mint.

The development companies also met with substantial encouragement, particularly the Oaks Co., in the continued improvement of ore body recently opened on the Queen vein on Clifton property, from which regular shipments to custom mill by burro were maintained. Another young mine, the Eureka, continues to sack high-grade ore for shipment to smelter, while results of work on a number of claims by their prospector owners lends energy to the task and a faith in the outcome that is unsurpassed in any other line of pursuit.

Supt. E. L. Perkins of Mogollon Mines Co. is conducting a series of flotation experiments on local ores and the results thus far justify the belief that a greatly simplified treatment with a substantial reduction of costs may be evolved. The Mogollon district has a recorded production of upwards of \$15,000,000 to date, largely from an average grade of \$12 ore. This activity has extended over a period of many years, and with comparatively high costs necessitating more or less selective mining methods, the camp has an immense tonnage of lower-grade ores in reserve. With the reduced costs of operation that will follow hydro-electric installations and the eventual adaptation of oil flotation treatment now in prospect, these ores should yield quite as much profit as the higher grades have in the past.

OREGON.

J. W. Larkin, A. Prader and E. L. Prader, Spokane, made an examination of the Overholt ground on Miller mountain. This property has about \$8000 worth of development work on it and the ore bodies are well developed.

Grants Pass.

The Grants Pass Hardware Co. has purchased the Ida mine of the Granite Hill group. The Waldo Mining Co., who

recently bought out the plant of the old Mt. Pitt mine, has a crew of wreckers at work taking down the mill, part of the machinery being hauled over to the Waldo mine and the remainder offered for sale. Manager P. B. Wickman of the Alameda mine has a crew of men at work constructing a road from the Copper Eagle mine, which he will develop. There are already several thousand tons of ore blocked out. It is expected that teams will be at work hauling it out within the next two weeks. The ore will be shipped to the Tacoma smelter. Loads of steel pipe are being hauled to Louise Creek valley for reopening the Granite Hill placer when the rains begin. Upwards of \$60,000 has been extracted previously. A shipment of 5 tons of high-grade from the Neil Success, was sent to Seattle as an experiment to determine the best method of reduction. Some of the ore was said to run over \$600. There is a good quantity of ore on the property.

SOUTH DAKOTA.

Lead.

Sinking has been resumed at the property of the Custer Peak Co. in a shaft which was previously put down 250 ft. The installation of a compressor and a new boiler, giving the plant a boiler capacity of 200-hp., has been completed. The sinking was commenced a few days ago and about 10 ft. have been added to the depth of the shaft. Two shifts are worked. It is the intention to employ three shifts in the sinking as soon as necessary arrangements can be made. The water is being satisfactorily handled with a No. 9 Knowles pump, which is part of the new equipment. The present plans include sinking the shaft to a depth of 500 ft. Here there is reason to believe the grade of the copper-bearing ore will have advanced to a commercial value. This expectation is based on the betterment of the grade from the 150 level, where copper was first noticed in appreciable quantities, to the 250 level, where the values showed a material increase. The ore body has a width of more than 100 ft.

After idleness for several years development has been resumed at the Puritan and shaft sinking begun. The initial work will consist of putting the main shaft down to a depth of 250 ft. Connection may then be made with other workings, and afford a practical means of mining ore from a ledge which has already been partially developed. An additional depth of 60 ft. will accomplish this. Aside from high-grade ore in the vertical, the ground contains an immense blanket of quartzite that will afford a supply of milling material. This blanket has an average depth of 28 ft. and has been prospected at eight or ten points in widely separated locations on the property. It is reliably stated that the quartzite will average between \$3 and \$4 in gold, silver and lead and under present treatment methods should yield a profit. Its development will require considerable additional mining, in order that it may be opened from underneath. The 20-stamp mill is in good condition and is expected to serve in handling the mine product.

UTAH.

Eureka.

A cave 100 ft. deep has been opened at the Eureka Lilly. It was encountered while a winze was being sunk on a fissure which was highly mineralized. The winze was sent down on an incline along the hanging wall. At a depth of 110 ft. below the 500 level the cave was encountered changing the dip of the fissure to vertical. It is the intention to sink the main working shaft, now down 500 ft. While waiting for new equipment they decided to sink a winze from the 500. This winze is located about 120 ft. from the shaft and had reached a depth of 110 ft. when the cave was located. Most of the ore mined at this property came from the 400 level. Operations at Tintic Standard have revealed deposits at greater depth and on the strength of this the future plans

of Eureka Lilly are to attain greater depth and the expected ore bodies.

Good ore, in places 4 ft. thick, is showing in the shaft of the Eagle & Blue Bell. The shaft is now down about 50 ft. in the new drive below the station at the 1875 level. It is the purpose to send the shaft to the water level, probably near the 2100 before cutting a new station and prospecting the new body at this depth. At the new station on the 1875, a drift is being sent out to connect with the winze sunk from the 1700. Another drift is going out in the opposite direction to prove the extent of the ore in that quarter.

By Nov. 1 the Tintic Milling Co. will have its new Holt-Dern roasters installed and started on an increased production. The addition of the roasters and other changes which are being made will bring the capacity of the mill up to about 300 tons per day. Already some of the mines are making preparations to supply the plant with ore. A good part of the ore will come from the Dragon and Iron Blossom, although the Colorado, Swansea and others will be benefited. Some of the copper ore in the Iron Blossom, while it is so rich that it cannot be considered a milling product, may possibly be sent to the mill, because it is a class of ore that is needed and on which a splendid extraction of values can be made.

Alta.

The Old Emma Leasing Co. is now installing a 500-gpm. pump to be operated by electricity. This will be used to dewater the shaft through the Bay City tunnel. Rails and other equipment have been ordered and by Nov. 6 it is expected that a drift of 100 ft. will be made from the shaft and the ore opened for shipment. By the time the property is ready to take out ore it is believed that the new railroad into Alta will be completed. A spur can be put in to the Emma bins and a large saving made on transportation. The third drill hole, No. 6, encountered the ore and has since been driven through the body. The three holes put down have demonstrated the presence of the ore body. A number of other drill holes will be put down but they will be used to demonstrate other geological features. The second level in the shaft below the Bay City tunnel is down 225 ft. It is expected that the pump can lower the water to that depth in 2 weeks. Power drills will be put to work drifting when the level is reached. The first week in November, according to calculations of engineers, the Herzig drift should reach its objective and pass through the Montezuma fault 650 ft. further to the northwest. It is being driven to encounter the downward extension of the ore body which was mined in the Gunderson stope in the Burgess Tunnel workings. The Gunderson was the largest stope in the old Vallejo mine and is reputed to have produced a big tonnage of high grade but was terminated against the Montezuma fault. Plans for consolidating the Old Emma and Emma Copper are now being negotiated.

Park City.

With some of its machinery on the ground and all buildings under cover it is expected that Judge Smelting will have its new plant ready for operation by January.

At the Iowa Copper ore being followed in the incline, which is improving in value at depth. A plan was decided upon which will mean the collecting of sufficient money each month to continue development work. In addition to this stock will be put on the market and if sales justify machinery will be installed.

John Nichols and associates, who have a lease on the Hog Pen tunnel, have been driving 6 months without results. This week ore was broken into. Since finding the streaks of ore no mining has been done, it being necessary to put in air pipes. The tunnel is above the No. 2 shaft, where high grade ore was found practically at the grass roots.

At the Ontario new ore reserves are being found and conditions are generally favorable. Every other day a car of ore is shipped. More is being piled up awaiting treatment, because the valley smelters cannot handle it at present.

Daly Judge Extension is equipped with a gasoline hoist, bunkhouse, blacksmith shop, etc. Three men are at work, John Hickson in charge. Work is being done in a shaft down 120 ft. and they expect to break into pay ore with every shot.

An 18-in. fissure has been cut from which is being taken good matter. The formation and dip are favorable. The directors are planning to finance so that work can be continued all winter.

Atkinson.

The new mill of the Big Four Exploration Co. has been completed and is now shipping a car of concentrates a day, though there is some shortage of cars. The product consists of lead-iron and zinc concentrates. The mill is rapidly being brought up to its capacity and is now treating an average of 750 tons of tailings per day. It is expected within a short time the mill will be handling 1000 tons per day. At the present rate of extraction the company is earning \$25,000 per month, or an equivalent of 6 cts. per share per month on the outstanding stock. With modifications that are being worked it is understood that the earnings will be increased. During the summer season the management has had a crew of men at work pilling up tailings. These will be treated in the mill during the winter months, all plans having been completed for keeping the mill running constantly. There are 1,000,000 tons of tailings to be treated, on which the company holds a lease for 8 years. Three shifts are being employed.

WASHINGTON.

Spokane.

The Chloride Hill Mining Co., capitalized for 1,000,000 shares at \$1 each, has been organized by Spokane men to take over and develop the old Santiago silver mine, on the Columbia river, 2 miles from Hunters. E. G. Ross is president and R. B. McClary secretary-treasurer of the new corporation, and, with J. T. Young, Hunters, compose the directorate. The property is one of the oldest locations in Stevens county, and was fairly well developed by former owners. "With silver at present price and the introduction of automobile trucks this property can be put in the shipping class practically at once," according to Mr. McClary. "There is about 10,000 tons of ore on the dumps, from which several cars of shipping product can be sorted. This will be done at once and we believe the property will pay for its own further development. There is a ledge on this property 5½ ft. wide, with an 18-in. strip that goes 80 ozs. silver. The rest of the ledge runs about 20 ozs. This is shown all the way down in a shaft 87 ft. deep and practically the same ore is found in the 240-ft. tunnel run in on the ledge. On the surface there is an ore shoot 700 ft. long that goes \$20 to \$35 silver, and is about 22 ins. wide. Former owners hauled ore to Davenport at a heavy cost. We can bring it out to the same point at much less expense by using auto trucks, or we can ship it by barges down the Columbia to the nearest railroad."

Deep development of the Great Western and Last Chance properties, near Northport, under lease and bond for the past year by Norman Mines Co. of Spokane, has proved disappointing, and operations will be abandoned in a few days. The company was organized over a year ago and in August, 1915, secured from George Thomas, of Colville, a lease and bond upon the Great Western group for \$20,000, running until 1918, with royalties of 15% applicable to all payments. Operations disclosed a large body of zinc carbonate ore above the main tunnel level, at a vertical depth of 85 ft., and under stimulating effect of high spelter prices prevailing early this year, heavy shipments were made to Edgar Zinc Co., Donora, Pa., and Kulsa Spelter Co., Kulsa, Okla. Approximately \$25,000 worth of zinc ores, averaging around 24%, was produced from a body about 250 ft. long mined to the surface from the tunnel level. A gasoline hoist was installed and a winze put down in the ore body at a point where it showed a width of 20 ft. For approximately 40 ft. the showing continued to be favorable, but from that point down to the 100 level no pay ore was found. The Last Chance group adjoining Great Western on the southeast was taken over under lease and bond for \$30,000 from the Jupiter Lead Co. last February. Under former ownership the property had produced approximately \$500,000 worth of lead ore,

and it was believed that the extension of this large ore body could be developed. While several excellent showings were uncovered in the old workings after they had been retimbered, none persisted for any distance and no evidence of continuation below the present workings was found. As a \$3000 payment falls due this month, the directors of the company decided that it would be unbusinesslike to meet it. Until final settlements are received from smelters and all accounts made up for the month of September, no financial statement can be issued to stockholders. All indebtedness will be retired, however, and it is possible that a small cash surplus will be left in the treasury. Another property may be taken over, but no definite arrangements have yet been made. In such event all small stockholders will be carried for interests identical with present holdings and a treasury fund created by stock donations from present control. The officials of the company own practically nine-tenths of the outstanding capital stock, less than 75,000 being held by small owners in this city. The Norman Mines Co. is capitalized for 1,000,000 shares at 10 cts. each, of which about 100,000 still are in the treasury. The officers are James A. Welch, president and general manager; H. R. Welch, vice-president, and Sidney Norman, secretary-treasurer.

WISCONSIN-ILLINOIS.

Platteville.

Deliveries of ore for the month of September were reported, by districts, as shown.

Districts.	Zinc, lbs.	Lead, lbs.	Pyrites, lbs.
Benton	28,766,000	386,000	1,384,000
Galena	7,200,000	118,000	874,000
Mifflin	5,480,000	84,000	.....
Hazel Green	4,326,000	60,000	.....
Cuba City	3,796,000	.....	2,600,000
Linden	3,338,000	156,000	240,000
Platteville	3,004,000	.....	.....
Shullsburg	2,754,000	172,000	.....
Highland	1,592,000	.....	.....
Montfort	518,000	.....	.....
Potosi	334,000	.....	.....
Mineral Point	262,000	.....	4,254,000
Totals	61,370,000	776,000	9,352,000

All previous records established for the field were broken in September. Shipments were the highest ever published. Recovery of zinc concentrates were highest, with a complete summary of 25,000 tons. High-grade refinery zinc ore direct to smelter also exceeded any previous mark, over 15,000 tons leaving the field. A total of 761 cars of zinc ore reached track for the month, 30,685 tons. The New Jersey Zinc Co. shipped 76 cars of high-grade separator ore to DePue, 1521 tons. The reserve at the close of the month, conservatively estimated, showed 7500 tons blende all grade on hand; 1000 tons lead ore and 15,000 tons iron pyrites.

The Block House Mining Co. has put on two shifts. A magnetic separating plant operated in connection with the mill is yielding the highest grade of ore of the field—62% zinc. The Grant County mine is the third low-grade producer to suspend operations within the past 3 weeks. Sixty men were thrown out of employment. Superintendent J. A. McCullough of the Vinegar Hill Zinc Co., with offices at Galena, has been transferred to this point. Mann & Harding Mining Co. has resumed operations. Lee Hinkins has been appointed superintendent. The M. & A. Mining Co., operating the Big Tom mine at Rewey, has a new rig. Shipments are expected soon. About \$35,000 has been expended by the new corporation. The regular annual meeting of the stockholders of the Wisconsin Zinc Co. will be held at 85 Exchange St., Portland, Maine, on the 17th.

Klar-Piquette sent in 2 cars of cleanup stuff, the mine being shut down for good. East End sent 2 cars to Galena, 86 tons; Star Mining Co. to LaSalle, 1 car high-grade, 44 tons; Hodge mine to National Works, Cuba, 4 cars, 172 tons. No returns came from Hazel Green or Potosi camps.

Returns for the field for week of 7th show 116 cars of zinc ore, 4530 tons, a considerable falling off over several previous weeks; 4 cars of lead ore, 153 tons; iron pyrites, 12 cars, 721 tons. The gross recovery crude concentrates were

light, only 3540 tons being reported. Net deliveries of high-grade refinery ore to smelters, 2654 tons. A gain of \$2 per ton for base zinc ore was registered, standard and top grades going at \$60 base, with the range down to \$50 on ore as low as 54% zinc content. Lead ore held at \$75; base 80%.

Shullsburg.

The only producer to report last week was the Winskill—8 cars to Galena. Reserve ore was found in bin at both the Rodhams Mining Co. and the Oliver Mining Co.

Mineral Point.

Receipts of crude concentrates at the Mineral Point Zinc Co. for 7th totaled 31 cars, 1155 tons; cars of this came from independent operators.

Montfort.

Eagle-Picher Lead Co. covered offerings on O. P. David Mining Co. zinc ore, 2 cars going to Collinsville, Ill., last week, 90 tons. This buying concern was active during September.

Cuba City.

National Zinc Ore Separating Co. report 19 cars raw ore delivered to works week of 7th, 750 tons. Shipments high grade to Illinois Zinc Co., 4 cars, 137 tons; to Granby Con., 7 cars, 265 tons. Linden Zinc Co. lessees, Campbell Separating Works to Lanyon Zinc Co., 2 cars, 75 tons. Utt-Thorne Mining Co. purchased the Big 8 mine, buildings and machinery. A new plant is also being provided for the Lawrence mine. Two new plants and one small separating plant are being supplied for Standard Metals Co., of Chicago; big strikes on the Dall & Coulthard lands continue.

Benton.

Shipments of mine run ore to track for week of 7th totaled 54 cars, 4,230,000 lbs.; lead ore, 4 cars, 153 tons; pyrites, 210 tons. H. Lewis, field representative of the Eagle-Picher Lead Co., secured heavy tonnages for early delivery. The Wisconsin Zinc Co. being a large contributor. Fields Mining & Milling Co. of Chicago has entered into contract with Grasselli Chemical Co. for a period of years, and last week shipped 6 cars, 226 tons. The Vinegar Hill Co. took the lead in shipments last week with 13 cars to separators at Cuba, 4 from the Blackstone, 3 from the Martin, and 6 from the Kittoe, the last named having proved a large producer for the past 2 years. Benton Roasters, high grade to Collinsville, 38 tons; Wisconsin Zinc Co., high grade to Collinsville, 3 cars, 116 tons; to American Zinc Co., 5 cars, 197 tons. Grand View, Sally and Wilkinson each reported a car last week. All are new producers.

Galena.

Shipments from Black-Jack were 6 cars to Mineral Point last week, 250 tons. North Unity, Federal and Day Mining each sent 1 car to market. Galena Refining Co. failed to report. Wisconsin Zinc Roasters sent 2 cars to LaSalle, 72 tons; 1 car to Hillsboro, 40 tons.

WYOMING.

Greybull.

The Liberty Oil & Gas Co. is down 1000 ft. Realizing that much better time can be made with a heavier rig, Supt. C. E. Russell has gone to Seattle, the home office of the company, to purchase a Standard rig. The company proposes to drill several wells in the district. The Northwest Oil & Development Co. has let a contract for the sinking of another well east of the one that was brought in recently. Crall & Hyde are drilling on the Rogers' ranch. They had a fishing job for several days but are again at work. Edwards brothers have let a contract to sink a well on their recently acquired property on the south side of Greybull river. A new hole has been started on the property of the Greybull Oil & Development Co. south of Greybull river. A new contract has been drawn up and it is hoped that the trouble the company has been having is eliminated. A new hole has also been started at the Reynolds & Sypher property on Greybull river.

CANADA.

BRITISH COLUMBIA.

Nelson.

Negotiations for the bonding of the Canadian Pacific group of claims in the Ymir district by John Arbuthnot of Victoria and New York associates have virtually been completed by Edward Peters of Nelson, one of the owners of the claims. The price is \$75,000. The group lies 4 miles from Ymir and near the Wilcox mine. It is a big low-grade gold proposition, on which surface work has exposed four veins from 4 to 30 ft. in width for a distance of about a mile. Assays show values to run from \$1.80 to \$14 in gold, and with silver values up to 10 ozs. Among those associated with Dr. Peters are George F. Motion, Dr. L. E. Borden, George H. Colwell, C. G. Peters and Robert Smillie of Nelson.

Sandon.

The Ivanhoe mill, built to replace the first plant destroyed by fire last year, will be completed within the next 2 weeks, and will commence what promises to be a long run on ores from the Surprise, now being developed at a vertical depth of 1200 ft. through No. 3 tunnel of Last Chance on the Cody Creek side of the mountain. The plant is being rebuilt under an agreement between W. H. Yawkey, of New York, owner of the Ivanhoe, and Alex Smith, manager and part owner of Surprise. The capacity is about 100 tons a day. Surprise ore will be brought from the mine over the Last Chance aerial tramway to the road bed of the abandoned Kaslo & Slocan narrow-gauge railroad below Cody. From there it will be hauled 2 miles to bins below the road bed and opposite the mill, and taken by aerial tram across the Carpenter Creek gulch to the mill bins. Little official information concerning mine conditions is obtainable, but there is no doubt that splendid reserves have been placed in sight by the deep development carried on persistently and quietly for so many years. The ore is said to contain good values in silver, lead and zinc and the mill is being equipped with flotation process and other modern improvements. The property has been steadily developed for 20 years under private ownership of Congressman Charles Kent, of California, and Alex Smith, who has had charge of operations during the entire period. The Ivanhoe has recently been reopened under lease, and the tramway is being put in shape to transport ore to the mill. The property was extensively developed by Yawkey and his father over 15 years ago, but has been idle for at least 10 years. The old mill was under lease to Keane & Cunningham for treatment of Lucky Jim ores when it was destroyed.

Greenwood.

Oscar Lachmund, general manager of the British Columbia Copper Co., has been unable to secure from either Coleman or Fernie sufficient coke to open up another furnace at the company's Greenwood smelter, where only one furnace is being operated. Shortage of labor at both Fernie and Coleman and a lack of demand for coal at the latter place are reasons given for the coke shortage. Fernie is said to need 500 more men to provide the coke needed by the Granby at Grand Forks, and the Consolidated at Trail. Granby is running seven furnaces, but may have to drop to six. Trail hopes to blow in two idle copper furnaces this week, but it is uncertain if it will have a sufficient supply of coke on hand to do so. At Coleman, the colliery has two seams, of which the upper is non-coking coal and the lower is coking coal. The lower can not advantageously be worked without the upper, so that when demand for coal falls off coke production is reduced. It is for this reason that the demand for coal as well as the labor supply is a factor in Coleman's coke output. Development work which has as its immediate purpose the blocking out of 5,000,000 tons of copper ore and as its secondary purpose the blocking out of a second 5,000,000 tons, is making good progress at the British Columbia Copper Co.'s Copper mountain properties, stated Mr. Lachmund. At Copper mountain, which is 13 miles from Princeton, the 2000-ft. crosscut tunnel the company is driving is in about 1200 ft., this distance having been driven since June 15. It

is proving conditions revealed by diamond drill explorations, which showed 5,000,000 tons of ore on this level. This crosscut, which when 2000 ft. have been driven will be extended in several directions, will give a maximum depth on the ore of 200 ft., the comparatively short distance between the apex and the floor of the tunnel providing for the glory hole operations the company intends to carry on when ore production begins.

ONTARIO.

Schumacher.

The No. 1 vein at the Schumacher mine has been opened on the 100 level and drifted on for 150 ft. and it is expected that it will soon be encountered on the 200 level. Development is being pushed. From 300 to 350 ft. of crosscutting and drifting is being done per month. Last month 20% of the ore milled came from development. The new 2-compartment shaft being sunk near the railway line is down 68 ft. Sinking is being done at the rate of 25 ft. a week. The shaft is being put down midway between two veins, and will be continued to the 200 level, where crosscuts will be made to each, and it is thought that the desired level will be reached by Nov. 10. The compressor plant is limited to 15 machines and at present is working to capacity. Operations are being carried on at all levels. On the 1st level 3 machines are working in ore. Five Leyners are working, development being carried on a scale greater than at any time. The dump is being run through, but this will not last long at the rate of handling. Preparations are being made on surface for the coming of winter, in the way of laying pipe lines. The new machine shop has been completed and the machinery, which is being brought up from the Swastika, will arrive soon. Following the accident to the transformers during a severe electrical storm, the compressor has been run by steam. Three of the transformers will be ready in 10 days or so. The mill is handling 1000 tons a week. The heads are running \$5 and the production is being maintained at about \$20,000 per month.

Porcupine.

The winze at the Porcupine Crown is down to the 900 level and the vein looks promising on the 600. At a point below the vein has either narrowed or faulted. Further work will determine this. The finding of the vein on the 800 was expected. As yet not enough work has been done to prove it. The tailings dump from the former amalgamation mill is being run through, and is now about 60% gone. The 200-ton crusher ordered last spring has not been received as yet. The latter was promised for Sept. 1. The present crusher is of 100 tons capacity and has to be forced above capacity to supply the mill.

Cobalt.

Development underground at the Dome Lake is now satisfactory. On the 180 level up to 70 ft., in the stope on one vein, the vein faulted. The fault has been crossed through and stoping is now being done above it in good ore. There is a new shoot on No. 2 vein on the 180 level. The shoot has only been opened a short distance, but drifting is being done on it now. On the 300 level No. 2 stope has been lengthened to the south and west. The average width is from 10 to 15 ft. and the average value about \$30. No. 2 is the biggest stope of high-grade in the mine. East of the dike, on the 300, No. 1 stope is 150 ft. long. The ore runs \$6 with high-grade in places. On the 400 ore has been located east of the dike and drifting is in progress. Two faces are in ore. To the west drifting is being pushed rapidly on No. 1 and a large tonnage is being developed. The shaft is down 456 ft. and sinking is still in progress to the 500 level. Here a station will be cut and drifting done on the same vein system. At the mill foundations are completed and the plate floors are being moved and new elevators constructed. The water tank is up and the ore bin for the Hardinge ball mill started. The stamps will run from the same bin. Only the one for the Hardinge mill is being built now. The classifiers have already been installed and the Koering drum is complete. It is expected that the new mill will be ready to run by Oct. 20, treating 200 tons daily. The increased mill capacity will give the company a chance to treat a large amount of the \$4 ore above the 300 level. Of the latter grade there is a large tonnage, which has scarcely been touched.

World's Index of Current Literature

A Weekly Classified Index to Current Periodical and other Literature, Appearing the World Over Relative to Mining, Mining Engineering, Metallurgy and Related Industries, in Four Parts.

Part 1. *Geology*—(a) Geology; (b) Ore Genesis; (c) Mineralogy.

Part 2. *Ores and Metals*—(a) Metals and Metal Ores; (b) Non-Metals.

Part 3. *Technology*—(a) Mines and Mining; (b) Mill and Milling; (c) Chemistry and Assaying; (d) Metallurgy; (e) Power and Machinery.

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(7) The price.

I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Schaller, Waldemar T.—*Mica* in 1915. [Gives prices, imports, exports, uses, production, nature and place of occurrence, foreign markets and general conditions of the industry in U. S.].—Min. Res. U. S. 11:21; pp 14.

Watkins, Joel H.—*Manganese in Tennessee*. [Describes the occurrence of the ores and geology of the formation].—E. & M. J. Sept. 23 1916; p 545; pp 1½*; 25c.

II. ORES AND METALS

(I) METALS AND ORES

Alloys

Corse, W. M.; Comstock, G. F.—*Some Copper-Aluminum-Iron Alloys*. [Deals with the physical properties and nature of the alloy. A metallographic review of the alloys and the results of physical tests are given].—American Inst. of Metals Adv. Paper 14; pp 16*; 35c.

Karr, C. P.—*Report on a Series of Comparative Tests of Zinc-Bronze (88 Cu-10 Sn-2 Zn) Standard Test Bars*. [Deals entirely with physical tests and the results obtained].—American Inst. of Metals Adv. Paper 16; pp 12; 35c.

Price, William B.; Davidson, Philip.—*Physical Tests on Common High Brass Taken Parallel and at Right Angles to the Direction of Rolling*. [The results and nature of the physical tests under varying conditions, with a metallographic review, is given].—American Inst. of Metals Adv. Paper 12; pp 32*; 35c.

Schirmeister, H.—*The Binary Alloys Aluminum*. [The influence of the 20 most important metals on aluminum].—Stahl & Eisen 1916; No. 35; p 648, 873 and 996; \$1.05.

—*Electric Alloy Steels Made on Tonnage Basis*. [A detailed description of the plant equipment and operation is given].—Iron Age Sept. 14 1916; p 571; pp 3¾*; 30c.

Aluminum

Comstock, George F.—*The Presence of Alumina in Steel*. [A paper read before the American Foundrymen's Assn. This paper points out that alumina may be distinguished from non-metallic inclusions and shows how it may be distinguished].—I. Tr. Rev. Sept. 21 1916; p 563; pp 5*; 25c. Iron Age Sept. 14; p 582; pp 2¾*; 30c.

Corse, W. M.; Comstock, G. F.—*Some Copper-Aluminum-Iron Alloys*. [Deals with the physical properties and nature of the alloy. A metallographic review of the alloys and the results of physical tests are given].—American Inst. of Metals Adv. Paper 14; pp 16*; 35c.

Schirmeister, H.—*The Binary Alloys of Aluminum*. [The influence of the 20 most important metals on aluminum].—Stahl & Eisen 1916; No. 35; p 648, 873 and 996; \$1.05.

Copper

Browne, P. W.—*Mineral Resources of Newfoundland*. [A review of the possibilities in operating the iron ore and copper deposits of the province. The past production of mines is given].—Canadian Mg. Jnl. Sept. 15 1916; p 437; pp 1¾; 35c.

Burch, H. K.—*The Inspiration Mine Plant*. [Abst. from a paper read before the A. I. M. E. Describes the equipment and methods used for handling the ore from the mine, both underground and on surface].—E. & M. J. Sept. 23 1916; p 537; pp 5¾*; 25c.

Corse, W. M.; Comstock, G. F.—*Some Copper-Aluminum-Iron Alloys*. [Deals with the physical properties and nature of the alloy. A metallographic review of the alloys and the results of physical tests are given].—American Inst. of Metals Adv. Paper 14; pp 16*; 35c.

Henderson, Charles W.—*New Mexico Metal Production in 1915*. [Abst. from a U. S. G. S. report. Zinc, lead and copper are considered].—Mg. & Oil Bull. Sept. 1916; p 227; pp 3*; 25c.

Gold Fields and Mining

Key, A. Cooper.—*The Rand's Ore Reserves*. [Description and tabulated information and data are given].—E. & M. J. Sept. 23 1916; p 557; pp 1¼; 25c.

—*Gold Mining in War Time*. [A

review of the conditions, prices and taxes in West Australia].—Monthly Jnl. Chamber of Mines West Aust. June 30 1916; p 108; pp 4½; 35c.

—*Kleinfontein, South Africa*. [Deals with the future of the district and reviews the production, financial information and general mine operations in the district].—S. Afr. Mg. Jnl. Aug. 12 1916; p 440; pp 1¾*; 35c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

Browne, P. W.—*Mineral Resources of Newfoundland*. [A review of the possibilities in operating the iron ore and copper deposits of the province. The past production of mines is given].—Canadian Mg. Jnl. Sept. 15 1916; p 437; pp 1¾; 35c.

Burchard, Ernest F.—*Potash as a By-Product in the Cement and Iron Industries*. [Abst. from the Manufacturer's Record. Consists of some details in a general discussion and review of the subject].—Chem. Eng. & Mfg. Sept. 1916; p 104; pp 4; 30c.

Iron and Steel

Comstock, George F.—*The Presence of Alumina in Steel*. [A paper read before the American Foundrymen's Assn. This paper points out that alumina may be distinguished from non-metallic inclusions and shows how it may be distinguished].—I. Tr. Rev. Sept. 21 1916; p 563; pp 5*; 25c. Iron Age Sept. 14; p 582; pp 2¾*; 30c.

Cone, Edwin F.—*Converter Steel Castings Low in Manganese*. [Unusual effect of attempts at economy by reducing the ferroalloy additions].—Iron Age Sept. 14 1916; p 578; pp 2¾*; 30c.

Corse, W. M.; Comstock, G. F.—*Some Copper-Aluminum-Iron Alloys*. [Deals with the physical properties and nature of the alloy. A metallographic review of the alloys and the results of physical tests are given].—American Inst. of Metals Adv. Paper 14; pp 16*; 35c.

Touceda, Enrique.—*Normal Fracture of Good Malleable Iron*. [A paper read before the American Foundrymen's Assn. on the effect of haphazard fractures and the

burning out of surface carbon, showing an erroneous theory regarding the strength].—Iron Age Sept. 14 1916; p 576; pp 2*; 30c.

Electric Alloy Steels Made on Tonnage Basis. [A detailed description of the plant equipment and operation is given].—Iron Age Sept. 14 1916; p 571; pp 3½*; 30c.

Lead

Edmonds, H. R.—*Some Notes on the Effect of Lead Salts and of Varying Degree of Alkalinity on the Solvent Power of Cyanide Solution for Gold*. [Gives the results of some tests made].—Monthly Jnl. Chamber of Mines West Aust. June 30 1916; p 108; pp 4½; 35c.

Henderson, Charles W.—*New Mexico Metal Production in 1915*. [Abst. from a U. S. G. S. report. Zinc lead and copper are considered].—Mg. & Oil Bull. Sept. 1916; p 227; pp 3*; 25c.

Siebethal, C. E.—*Lead in 1915*. [On the production and market conditions in United States and briefs on several foreign countries].—Min. Res. U. S. I:9; pp 19.

Sullivan Mine, East Kootenay, B. C. [A description of mine operations and production, with an account of the geology of the formation and nature and occurrence of the ore bodies].—Canadian Mg. Jnl. Sept. 15 1916; p 444; pp 2¼; 35c.

Manganese

Cone, Edwin F.—*Converter Steel Castings Low in Manganese*. [Unusual effects of attempts at economy by reducing the ferroalloy additions].—Iron Age Sept. 14 1916; p 578; pp 2¼*; 30c.

Watkins, Joel H.—*Manganese in Tennessee*. [Describes the occurrence of the ores and geology of the formation].—E. & M. J. Sept. 23 1916; p 545; pp 1½*; 25c.

Mercury

Oceanic Quicksilver Mill, California. [An account of equipment and operations].—E. & M. J. Sept. 16 1916; p 512; pp 1*; 25c.

Nickel

Hammond, L. D.—*The Electrodeposition of Nickel*. [Tables and description showing the chemicals used in different electrolytes are given with the current used in deposition and all the information given is specific rather than general].—American Electrochem. Soc. Adv. Paper 12; p 201; pp 29; 35c.

Kelley, G. L.; Conant, J. B.—*The Use of Diphenyl Glyoxime as an Indicator in the Volumetric Determination of Nickel by Frevet's Method*. [Gives a description of procedure for the method and the use of the indicator].—Jnl. Ind. & Engg. Chem. Sept. 1916; p 804; pp 3; 60c.

Knight, Cyril W.—*Geological Relations of Sudbury Nickel Ores*. [Reviews the nature of the deposits and geology of the related formation. The whole is in the form of discussion].—E. & M. J. Sept. 23 1916; pp 1¾*; 25c.

Leonard, R. W.—*Nickel Refining in Canada*. [A general review of the industry].—Canadian Mg. Inst. Bull. Sept. 1916; p 758; pp 2; 50c.

Silver

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*Silver-Tin Mining in Bolivia*. [Old stope filling is being taken out, chloridized, leached and then concentrated for the tin residue].—E. & M. J. Sept. 23 1916; p 533; pp 3*; 25c.

Sullivan Mine, East Kootenay,

B. C. [A description of mine operations and production, with an account of the geology of the formation and nature and occurrence of the ore bodies].—Canadian Mg. Jnl. Sept. 15 1916; p 444; pp 2¼; 35c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Zinc

Henderson, Charles W.—*New Mexico Metal Production in 1915*. [Abst. from a U. S. G. S. report. Zinc, lead and copper are considered].—Mg. & Oil Bull. Sept. 1916; p 227; pp 3*; 25c.

Karr, C. P.—*Report on a Series of Comparative Tests of Zinc-Bronze (88 Cu-10 Sn-2 Zn) Standard Test Bars*. [Deals entirely with physical tests and the results obtained].—American Inst. of Metals Adv. Paper 16; pp 12; 35c.

Sullivan Mine, East Kootenay, B. C. [A description of mine operations and production, with an account of the geology of the formation and nature and occurrence of the ore bodies].—Canadian Mg. Jnl. Sept. 15 1916; p 444; pp 2¼; 35c.

Miscellaneous Metals and Ores

Browning, P. E.; Spencer, S. R.—*On the Separation of Caesium and Rubidium by the Fractional Crystallization of the Aluminum and Iron Alums and Its Application to the Extraction of These Elements from Their Mineral Sources*.—American Jnl. of Sci. Sept. 1916; p 2½; 35c.

Wells, Arthur E.—*Laboratory Investigations Concerning the Reduction of Barium Sulphate to Barium Sulphide*. [Published by permission of the Bureau of Mines. Details of methods used in the investigation are given, with results obtained].—Jnl. Ind. & Engg. Chem. Sept. 1916; p 770; pp 7¾*; 60c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Crankshaw, H. M.—*Methods of Mining in the Anthracite Field*. [Details in description and drawings show the methods used in mining operations].—Coal Age Sept. 23 1916; p 490; pp 3½*; 20c.

Fay, Albert H.—*Production of Explosives in the United States*. [Also contains notes on coal mine accidents due to explosives and a list of permissible explosives, lamps and motors tested before May 1 1916].—U. S. Bureau of Mines Tech. Paper 159; pp 24; 15c.

McGrath, J. W.—*Newfoundland Coal Deposits*. [A review of the deposits now being held as reserves and those being operated].—Canadian Mg. Jnl. Sept. 15 1916; p 439; pp 2½; 35c.

Sampson, R. J.—*An Economical System of Mining*. [The system allows of complete extraction of the ground at a low cost and consists mostly of pillar drawing. A tenacious sandstone roof permits the running of wide entries].—Coal Age Sept. 23 1916; p 494; pp 2¼*; 20c.

Coal Handling on the Norfolk & Western Railway. [A brief description of the coal handling facilities and methods used by this road].—Coal Age Sept. 23 1916; p 498; pp 1½; 20c.

The Use of Squibs Vs. Fuses. [The results of a thorough study made by the British Government bringing out that in general squibs are the safest and best].—Coal Age Sept. 23 1916; p 501; pp 1½; 20c.

Coal Preparation, Marketing, Etc.

Davenport, Frank B.—*The History of a Successful Jig*. [Drawings and description are given].—Coal Age Sept. 23 1916; p 497; pp 1½*; 20c.

Holbrook, E. A.—*Dry Preparation of Bituminous Coal at Illinois Mines*. [The nature of the coal and the deposits are described. Drawings of tipples and plants are shown and a complete description of methods used in preparing coal is given].—Univ. Ill. Bull. 43; pp 133*.

Surface Plant at Brodsworth Main Colliery, England. [Turbines using mixed pressure steam are used. Hoist, boilers, compressed air, etc., are described].—Colly Guard. Sept. 1 1916; p 401; pp 1½*; 35c.

(B) STRUCTURALS AND CERAMICS

Brick and Tile

Kelley, W. H.—*Fire Brick for the Lime Kiln*. [A talk on the uses and properties of different brick used in different plants].—National Lime Mfg. Bull. 21; pp 5; 25c.

Cement

Burchard, Ernest F.—*Potash as a By-Product in the Cement and Iron Industries*. [Abst. from the Manufacturer's Record. Consists of some details in a general discussion and review of the subject].—Chem. Eng. & Mfg. Sept. 1916; p 104; pp 4; 30c.

Findlay, D. C.—*Electrification of a Modern Cement Plant*. [A description of the Oregon Portland Cement Co.'s plant].—Jnl. of Elect. Power & Gas Sept. 16 1916; p 218; pp 2*; 35c.

Clays, Ceramics

Greaves-Walker, A. F.—*"Tight Bolt" Setting in Up-Draft Kilns*. [A method little used in this country, but which saves labor, produces more even burns and eliminates kiln markings].—B. & C. Rec. Sept. 19 1916; p 510; pp 2¼*; 35c.

Huac, A. J.—*Cost Accounting for the Clay Plant*. [A part of a series of articles on a complete accounting system].—B. & C. Rec. Sept. 19 1916; p 513; pp 1½*; 35c.

Concrete

Hull, Walter A.—*Investigation of Fire Resisting Materials Particularly as Related to Limestone Concrete*. [Describes the furnaces used and gives curves and description with respect to the results of the investigations].—National Lime Mfg. Bull. 20; pp 14*; 25c.

McMillan, Franklin R.—*Time Tests of Concrete*. [A paper read before the Engineers' Club of St. Louis. Curves and the results of tests are given].—Canadian Eng. Sept. 14 1916; p 211; pp 4¼*; Sept. 21 1916; p 231; pp 4*; 70c.

Emley, W. E.—*The Comparative Values of Different Kinds of Fuels for Lime Burning*. [Specific data and information are included in the description].—National Lime Mfg. Bull. 22; pp 6; 25c.

Lime

Hull, Walter A.—*Investigations of Fire Resisting Materials, Particularly as Related to Limestone Concrete*. [Describes the furnaces used and gives curves and description with respect to the results of the investigations].—National Lime Mfg. Bull. 20; pp 14*; 25c.

False Prophets in the Machinery Business for the Sake of False Profits. [A talk on machinery and the lime manufacturing industry].—National Lime Mfg. Assn. Bull. 19; pp 4.

(C) OTHER NON-METALS

Acids

Harris, T. N.—*New Sulphuric Acid Plant*. The construction and method of manufacture used by the U. S. Steel Corporation at its plant at Donora, Pa.—Met. & Chem. Engg. Sept. 15 1916; p 313; pp 5¼*; 35c.

Phalen, W. C.—*Sulphur, Pyrite and Sulphuric Acid in 1915*. [A review of production and conditions, including some foreign countries].—Min. Res. U. S. II: 22; pp 16.

Asbestos

Dunstan, B.—*Queensland Mineral Deposits, Australia*. [A detailed description of nature of occurrence, production, prospects and methods of concentration of asbestos ores].—Queen. Govt. Mg. Jnl. Aug. 15 1916; p 372; pp 3½*; 35c.

—*Quebec Mining Industry—A Review for the First Half of 1916*. [Brief accounts of operations at various properties].—Canadian Mg. Inst. Bull. Sept. 1916; p 796; pp 4; 50c.

Potash

Burchard, Ernest F.—*Potash as a By-Product in the Cement and Iron Industries*. [Abst. from the Manufacturer's Record. Consists of some details in a general discussion and review of the subject].—Chem. Eng. & Mfg. Sept. 1916; p 104; pp 4; 30c.

Hicks, W. B.—*Simple Tests for Potash*. [In general the test consists of flame coloration peculiarities].—American Fertilizer Sept. 16 1916; p 30; pp 1¼; 25c.

Sulphur

Osann, B.—*Behavior of Sulphur in the Blast Furnace*. [The reduction is regarded as taking place in the semi-solid magma].—Stahl & Eisen 1916 No. 36; p 210; pp 5; 35c.

Phalen, W. C.—*Sulphur, Pyrite, and Sulphuric Acid in 1915*. [A review of production and conditions, including some foreign countries].—Min. Res. U. S. II: 22; pp 16.

—*Quebec Mining Industry—A Review for the First Half of 1916*. [Brief accounts of operations at various properties].—Canadian Mg. Inst. Bull. Sept. 1916; p 796; pp 4; 50c.

Miscellaneous Non-Metals

Phalen, W. C.—*Salt, Bromine and Calcium Chloride in 1915*. [Deals with production only].—Min. Res. U. S. II: 20; pp 12.

Robinson, Heath M.—*The Ozokerite Field in Central Utah*. [Abst. from a U. S. G. S. bulletin. Genesis, properties, production, concentration, etc., are considered].—Mg. World Sept. 16 1916; p 497; pp 1¼*; 10c.

III. TECHNOLOGY**MINES AND MINING****Ore Reserves**

Key, A. Cooper.—*The Rand's Ore Reserves*. [Description and tabulated information and data are given].—E. & M. J. Sept. 23 1916; p 557; pp 1¼; 25c.

McGrath, J. W.—*Newfoundland Cool Deposits*. [A review of the deposits now being held as reserves and those being operated].—Canadian Mg. Jnl. Sept. 15 1916; p 439; pp 2½; 35c.

Explosives and Blasting

Fay, Albert H.—*Production of Explosives in the United States*. [Also contains notes on coal mine accidents due to explosives and a list of permissible explosives, lamps and motors tested before May 1 1916].—U. S. Bureau of Mines Tech. Paper 159; pp 24; 15c.

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Pumps and Pumping

Alderson, G. F.—*A Reservoir and Pumphouse*. [Describes the construction of the installation and itemization of costs].—E. & M. J. Sept. 23 1916; p 547; pp 1¼*; 25c.

Scott, W. A.—*Leadville Pumping and Drainage Projects*. [Descriptions are given of methods used and plants at various places in the district which use different kinds of power, styles of pumps and methods of operation].—Mg. World Sept. 23 1916; p 533; pp 3¼*; 10c.

Transport

Clapp, W. B.—*Motor Truck Development and Use in Southern California*. [A very complete table is given showing the cost of operating gasoline motor trucks at various mileages].—Mg. & Oil Bull. Sept. 1916; p 222; pp 6; 25c.

—*Antimony Ore in Southern Rhodesia*. [Types of occurrences and methods for calculating shipments and cost of the same are explained].—S. Afr. Mg. Jnl. Aug. 19 1916; p 465; pp 1; 35c.

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Mining Costs

Jennings, Hennen.—*Dredging in Montana*. [From a U. S. G. S. Bulletin, giving the costs of operation and construction of dredges used].—M. & S. P. Sept. 23 1916; p 465; pp 2½*; 20c.

Lewis, Robert S.—*Amortization and Depreciation*. Deals with methods for computing the same and states that omission of the same in computing costs is a great mistake, which is often made].—M. & S. P. Sept. 23 1916; p 456; pp 3*; 20c.

—*Gold Mining in War Time*. [A review of the conditions, prices and taxes in West Australia].—Monthly Jnl. Chamber of Mines West Aust. June 30 1916; p 108; pp 4½; 35c.

CHEMISTRY AND ASSAYING**Chemistry**

Kelley, G. L.; Conant, J. B.—*The Use of Diphenyl Glyoxime as an Indicator in the Volumetric Determination of Nickel by Frevert's Method*. [Gives a description of procedure for the method and the use of the indicator].—Jnl. Ind. & Engg. Chem. Sept. 1916; p 804; pp 3; 60c.

Schroeder, J.—*The Solubility of Leucite in Sulphurous Acid*. [Details of the chemistry and methods applied thereto].—Jnl. Ind. & Engg. Chem. Sept. 1916; p 779; pp 1; 60c.

Wells, Arthur E.—*Laboratory Investigations Concerning the Reduction of Barium Sulphate to Barium Sulphide*. [Published by permission of the Bureau of Mines. Details of methods used in the investigation are given, with results obtained].—Jnl. Ind. & Engg. Chem. Sept. 1916; p 770; pp 7½*; 60c.

Analysis

Kelley, G. L.; Conant, J. B.—*The Use of Diphenyl Glyoxime as an Indicator in the Volumetric Determination of Nickel by Frevert's Method*. [Gives a description of procedure for the method and the use of the indicator].—Jnl. Ind. & Engg. Chem. Sept. 1916; p 804; pp 3; 60c.

Leaming, T. H.; Schlundt, Herman; Underwood, Julius.—*Comparison of the Ionization Currents Due to Equal Quantities of Radium Emanation in Different Types of Electroscopes*. [A method by which small quantities of radium may be determined].—American Electrochem. Soc. Adv. Paper 2; p 13; pp 14; 35c.

Refractories

Kelley, W. H.—*Fire Brick for the Lime Kiln*. [A talk on the uses and properties of different brick used in different plants].—National Lime Mfg. Bull. 21; pp 5; 25c.

METALLURGY**Electrometallurgy**

Crowley, John A.—*The Gromwall-Dixon Electric Furnace*. [A paper read before the American Foundrymen's Assn. Deals with the construction of the furnace, its operation and gives drawing and detailed costs of producing steel with the same].—I. Tr. Rev. Sept. 21 1916; p 571; pp 2½*; 25c.

Fischer, Sigfried, Jr.—*Contributions to the Knowledge of the Electrolysis*

Aqueous Solutions of Vanadium Salts. [Gives the results of previous investigations showing the behavior of vanadium and its salts under various conditions, specially in solution as an electrolyte].—American Electrochem. Soc. Adv. Paper 9; p 119; pp 45*; 35c.

Hammond, L. D.—*The Electrodeposition of Nickel.* [Tables and description showing the chemicals used in different electrolytes are given with the current used in deposition and all the information given is specific, rather than general].—American Electrochem. Soc. Adv. Paper 12; p 201; pp 29; 35c.

—*Electric Alloy Steels Made on Tonnage Basis.* [A detailed description of the plant equipment and operation is given].—Iron Age Sept. 14 1916; p 571; pp 3½*; 30c.

Hydro-Metallurgy

Fischer, Sigfried, Jr.—*Contributions to the Knowledge of the Electrolysis Aqueous Solutions of Vanadium Salts.* [Gives the results of previous investigations showing the behavior of vanadium and its salts under various conditions, specially in solution as an electrolyte].—American Electrochem. Soc. Adv. Paper 9; p 119; pp 45*; 35c.

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Singewald, Joseph T., Jr.; Miller, Benjamin L.—*Silver-Tin Mining in Bolivia.* [Old stope filling is being taken out, chloridized, leached and then concentrated for the tin residue].—E. & M. J. Sept. 23 1916; p 533; pp 3*; 25c.

POWER AND MACHINERY

Electricity

Leaming, T. H.; Schlundt, Herman; Underwood, Julius.—*Comparison of the Ionization Currents Due to Equal Quantities of Radium Emanation in Different Types of Electroscopes.* [A method by which small quantities of radium may be determined].—American Electrochem. Soc. Adv. Paper 2; p 13; pp 14; 35c.

Scott, W. A.—*Leadville Pumping and Drainage Projects.* [Descriptions are given of methods used and plants at various places in the district which use different kinds of power, styles of pumps and methods of operation].—Mg. World Sept. 23 1916; p 533; pp 3½*; 10c.

Compressed Air

Burch, H. K.—*The Inspiration Mine Plant.* [Abst. from a paper read before the A. I. M. E. Describes the equipment and methods used for handling the ore from the mine, both underground and on the surface].—E. & M. J. Sept. 23 1916; p 537; pp 5½*; 25c.

Miscellaneous Power and Machinery

—*Purchase and Inspection of Leather Belting.* [From the American Machinist, being a general discussion of the subject].—E. & M. J. Sept. 23 1916; p 549; pp 1½; 25c.

IV. MISCELLANEOUS

Miscellaneous Costs

Alderson, G. F.—*A Reservoir and Pumphouse.* [Describes the construction

of the installation and itemization of costs].—E. & M. J. Sept. 23 1916; p 547; pp 1½*; 25c.

Clapp, W. B.—*Motor Truck Development and Use in Southern California.* [A very complete table is given showing the cost of operating gasoline motor trucks at various mileages].—Mg. & Oil Bull. Sept. 1916; p 222; pp 6; 25c.

Huac, A. J.—*Cost Accounting for the Clay Plant.* [A part of a series of articles on a complete accounting system].—B. & C. Rec. Sept. 19 1916; p 513; pp 1½*; 35c.

—*Antimony Ore in Southern Rhodesia.* [Types of occurrences and methods for calculating shipments and cost of the same are explained].—S. Afr. Mg. Jnl. Aug. 19 1916; p 465; pp 1; 35c.

Testing

Corse, W. M.; Comstock, G. F.—*Some Copper-Aluminum-Iron Alloys.* [Deals with the physical properties and nature of the alloy. A metallographic review of the alloys and the results of physical tests are given].—American Inst. of Metals Adv. Paper 14; pp 16*; 35c.

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Fischer, Sigfried, Jr.—*Contributions to the Knowledge of the Electrolysis Aqueous Solutions of Vanadium Salts.* [Gives the results of previous investigations, showing the behavior of vanadium and its salts under various conditions, specially in solution as an electrolyte].—American Electrochem. Soc. Adv. Paper 9; p 119; pp 45*; 35c.

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McMillan, Frank R.—*Time Tests of Concrete.* [A paper read before the Engineers' Club of St. Louis. Curves of results are reproduced and details of results given in the description].—Canadian Eng. Sept. 21 1916; p 231; pp 4*; 35c.

Price, William B.; Davidson, Philip.—*Physical Tests on Common High Brass Taken Parallel and at Right Angles to the Direction of Rolling.* [The results and nature of the physical tests under varying conditions with a metallographic review is given].—American Inst. of Metals Adv. Paper 12; pp 32*; 35c.

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Comstock, George F.—*The Presence of Alumina in Steel.* [A paper read before the American Foundrymen's Assn. This paper points out that alumina may be distinguished from non-metallic inclusions and shows how it may be distinguished].—I. Tr. Rev. Sept. 21 1916; p 563; pp 5*; 25c. Iron Age Sept. 19; p 582; pp 2½*; 30c.

Corse, W. M.; Comstock, G. F.—*Some Copper-Aluminum-Iron Alloys.* [Deals with the physical properties and nature of the alloy. A metallographic review of the alloys and the results of physical tests are given].—American Inst. of Metals Adv. Paper 14; pp 16*; 35c.

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the Direction of Rolling. [The results and nature of the physical tests under varying conditions with a metallographic review is given].—American Inst. of Metals Adv. Paper 12; pp 32*; 35c.

Touceda, Enrique.—*Normal Fracture of Good Malleable Iron.* [A paper read before the American Foundrymen's Assn. on the effect of haphazard fractures and the burning out of surface carbon, showing an erroneous theory regarding the strength].—Iron Age Sept. 14 1916; p 576; pp 2*; 30c.

Law, Legislation, Taxation

—*Gold Mining in War-Time.* [A review of the conditions, prices and taxes in West Australia].—Monthly Jnl. Chamber of Mines West Aust. June 30 1916; p 108; pp 4½; 35c.

History

Davenport, Frank B.—*The History of a Successful Jig.* [Drawings and description are given].—Coal Age Sept. 23, 1916; p 497; pp 1½*; 20c.

Elmore A. Stanley.—*The Invention, Development and Introduction of the Flotation Process.* [A general historical account of the process carrying the method to a point where it was practically introduced].—M. & S. P. Sept. 23 1916; p 449; pp 6½; 20c.

Societies

—*American Institute of Metals.*—I. Tr. Rev. Sept. 21 1916; p 588; pp 3*; 25c.

—*American Mining Congress, Nineteenth Annual Meeting.*—Mg. World Sept. 23 1916; p 539; pp 2; 10c.

—*Arizona Meeting of A. I. M. E.* [An account of the society's trips].—E. & M. J. Sept. 23 1916; p 558; pp 1½; 25c.

—*Cleveland Meeting of Allied Foundry Organizations.*—I. Tr. Rev. Sept. 21 1916; p 579; pp 9½*; 25c.

—*Meeting of the American Chemical Society and the Second National Exposition of Chemical Industries.*—Jnl. Ind. & Engg. Chem. Sept. 1916; p 856; pp 2; 60c.

Financial

Huac, A. J.—*The Value of a Clay Deposit.* [Formulas are given and their application explained and include all formulas needed in figuring the value of a deposit which was formerly done mostly from experience].—B. & C. Rec. Sept. 19 1916; p 499; pp 2½*; 35c.

Lewis, Robert S.—*Amortization and Depreciation.* [Deals with methods for computing the same and states that omission of the same in computing costs is a great mistake which is often made].—M. & S. P. Sept. 23 1916; p 456; pp 3*; 20c.

—*Kleinfontein, South Africa.* [Deals with the future of the district and reviews the production, financial information and general mine operations in the district].—S. Afr. Mg. Jnl. Aug. 12 1916; p 440; pp 1½*; 35c.

General Miscellany

Alderson, G. F.—*A Reservoir and Pumphouse.* [Describes the construction of the installation and itemization of costs].—E. & M. J. Sept. 23 1916; p 547; pp 1½*; 25c.

Corless, C. F.—*Widespread and Increased Intelligence, the Surest Remedy for Industrial Ills.* [An essay on the subject].—Canadian Mg. Inst. Bull. Sept. 1916; p 764; pp 9; 50c.

Ore and Metal Markets; Prices-Current

New York, Oct. 12, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Oct. 11 were as follows:

		New York, cents.	London, pence.
Oct. 5.....	67½	32½	
6.....	68½	32½	
7.....	68¼	32½	
9.....	67½	32½	
10.....	67½	32½	
11.....	67½	32½	

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York—Standard			London	
	High.	Low.	Avg.	1916.	1915.
January	57½	55½	56.775	48.890	26.875
February	57	56½	56.755	48.477	27.000
March	60½	56½	57.935	49.926	27.080
April	73½	60½	64.415	50.034	31.375
May	77½	68½	74.27	49.915	34.182
June	68½	62½	65.02	49.072	31.038
July	65	60	62.94	47.519	29.870
August	67	64	65.50	47.178	31.25
September	69½	67½	68.515	48.68	32.18
October				49.385	23.600
November				51.713	23.923
December				55.038	24.640
Year			49.690		26.232

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Domestic buying of copper continued with unabated energy last week, transactions amounting to about 65,000,000 lbs. Even the outbreak of submarine activities on this side of the Atlantic failed to disturb the copper situation. Buying continued as though there were no possibility of another Lusitania incident and the results that would follow such a disaster. Copper is so strongly entrenched that incidents that would severely affect other metals fail to create the slightest ripple of a disturbance in the red metal. Foreign buying appears to be about over. The English negotiations for 200,000,000 lbs. additional have come to naught. Some miscellaneous foreign business is steadily coming to hand, but the satiating of domestic requirements is the dominant occupation of producers. Practically all of the large domestic consumers have covered their needs over the first half of next year. There still remain a considerable number of users who have only protected first quarter needs and these latter interests are steadily coming into the market for supplies for the second quarter. On Thursday of last week the business taken by one producer amounted to 30,000,000 lbs.

Little copper remains unsold in the hands of producers for delivery this year. Investigation shows that all of the prominent producers have disposed of every pound of copper that they will produce this year. Some of the producers have laid aside a small tonnage with which to meet the wants of regular customers in case of a sudden shortage, but any buyer seeking metal for delivery this year would have to go to dealers for it. Spot electrolytic is quoted at a range from 28¾ to 29½ cts. For November delivery sales have been made at 28¾ cts.; while for December delivery business has been done at 28¼@28½ cts. These quotations are on regular terms, while cash prices are about a half cent lower. Prime lake copper for prompt October and November delivery is available at 28½ cts. cash, while for December delivery sellers asked 27¾ cts. Spot casting copper sold up to 27¼ cts., with some business done at 27½ cts. Casting copper for November delivery is quoted at 27¼ cts. Ordinary casting copper is quoted a half to three-quarters of a cent lower.

Producers reported heavy bookings for the first half of next year. Consumers who have not covered are heeding the advice of important factors and are putting their orders in before there is a shortage for the first six months of 1917. At the present rate of bookings little copper for first half 1917 delivery will be available for sale by the end of

November. Sales of electrolytic for the first quarter are being done at 27½ cts. and for the second quarter at 27 cts.

The market is now shaping for an effort on the part of certain large dealers to depress prices in order to accumulate supplies. This is usually accomplished by forced sales and has in the past been effective in lowering producers' prices. A different result may now develop. Producers assured buyers of the recent past that the market would not go lower in any event and with their extensive business in hand there is no doubt that dealers will find an unusually strong market to combat in their efforts to secure stocks of metal. Second hands have confined their selling operations to nearby deliveries and as soon as they begin offering for the first half then it will be known that their movement to depress first hand sellers' prices has been started.

The London market has continued to move towards higher ground. Last week electrolytic advanced £2 to £142, while gains of £2 were also made in standard copper, with further advances in standard this week.

There have been no startling developments in connection with exports of copper. September exports, according to preliminary returns, not including Gulf ports of Pacific coast shipments, totaled 29,803 tons, so that the detailed statistics will show shipments of slightly over 1000 tons a day last month. Since the first of October exports have aggregated 5225 tons. It is expected that exports of copper in the first three months of next year will pass 40,000 tons a month and that by midsummer of next year exports of 50,000 tons a month would not be surprising.

Quotations for copper per pound at New York for the week ended Oct. 11 were as follows:

(For Fourth Quarter Delivery.)			
	Lake.	Electrolytic.	Casting.
Oct. 5.....	28½ @ 29	28½ @ 29	26¾ @ 27
6.....	28½ @ 29	28½ @ 29	26¾ @ 27
7.....	28½ @ 29	28½ @ 29	27 @ 27¼
9.....	28½ @ 29	28½ @ 29	27 @ 27½
10.....	28½ @ 29	28½ @ 29	27 @ 27½
11.....	28½ @ 29	28½ @ 29	27 @ 27½

Quotations for copper per ton at London for the week ended Oct. 11 were as follows:

	Spot.	Standard	Futures.	Electrolytic.
Oct. 5.....	£120 0 0	£116 10 0	£141 0 0	£142 0 0
6.....	120 10 0	117 0 0	142 0 0	142 0 0
7.....	120 10 0	117 6 0	142 0 0	142 0 0
9.....	121 0 0	117 10 0	142 0 0	142 0 0
10.....	122 0 0	119 0 0	142 0 0	142 0 0
11.....	123 10 0	119 10 0	142 0 0	142 0 0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	28.00	28.75	17.758
October				17.925
November				18.856
December				20.375
Year				17.647

Month.	New York—Electrolytic.			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	28.00	28.75	17.705
October				17.859
November				18.826
December				20.348
Year				17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Castling Copper.

Month.	New York			London	
	1916	1916	1915.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	25.50	27.00	26.40	116.10	68.560
October .....	.....	.....	.....	.....	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—Great strength developed in tin last week and has continued this week. The detailed statistics were especially favorable, showing declines in the total visible supply and much smaller shipments from the Straits. This helped to strengthen the spot position, while higher limits from the east brought futures up to April within three-quarters of a cent of spot metal.

Spot Straits tin closed last week at 40 cts. On Monday of this week there were no sellers, but many buyers. Sellers refused to be drawn into making quotations. Buyers offered 43 cts. for spot Straits and 42 cts. for spot Banka, without forcing sellers to recede from their determination not to quote. The tin market verged on the border of a panic. On Monday there was absolutely no future business doing at all, while last week sales of about 700 tons were noted on which shipments run up to June of next year. Limits for December, January, February and March shipments held around 39¾@40 cts.

London and Singapore pursued a fairly even course, the upward movement being more pronounced in the east than at London. The Singapore market advanced to £181 10s, while Straits tin at London went up to £178 2s 6d. Standard tin advanced to £178 for spot and £178 10s for futures.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Oct. 11 were as follows:

Month.	New York		London.	Singapore.
	Spot.	October.	Straits. spot.	shipments.
Oct. 5.....	39¾c	39¾c	£177 10 0	£179 15 0
6.....	39¾c	39¾c	177 5 0	181 10 0
7.....	40c	40c	177 5 0	181 10 0
9.....	42c	42c	178 2 6	181 6 0
10.....	42c	42½c	181 0 0	183 0 0
11.....	43c	42½c	180 2 6	187 10 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.43	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.386
September	39.50	38.00	39.50	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Business fell off last week, due to the fact that domestic and foreign consumers had covered nearby requirements and were disposed to wait awhile before protecting needs over November and December in hopes of an easier market. Prominent factors in this metal declare that prospects for lower prices this year on lead are not very bright. They point out that Canada will be a large consumer for many months to come. Munition contracts that were placed in the Dominion were tremendous in size, as purchases of lead for October delivery alone to Canada amounted to over 10,000 tons. Russia and Japan are also in need of lead and must re-enter this market at a very early date. Producers are sold out for October and some of the independents have already sold out their first half November output. Thus the situation in lead is very strong, and while resellers may shade spot metal to the extent of \$1 a ton, the future situation is regarded as making higher prices certain. Dealers quote spot lead at 7.05 cts. New York and 6.85 cts. St. Louis. For November delivery outside sellers quote 7.05 cts. New York and for December delivery 7 cts. New York. The

London market has been receding. Last week spot moved off £1 5s to £30 15s and futures £1 to £29 10s.

Quotations for lead per pound at New York and per ton at London for the week ended Oct. 11 were as follows:

Month.	New York		London	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
Oct. 5.....	7.05c	7.00c	£31 0 0	£29 10 0
6.....	7.05c	7.00c	30 15 0	29 10 0
7.....	7.05c	7.00c	30 15 0	29 10 0
9.....	7.05c	7.00c	30 15 0	29 10 0
10.....	7.05c	7.00c	30 15 0	29 10 0
11.....	7.05c	7.00c	30 10 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	1916	1915.	1915.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August	6.70	5.95	6.32	4.760	30.260
September	7.10	6.70	6.88	4.627	31.25
October .....	.....	.....	.....	4.612	.....
November .....	.....	.....	.....	5.152	.....
December .....	.....	.....	.....	5.346	.....
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—Lead ore showed a marked increase in production in the Missouri-Kansas-Oklahoma district last week, being no less than 1,000,000 lbs. greater than the week previous. Prices were firm at \$75, with choice ores bringing \$80. Production for the week totaled 2,160,690 lbs. of a value of \$67,990. The total for the year is 79,957,797 lbs. of a value of \$3,311,011.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.60
May	97.00	92.00	94.75	50.50
June	82.50	76.00	76.35	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	48.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—In the Missouri-Kansas-Oklahoma district last week the market was considerably stronger, low-grade ore jumping from \$5 to \$10, while the top was established at \$67.50, \$2.50 higher than the week previous. Production during the week totaled 13,913,350 lbs., making the total for the year 506,170,170 lbs., with values of \$407,086 and \$21,641,526 respectively.

Calamine.—Calamine was rather weak at \$37.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.60	62.60
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	58.75	60.25
September	65.00	45.00	55.00	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—A very sizable business has been done in spelter, the demand only being interrupted by the commencement of submarine operations off our coast. This stoppage in business is thought to be only temporary, as no adequate reason can be put forth why speculative buying which had such zest last week should suddenly halt. Prices receded this week, but the upward movement was so sharp last week the current quotations are quite high. Spot moved up to 10½ cts. New York and 10½ cts. St. Louis, and at this writing is holding at 10 cts. New York and 9¾ cts. St. Louis. Prime western for the fourth quarter advanced to 10 cts. St. Louis and first quarter to 9¾ cts. St. Louis, but the reaction early this week carried fourth quarter down to 9¾ cts. St.

Louis and first quarter to 9½ cts. St. Louis. Brass special held at 10¼@11 cts. St. Louis for prompt delivery.

The London market has moved up steadily, going up £2 10s in spot and £3 10s in futures last week, with further advances of £2 10s in spot and futures at the opening this week.

Quotations for spelter per pound at New York and per ton at London for the week ended Oct. 11 were as follows:

		New York.	London.	
		Spot.	Spot.	Futures.
Oct.	5.....	9.80c	£54 6 0	£49 0 0
	6.....	10.37½c	54 10 0	49 10 0
	7.....	10.37½c	54 10 0	49 10 0
	9.....	10.00c	57 0 0	52 0 0
	10.....	10.00c	.....	.....
	11.....	9.87½c	.....	.....

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	1916	1915	1916	1915	
	High.	Low.	Avg.	Avg.	Avg.
January	19.42½	17.30	18.801	6.519	89.840
February	21.17½	18.67½	20.094	8.866	97.840
March	20.50	16.50	18.40	10.125	100.720
April	19.37½	17.75	18.76	11.48	98.103
May	17.50	13.75	15.98	15.825	89.507
June	13.62½	11.25	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August	9.75	8.37½	9.11½	16.110	56.00
September	9.70	8.12½	9.22	14.493	51.30
October	.....	.....	.....	14.196	.....
November	.....	.....	.....	16.875	.....
December	.....	.....	.....	16.675	.....
Year	.....	.....	.....	13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Scarcity of supplies and an active demand coming from domestic users caused quicksilver to advance to \$80 a flask, an advance of \$3 a flask since our last report. Sellers have been scouring the market for a few flasks, but in many instances failed to secure metal. Further advances are anticipated. Quite a little export business has been done in the past 2 months, against which supplies were not increased, thus bringing about the present shortage.

Antimony.—A better foreign demand is noted in antimony, while domestic inquiry appears to have improved. Italy and Canada have been in the market, the latter for quite a large amount. Prices moved up slightly on the prospect of more business, but the surplus holdings here have prevented any decided advance. Spot moved up to 11@11½ cts. and business at 11½ cts., duty paid, has been done.

Aluminum.—An active demand for spot virgin ingots has been noted in the past few days, with the market inclined towards higher prices. Sellers have already advanced to 65@67 cts. for spot virgin metal. There is little business moving in remelted ingots, with prices unchanged at 59@60 cts. for No. 1 remelted and 47@48 cts. for No. 12 alloy. Large export shipments made by the leading interest have caused a shortage in nearby metal. For 1917 most of the business has been closed, consumers' contracts being renewed on a basis of 35 cts. f. o. b. smelter for No. 1 virgin ingots. There is an active demand for aluminum sheets for early delivery, prompt being sold at an average price of 90 cts., while contracts for next year have been renewed by the leading interest at 40 cts. base.

Tungsten.—There has been little change in the situation in tungsten ore. Demand continues light, while the supply is plentiful. Sellers continue to quote \$15 a unit delivered New York. This price compares with \$90 a unit paid early in the year.

Platinum.—Prices are repeated by refiners, with a fair demand. Soft platinum is quoted at \$90 an ounce and hard at \$96 an ounce.

Pig Iron.—Tremendous foreign buying of steel-making irons has featured the pig iron market recently, with prices advancing sharply. England took 200,000 tons basic from southern furnaces and 60,000 tons low phosphorus iron from Pennsylvania makers last week. Domestic demand for basic has also been large, sales totaling 75,000 tons. Basic has advanced to \$20.50 valley and bessemer to \$23.50 valley.

Foundry grades have also advanced 50 cts. to \$1 a ton, with buying more general. The situation in pig iron has improved wonderfully and startling price advances, such as characterized the steel market about a year ago, are looked for. Bessemer iron at \$25 and basic at \$23 are predicted by the end of October.

Ferromanganese.—With the improvement in pig iron higher prices on ferromanganese are expected, but as yet the market holds at \$164 seaboard for English make and \$165 furnace for domestic. Spiegeleisen, 20%, is quoted at \$45@50 furnace for spot or contract, while ferrosilicon is quoted at \$83@85 Pittsburgh for 50%.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06½	to	.06½
Nitric, 40 deg.....	.06½	to	.07
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured, 183 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.72
Alum—Powdered, lb.....	4.60	to	4.65
Lump, lb.....	.04	to	.06
Ground, lbs.....	4.10	to	4.12½
Ammonia—			
Muriate, white grain, lb.....	.10	to	.10½
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.05½	to	.06
Red, lb.....	.62½	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., ear lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	3.50	to	3.75
Foundry.....	3.75	to	4.00
Copperas—Spot, lb.....	1.25	to	1.50
Ferromanganese.....	165.00	to	.....
Ferrosilicon, 50%.....	.....	to	\$5.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....	.....	to	2.50
Iron Ore—			
Bessemer, old range, ton.....	4.45		
Bessemer, Mesabi.....	4.20		
Non-Bessemer, old range.....	3.70		
Non-Bessemer, Mesabi.....	3.55		
Lead—Granulated, lb.....	.14½	to	.15½
Brown sugar.....	.11½	to	.12
White crystals.....	.13½	to	.15
Broken, cakes.....	.12½	to	.13½
Powdered.....	.17	to	.17½
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....	.....	to	.12
Platinum—Oz. ref.....	90.00	to	96.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....	.....	to	32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal	to	32.00
Potassium—			
Bichromate.....	.39	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.45	to	.50
Prussiate, yellow.....	.62½	to	.65
Prussiate, red.....	1.85	to	2.00
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.29½	to	.30
Soda—Ash, 48% (43% basis), bbl.....	3.12½	to	3.65
Strontia Nitrate, casks, lb.....	.32	to	.35
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.28½	to	.29
Oxide, lb.....	.44	to	.46
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

Dividends on Issued Capitalization						Dividends on Issued Capitalization									
NAME OF COMPANY	Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest		NAME OF COMPANY	Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest			
					Date	Am't.						Date	Am't.		
Acacia, g.....	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.....	Colo.	480,915	\$1	\$.....	\$93,916	Sept. '01	\$0.01
Adams, z l c.....	Colo.	80,000	10	50,000	778,000	Dec. 13, '09	.54	Golden Star, g.....	Ariz.	400,000	5	120,000	Mar. 15, '10	.06	
Adventure, c.....	Mich.	100,000	25	50,000	50,000	July 20, '16	.50	Gold Com. Fra. g.....	Nev.	922,000	1	92,111	Oct. 15, '09	.10	
Alhambra, c.....	Mich.	200,000	25	1,200,000	5,250,000	July 10, '16	3.00	Goldfield Con.....	Nev.	3,569,148	10	28,999,831	Oct. 31, '15	.10	
Alaska Goldfields.....	Alaska	250,000	5	403,250	403,250	Jan. 10, '15	.15	Good Hope, g. s.....	Colo.	600	100	941,250	Jan. '03	.25	
Alaska Mexican, g.....	Alaska	150,000	5	3,507,391	3,507,391	Nov. 28, '15	.10	Good Sp. Anchor, z s	Nev.	650,000	1	33,000	June 15, '16	.02%	
Alaska Mines Sec.....	U. S.	500,000	5	90,000	90,000	Nov. 1, '06	.....	Grand Central, g.....	Utah	600,000	1	1,545,200	Dec. 23, '15	.02%
Alaska Treadwell, g.....	Alaska	200,000	25	250,000	15,780,000	May 19, '16	.50	Grand Gulch, c. s.....	Nev.	239,845	2.10	19,187	Sept. 6, '16	.03	
Alaska United, g.....	Alaska	180,200	5	64,060	2,045,270	Feb. 28, '16	.30	Granite, g.....	Alaska	430,000	1	17,200	May 10, '16	.02	
Allouez, c.....	Mich.	100,000	25	450,000	550,000	July 15, '16	2.00	Gwin, g.....	Cal.	100,000	10	451,500	Feb. '05	.25	
Amalgamated, c.....	Mont.	1,538,829	100	103,444,983	103,444,983	Aug. 30, '15	3.77	Hazel, g.....	Cal.	900,000	1	1,114,000	Jan. 5, '05	.01	
Am. Sm. & R. com	U. S.	600,000	100	2,500,000	31,833,333	Sept. 1, '16	1.50	Hecla, s. l.....	Idaho	1,000,000	0.25	1,110,000	Sept. 10, '16	.15	
Am. Sm. & R. pf.	U. S.	600,000	100	2,500,000	57,421,396	Sept. 1, '16	1.75	Hercules.....	Idaho	1,000,000	1	1,950,000	Sept. 15, '16	.20	
Am. Sm. Sec. A pf.	U. S.	170,000	100	765,000	11,455,000	July 1, '16	1.50	Hidden Treasure, g.....	Cal.	30,000	10	457,452	Sept. '00	.10	
Am. Sm. Sec. B pf.	U. S.	300,000	100	1,125,000	15,635,000	July 3, '16	1.25	Holy Terror, g.....	S. D.	600,000	1	172,000	Jan. '00	.01	
Am. Zinc, L. & Sm	Mo.	193,120	25	2,756,150	3,805,000	Aug. 1, '16	1.50	Homestake, g.....	S. D.	251,160	10	1,469,286	Sept. 25, '16	.65	
Anaconda, c.....	Mont.	2,331,250	50	11,656,250	175,914,271	Aug. 28, '16	2.00	Hope Dev.....	Cal.	600,000	1	5,000	Dec. 31, '15	.01	
Annie Laurie, g.....	Utah	25,000	100	439,561	439,561	Apr. 22, '05	.50	Horn Silver, l. s. z.....	Utah	400,000	1	40,000	June 30, '16	.06	
Argonaut, g.....	Cal.	200,000	5	55,000	1,695,000	Sept. 25, '16	.07%	Imperial, c.....	Ariz.	600,000	10	300,000	June 24, '07	.20	
Arizona, c.....	Ariz.	100,000	25	521,164	23,212,164	Apr. 1, '16	.16	Inspiration Con.....	Ariz.	920,687	20	3,091,233	July 31, '16	2.00	
Atlantic, c.....	Mich.	100,000	25	990,000	990,000	Feb. 21, '05	.50	Inter'l Nickel, com.	U. S.	1,673,354	25	7,948,574	Sept. 1, '16	2.00	
Atlantic, c.....	Mich.	84,819	5	202,394	202,394	Jan. 1, '09	.10	Inter'l Nickel, pf.....	U. S.	89,125	100	401,067	Aug. 1, '16	.50	
Bagdad-Chase, g. pf	Cal.	250,000	1	1,354,648	1,354,648	Nov. 1, '02	.04	Intern'l Sm. & Ref.	U. S.	100,000	100	4,100,000	May 2, '14	2.00	
Bald Butte, g. s.....	Mont.	100,000	25	7,950,000	7,950,000	Dec. 31, '13	2.00	Interstate Callahan	Idaho	464,990	10	2,092,455	Sept. 30, '16	1.50	
Baltic, c.....	Mont.	40,000	5	60,000	60,000	June 1, '15	.07%	Iowa, g. s. l.....	Colo.	1,666,667	1	270,187	Dec. 31, '15	.00%	
Barnes-King, g.....	Utah	1,000,000	0.10	940,000	940,000	Nov. 15, '07	.02	Iowa Tiger, g. s. l.....	Colo.	3,000	1	26,179	Jan. 15, '15	.50	
Beck Tunnel Con.....	Utah	400,000	1	110,000	110,000	Sept. 4, '15	.05	Iron Blossom, l. s. g.	Utah	1,000,000	1	2,750,000	July 10, '16	.10	
Big Four Expl.....	Wis.	120,000	1	78,000	78,000	Jan. 15, '16	.06	Iron Cap, pf. c.....	Ariz.	33,481	10	6,422	29,983	July 1, '16	.35
Board of Trade, z.....	Colo.	350,000	1	1,425,000	1,425,000	Oct. 28, '11	.20	Iron Clad, g.....	Colo.	1,000,000	1	50,000	Nov. '06	.06	
Bonanza Dev.....	Nev.	998,795	5	349,949	349,949	June 25, '16	.05	Iron Silver.....	Colo.	600,000	20	5,050,000	Dec. 31, '15	.10	
Booth (Reorganized)	Nev.	408,600	1	40,850	40,850	Dec. 10, '14	.10	Isabella, g.....	Colo.	2,250,000	1	742,600	Mar. '01	.01	
Boss, g.....	Colo.	15,000	10	402,350	402,350	Oct. '02	.75	Isle Royale, c.....	Mich.	150,000	25	300,000	July 31, '16	1.00	
Boston & Colo. Sm.	Mont.	100,000	25	63,225,000	63,225,000	May 15, '11	4.00	Jamison, g.....	Cal.	390,000	10	378,300	Jan. '01	.02	
Boz, c.....	Colo.	300,000	25	203,315	203,315	Sept. 15, '15	.06	Jerry Johnson, g.....	Colo.	2,500,000	10	187,500	Nov. 5, '14	.00%	
Brunswick Con. g.	Utah	100,000	10	2,768,400	2,768,400	July 11, '06	.10	Jim Butler.....	Nev.	1,718,020	1	515,406	Aug. 1, '16	.10	
Bullion-B & Champ	Cal.	200,000	1	866,000	866,000	Sept. 4, '16	.02%	Joplin Ore & Spelter	Mo.	400,000	5	62,000	July 22, '16	.04%	
Bunker Hill Con. g.	Idaho	327,000	10	1,318,000	1,318,000	Sept. 5, '16	.40	Jumbo Ext. g.....	Nev.	1,550,000	1	194,000	June 30, '16	.05	
Bunker Hill & Sull.	Mont.	75,000	10	844,662	1,054,119	Apr. 10, '16	10.50	Kendall, g.....	Mont.	600,000	5	1,555,000	Apr. 3, '16	.10	
Butte Alex Scott.....	Mont.	250,000	10	125,000	125,000	Aug. 1, '10	.50	Kendrick Zinc.....	Mo.	200,000	.....	80,000	June 30, '16	.10
Butte-Balaklava, c.	Mont.	1,000,000	15	4,700,000	4,700,000	Dec. 1, '11	.25	Kennecott, c.....	Alas.	2,780,990	10	11,200,000	Sept. 30, '16	1.50	
Butte & Superior, s.	Idaho	272,697	10	7,676,734	13,196,758	Sept. 30, '16	6.25	Kennedy, g.....	Cal.	100,000	100	1,801,001	June '00	.05	
Caledonia, l. s. c.....	Ariz.	641,923	10	3,849,522	26,997,347	Sept. 25, '16	2.00	King of Arizona, g.	Ariz.	200,000	1	395,000	Aug. 2, '09	.12	
Calumet & Ariz., c.	Mich.	100,000	25	5,000,000	134,250,000	Sept. 22, '15	20.00	King Piquet, z.....	Wis.	20,000	1	157,600	Dec. 15, '16	.05	
Calumet & Hecla, c.	Colo.	1,760,000	25	113,654	18,243,964	Jan. 1, '16	.17%	Knob Hill, g.....	Wash.	1,000,000	1	70,000	Aug. 1, '13	.00%	
Camp Bird, g.....	Utah	500,000	1	375,000	600,000	Sept. 19, '15	.25	La Fortuna, g.....	Ariz.	250,000	1	1,200,600	Oct. '02	.01%	
Cardiff, g. c. c.....	Utah	600,000	25	60,000	60,000	Dec. '06	.01	Lake View.....	Utah	500,000	.05	60,000	June 12, '16	.01	
Carlisa, g. s. c.....	Mich.	1,000,000	1	100,000	100,000	Sept. 1, '16	1.00	East Dollar, g.....	Colo.	1,600,000	1	180,000	Feb. 23, '03	.02	
Centennial, c.....	Utah	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Liberty Bell, g.....	Colo.	133,651	5	1,762,795	Jan. 31, '16	.05	
Centennial Eureka.	Mo.	100,000	10	70,000	665,000	Sept. 1, '16	.15	Lightner, g.....	Cal.	102,255	1	331,179	June '06	.06	
Center Creek, l. z.....	Cal.	100,000	1	799,189	799,189	Mar. 6, '06	.05	Linden, z.....	Wis.	1,020	10	11,200	Dec. 31, '16	3.00	
Century, g. s. l.....	Utah	1,000,000	1	44,000	392,067	Feb. 15, '16	.60	Little Bell, s. l.....	Utah	300,000	1	76,000	Apr. 22, '16	.05	
Champion, c.....	Mich.	100,000	25	5,643,000	15,640,000	Sept. 5, '16	6.40	Little Florence.....	Nev.	1,000,000	1	430,000	Jan. '08	.03	
Chile Con.....	Utah	892,960	1	132,323	483,360	Aug. 2, '15	.06	Lost Packer.....	Idaho	160,000	1	37,500	Oct. 23, '15	.25	
Chino Copper c.....	N. M.	869,950	5	5,002,355	11,700,377	Sept. 30, '16	2.25	Lower Mammoth.....	Utah	1,000,000	1	67,000	Dec. 15, '15	.01	
C. K. & N. g.....	Colo.	1,431,900	1	171,825	171,825	Nov. '04	.01	MacNamara, g. s.....	Nev.	73,676	5.00	46,500	Apr. 23, '06	12.00	
Cliff, s. l. c.....	Alaska	100,000	1	115,000	115,000	Feb. 5, '14	.05	Magma, c.....	Ariz.	240,000	5.00	300,000	Sept. 30, '16	.80	
Clinton, g. s.....	Utah	300,000	10	90,000	90,000	Jan. 1, '13	.10	Mammoth, g. s. c.....	Utah	400,000	1.10	50,000	June 30, '16	.05	
Colo. G. Dredging.....	Colo.	200,000	10	60,000	60,000	Dec. '03	.30	Manhattan-Big 4, g.	Nev.	762,400	1	30,248	Aug. 15, '11	.02	
Colorado, s. l.....	Utah	1,000,000	0.20	2,600,000	2,600,000	Mar. 15, '13	.08	Mary McKinney, g.	Colo.	1,309,252	1	1,189,306	July 28, '14	.02	
Columbus Con. l. s. c.	Utah	283,540	5	212,623	212,623	Oct. 14, '02	.20	Mary Murphy, g. s. l.	Colo.	370,000	5	93,106	May 1, '16	.07	
Combination, g.....	Nev.	320,000	1	873,000	873,000	Dec. '06	.16	Mass Con. c.....	Mich.	100,000	.5	100,000	Aug. 16, '16	1.00	
Comstock-Phoenix.	Nev.	785,000	1	60,000	60,000	Nov. 11, '11	.05	May Day.....	Utah	800,000	0.25	40,000	May 26, '16	.02	
Con. Mercur, g.....	Utah	1,000,000	1	1,265,000	1,265,000	June 25, '13	.03	Mexican, g. s.....	Nev.	201,600	3	171,350	June 4, '14	.75	

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Am.							Date	Am.
Petro, g. s.	Utah	600,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success.	Ida	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03
Pharmacist, g.	Colo.	1,500,000	100	.....	91,500	Feb. 1, '10	.00%	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Sept. 30, '16	1.00
Phelps, Dodge & Co	U. S.	450,000	1	9,000,000	57,371,527	Sept. 30, '16	8.00	Tamarack & Pitts, c.	Ariz.	1,499,792	10	.....	10,318,568	Dec. 21, '16	.35
Pioneer, g.	Alaska	5,000,000	1	.....	2,041,526	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	.....	9,420,000	July 23, '07	4.00
Pittsburg, I. z.	Mo.	1,000,000	1	.....	20,000	July 15, '07	.02	Tamarack-Custer.	Idaho	2,000,000	25	300,000	6,206,250	Aug. 30, '16	.02
Pittsburg-Idaho, I.	Ida	1,000,000	1	.....	249,104	July 15, '13	.04	Tennessee, c.	Tenn.	200,000	25	300,000	6,206,250	Jan. 15, '16	.75
Pitts Silver Peak.	Nev.	2,790,000	1	.....	840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100	.....	160,000	Jan. 3, '14	.24
Platteville, I. z.	Wis.	600	60	.....	179,600	June 16, '07	10.00	Tomboy, g. s.	Colo.	310,000	6	74,400	3,361,555	June 30, '16	.....
Plumas Eureka, g.	Cal.	150,625	10	.....	2,831,294	Apr. 8, '01	.06	Tom Reed, g.	Ariz.	909,555	1	.....	2,555,934	Sept. 5, '16	.01
Plymouth Con.	Cal.	240,000	6	116,500	289,300	Aug. 10, '16	.24	Ton-Belmont, g.	Nev.	1,500,000	1	562,600	8,206,527	July 1, '16	.12%
Portland, g.	Colo.	3,000,000	1	270,000	10,447,080	July 20, '16	.03	Ton-Extension, g. s.	Nev.	1,272,901	1	413,660	1,400,556	July 1, '16	.15
Prince Con, s. l.	Nev.	1,000,000	2	175,000	300,000	Sept. 6, '16	.06	Tonopah, g. s.	Nev.	1,000,000	1	450,000	13,400,000	July 21, '16	.15
Quartette, g. s.	Nev.	100,000	10	.....	375,000	July 31, '07	.20	Tonopah Midway, g.	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.06%
Quicksilver, pf.	Cal.	43,000	100	.....	1,831,411	Apr. 8, '03	.05	Tremmis	Cal.	200,000	2.50	.....	234,000	Apr. 25, '15	.02
Quip, g.	Wash.	1,500,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,100,000	Oct. 30, '12	3.00
Quincy, c.	Mich.	110,000	25	1,210,000	22,897,500	Sept. 25, '16	4.00	Tuolumne, c.	Mont.	800,000	1	.....	496,525	Apr. 15, '13	.10
Ray Con, c.	Ariz.	1,571,279	10	2,743,748	7,322,875	Sept. 30, '16	.75	Uncle Sam Con, s.	Utah	600,000	1	.....	470,000	Sept. 20, '11	.06
Red Metal, c.	Mont.	100,000	10	.....	1,200,000	Apr. 1, '07	.40	Union Basin, z.	Ariz.	835,350	1	.....	167,070	Nov. 16, '10	.10
Red Top, g.	Nev.	1,000,000	1	.....	128,176	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	.....	1,500,000	Apr. 15, '07	3.30
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	.....	6,125,000	Aug. 5, '07	1.75
Richmond, g. s. l.	Nev.	54,000	1	.....	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	.....	211,527	Oct. 15, '07	.60
Rocco Home, I. s.	Nev.	300,000	1	.....	152,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Rochester L. & L.	Mo.	4,900	100	.....	190,346	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev.	889,018	1	.....	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	1,173,000	3,749,000	Sept. 30, '16	18.00
Sacramento, g.	Utah	1,000,000	6	.....	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	60,000	100	.....	11,000,000	Sept. 23, '10	6.00
St. Joseph, I.	Mo.	1,409,468	10	1,761,830	12,029,729	Sept. 20, '16	.75	United Verde, c.	Ariz.	300,000	10	2,925,000	38,722,000	Sept. 9, '16	1.50
St. Mary's M. L.	Mich.	160,000	25	2,403,000	6,890,000	Sept. 18, '16	2.00	United Verde Ext.	Ariz.	1,000,000	50	600,000	500,000	Aug. 1, '16	.50
Schoenh'r-Wal'n, z. l.	Mo.	10,000	1	.....	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo.	69,188	100	.....	414,078	Oct. 9, '03	1.00
Scratch Gravel.	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,488	100	.....	1,775,956	Oct. 1, '07	1.50
Seven Tro. Con, g. s.	Nev.	1,443,077	1	36,076	252,532	Apr. 1, '16	.02%	U. S. R. & M. com	USMx	351,116	60	985,566	7,580,745	July 15, '16	1.00
Shannon, c.	Ariz.	300,000	10	.....	750,000	Jan. 7, '13	.50	U. S. R. & M. pf.	USMx	486,350	60	1,288,668	15,084,061	July 25, '16	.87%
Shattuck-Ariz, c.	Ariz.	350,000	10	1,225,600	4,200,000	July 20, '16	1.25	Utah, c. s. l.	Utah	1,624,490	10	13,808,165	46,630,042	Sept. 30, '16	3.00
Silver Hill, g. s.	Nev.	108,000	1	.....	88,200	June 24, '07	.05	Utah-Apex, g. s. l.	Utah	628,200	6	396,154	462,179	Sept. 30, '16	.25
*Silver King Coal'n	Utah	1,250,000	6	562,500	14,147,485	July 1, '16	.16	Utah Con, c.	Utah	300,000	6	675,000	9,825,000	Sept. 26, '16	.75
Silver King Con.	Utah	637,582	1	127,516	942,373	July 22, '15	.10	Utah M. & T. i.	Utah	760,000	1	325,000	1,285,492	Aug. 15, '16	.50
Silver Mines Expl.	N. Y.	10,000	100	.....	260,000	June 16, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00
Sioux Cons. I. s. c.	Utah	745,399	1	.....	872,106	June 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	.....	207,500	Apr. 23, '10	.04
Skidoo, g.	Cal.	1,000,000	5	.....	365,000	Oct. 2, '14	.01	Vindicator Con., g.	Colo.	1,500,000	1	135,000	3,397,500	July 25, '16	.03
Smuggler, s. l. z.	Colo.	1,000,000	1	.....	2,235,000	Nov. 22, '08	.03	Wasp No. 2, g.	S. D.	600,000	1	100,000	649,466	May 15, '16	.02%
Snowstorm, c.	Idaho	1,600,000	1	.....	1,169,610	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,000,000	1	400,000	1,050,000	Jan. 1, '16	.02
Socorro, N. M.	N. M.	377,342	5	58,599	196,070	Aug. 1, '16	.05	West End Con.	Nev.	1,788,486	1	.....	526,545	Jan. 15, '16	.05
South Eureka, g.	Cal.	299,381	1	167,920	1,409,754	Aug. 15, '16	.07	West Hill.	Wis.	20,000	1	8,000	40,000	June 29, '16	.20
South Hecla	Ida	500,000	1	39,450	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal.	200,000	10	60,000	190,000	Aug. 25, '16	.10
So. Swansea, g. s. l.	Utah	300,000	1	.....	237,500	Apr. 8, '16	.01%	Wilbert.	Ida	1,000,000	1	30,000	40,000	Aug. 15, '16	.01
Speerfish, g.	S. D.	1,600,000	1	.....	155,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	360,600	8,764,000	Apr. 1, '16	6.00
Standard Con, g. s.	Cal.	173,394	10	.....	5,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c.	Ariz.	118,674	16	.....	53,403	.....	.02
Standard, c.	Ariz.	425,000	1	.....	69,500	Sept. 8, '05	.60%	Work, g.	Colo.	1,500,000	1	.....	1,697,655	Apr. 31, '12	.05
Stewart, I. z.	Idaho	1,238,362	1	.....	2,043,297	Dec. 31, '16	.05	Yak.	Colo.	1,000,000	1	120,000	2,127,655	June 30, '16	.07
Stratton's Crip. Ck.	Colo.	2,000,000	1	.....	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	.....	167,600	Feb. 1, '13	.01
Stratton's Ind.	Colo.	1,000,000	5	.....	5,028,568	Dec. 23, '06	.12%	Yellow Aster, g.	Cal.	100,000	10	19,000	1,181,789	Sept. 1, '16	.02
Str'n's Ind. (new)g.	Colo.	1,000,000	.30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine, z. l. s.	Nev.	1,000,000	1	700,000	1,593,008	Sept. 15, '16	.10
Strong, g.	Colo.	1,000,000	1	.....	2,275,000	July 9, '06	.02	Yosemite Dredg.	Cal.	24,000	10	.....	102,583	July 15, '14	.10

Corrected to October 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675.00.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization						NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					
				Paid in 1916	Total to Date	Latest								Paid in 1916	Total to Date	Latest			
						Date	Am.	Date	Am.							Date	Am.	Date	Am.
Ajuchitlan	Mex.	60,000	\$ 6	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrilas	Mex.	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00				
Amistad y Concordia g	Mex.	9,600	50	.....	429,535	July 16, '08	1.28	La Roi No. 2, g.	B. C.	120,000	25	.....	1,527,320	Dec. 15, '15	\$0.24		
Amparo, s. g.	Mex.	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.06	Lucky Tiger	Mex.	715,337	10	379,129	3,642,520	Sept. 20, '16	.08				
Barotolo de Medina Mill	Mex.	2,000	25	.....	103,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,692	1	202,293	4,810,051	July 1, '16	.03			
Basitopias, s.	Mex.	446,268	20	.....	55,870	Dec. 31, '07	.12%	Mexican, I. pf.	Mex.	12,500	100	.....	1,018,750	May 1, '12	3.60		
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex.	240,000	10	.....	660,000	Mar. 10, '08	.25			
Boleo, g.	Mex.	120,000	20	.....	721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex.	150,000	5	.....	1,478,500	June 28, '14	.96		
British Columbia, c.	B. C.	591,709	6	.....	615,399	Jan. 6, '13	.36	Minas Pedrazini	Mex.	1,000,000	1	.....	497,500	Jan. 23, '11	.08%		
Buena Tierra	Mex.	330,000	5	.....	160,380	Jan. 30, '15	.24	Mines Co. of Am.	Mex.	900,000	10	.....	4,968,600	July 25, '13	.12%		
Buffalo, Ont.	Can.	1,000,000	1	.....	2,787,000	July 1, '14	.06	Mining Corp. of Canada	Can.	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%			
Canadian Goldfields	Ont.	600,000	0.10	.....	237,099	July 15, '14	.01%	Monterezuma, I. pf.	Mex.	5,000	100	.....	402,500	Nov. 15, '12	3.50		
Cananea Central, c.	Mex.	600,000	10	.....	360,000	Mar. 1, '12	.60	Monterezuma M. & Sm.	Mex.	500,000	1	.....	100,000	July 20, '09	.04		
Cariboo-Cobalt	Ont.	1,000,000	1	.....	295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11			
Cariboo-McKinney, g.	B. C.	1,250,000	1	.....	66,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex.	100	300	.....	3,190,000	Oct. 11, '09	\$253		
City of Cobalt	Ont.	600,000	1	.....	138,375	May 16, '09	.01	N. Y. & Hond. Rosario	O. A.	200,000	10	220,000	3,970,000	July 28, '16	.50			
Cobalt Central, s.	Ont.	4,761,500	1	.....	192,848	Aug. 24, '09	.01	Nipissing, s.	Ont.	1,200,000	5	900,000	4,340,000	July 20, '16	.25			
Cobalt Lake, s.	Ont.	3,000,000	1	.....	465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	.....	533,000	Dec. 1, '15	.02		
Cobalt Silver Queen	Ont.	1,500,000	1	.....	316,000	Dec. 1, '08	.33	Palanca, g.	Mex.	10,000	.....	99,800	Nov. 1, '12	5.00			
Cobalt Townsite, s.	Ont.	139,232	6	.....	1,042,259	Aug. 20, '14	.24	Panuco	Mex.	10,000	.....	7,465,000	Feb. 4, '09	5.00			
Coniasas, g.	Ont.	800,000	6	400,000	8,240,000	Aug. 5, '16	.25	Penoles, s. g.	Mex.	120,000	20	.....	6,451,687	Sept. 30, '13	1.25			
Con. Mg. & Sm., g. s. c.	B. C.	58,650	10	429,517	7,240,854	July 1, '16	2.50	Peregrina, pf.	Mex.	10,000	100	.....	328,656	Sept. 1, 1	3.50			
Crown Reserve, s.	Ont.	1,999,957	1	.....	6,162,408	July 16, '15	.03	Peterson Lake	Ont.	2,401,820	1	84,064	340,287	July 1, '16	.01%			
Dolores	Mex.	400,000	5	.....	1,374,865	July 24, '11	.22%	Pinguico, pf.	Mex.	20,000	100	.....	780,000	Apr. 15, '13	.30		
Dome Mines, s.	Ont.	400,000	10	600,000	1,000,000	Sept. 1, '16	.60	Porcupine Crown	Ont.	2,000,000	1	180,000	600,000	July 2, '16	.03				
Dos Estrellas, (El Oro)	Mex.	300,000	0.50	.....	15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex.	6,000	15	.....	953,360	Apr. 1, '08	1.00		
El Favor	Mex.	3,600,000	1	.....	210,000	Apr. 30, '14	.01	Rambler-Cariboo	B. C.	17,500	100	70,000	490,000	Aug. 15, '09	.01			
El Oro, s. g.	Mex.	1,147,500	5	.....	9,136,849	July 11, '13	.24	Ranch Mines, Leasing	Ont.	200,000	100	.....	12,750	Feb. 20, '15	.06%		
El Rayo, g. s.	Mex.	260,020	10	.....	104,410	Apr. 24, '11	.36	Right of Way	Ont.	1,655,500	1	16,855	560,514	June 16, '16	.00%			
El Triunfo, c.	Mex.	2,000,000	1	.....	20,000	Aug. 23, '11	.01	Rio Plata	Mex.	374,618	5	.....	345,744	Feb. 1, '13	.06		
Esperanza, s. g.	Mex.	450,000	6	.....	12,521,250	Dec. 31, '16	1.00	San Francisco Mill	Mex.	6,000	25	.....	445,086	Oct. 15, '09	1.00		
Granby Con. c. g. s.	B. C.	149,985	100	749,926	6,350,311	Aug. 1, '16	2.00	San Rafael	Mex.	2,400	25	.....	6,798,260	Jan. 11, '12	2.00			
Oreene-Cananea, c.	Mex.	474,411	100	2,431,045	6,966,850	Aug. 28, '16	2.00	San Toy, s. l.	Mex.	6,000,000	1.00	.....	640,000	July 24, '13	.01			
Greene Con. c.	Mex.	1,000,000	10	2,600,000	12,544,000	July 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex.	1,500,000	5	354,500	2,819,772	June 16, '16	.24				
Greene Gold-Silver, pf.	Mex.	300,000	10	.....	194,871	Mar. 28, '07	.40	Sita, Gertr'y Guadalupe, g. s.	Mex.	60,000	.....	3,960,000	Mar. 27, '06	1.00			
Guantanamo Con.	Mex.	540,000	10	.....	600,000	Oct. 8, '16	.24	Sola Maria del Paz	Ont.	2,500	12%	.....	5,606,000	Jan. 2, '13	2.50		
Guanaquato Dev. pf.	Mex.	10,000	100	.....	242,356	Jan. 1, '11	3.00	Sociedad Superior	Ont.	478,844	.....	766,214	1,687,420	Sept. 15, '16	.30		
Guggenheim Explorat.	Mex.	833,732	25	10,713,456	30,073,660	Apr. 3, '16	11.85	Soledad, s. l.	Mex.	960	20	.....	4,439,340	Oct. 17, '11	8.00			
Halleybury, s.	Ont.	60,000	1	.....	60,000	Apr. 5, '11	.50	Sorresra, g. s.	Mex.	19,200	20	.....	3,979,240	Jan. 6, '11	34.00		
Halley	B. C.	120,000	10	180,000	2,003,520	Sept. 30, '16	.60	Standard, s. l.	B. C.	2,000,000	1	450,000	2,250,000	Sept. 10, '16	.02%				
Hinds Con., g. s. l.	Mex.	5,000,000	1	.....	88,000	Feb. 27, '08	.02	Temiscam'g & Hud. Bay	Ont.	7,761	1	.....	1,940,250	Nov. 10, '14	3.00		
Hollinger	Ont.	4,000,000	6	1,440,000	5,610,000	Sept. 8, '16	.05	Temiskaming, s.	Ont.	2,500,000	1	75,000	1,534,156	July 22, '16	.08				
Jimulco, c.	Mex.	1,000,000	100	.....	975,000	Feb. 27, '11	1.00	Tezuitlan, c.	Mex.	8,000	100	.....	1,855,000	Jan. 1, '16	.12%		
La Lata, s.	Mex.	600,000	10	.....	2,778,000	Sept. 15, '16	.30	Two Oakes	Ont.	50,000	.....	199,811	2,656,750	July 1, '16	.12%		
La Blanca	Mex.	140,000	20	.....	2,778,000	Mar. 27, '16	.30	Tretheway	Ont.	1,000,000	1	.....	1,051,988	July 15, '16	.05		
La Republica, s.	Mex.	400,000	6	.....	110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.	Ont.	1,416,690	1	.....	656,886	Oct. 20, '13	.05		
La Rose Con., s.	Ont.	1,498,627	6	224,793	6,811,913	July 20, '16	.05	Yukon, K.	Y. T.	3,600,000	5	757,600	8,370,610	Sept. 30, '16	.07%				

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WOLF TONGUE MINING CO.'S MILL, NEDERLAND, COLO.

Concentrating Tungsten Ores, Boulder County, Colorado

W. A. SCOTT.

In passing briefly over the tungsten producing interests of Boulder county, Colorado, no attempt will be made to discuss market conditions, nor make predictions as to future demands and consequent output of that metal. The best informed men of that locality, including producers and buyers, are not making calculations extending far into the future, concerning demands and prices. That many companies and individuals are well prepared to mine ore and turn out marketable concentrates, is everywhere evident. Nearly all seem to concur in the effort that is being made to influence action by Congress to fix an import duty on tungsten ores and tungstic acid, to protect American producers against the products of foreign mines, which are operated at much lower cost, especially as to labor. While some large foreign sources of supply are now cut off from our markets by the exigencies of war, it is realized that, with the probable cessation of hostilities soon, American tungsten production may be further depressed and curtailed by the importation of cheaper foreign ores, by which prices will be governed.

When, in the winter of 1915-16, demands became great and prices advanced, it was demonstrated that tungsten miners of the western states were quick to respond to this demand, their production for the first 6 months of 1916 having amounted to 3290 tons of 60% product, sub-divided as follows: Colorado, 1505

tons; California, 984 tons; Nevada, 461 tons; and 165 tons were produced by Alaska, Idaho, Utah, and other states. The imports for that period amounted to 1824 tons. This leads to the belief that the mines of this country are capable of producing tungsten sufficient to supply any domestic demands that may exist. Evidently, the element of uncertainty as to future prices is the foreign supply. A reasonable import duty probably would tend to steady the market, and keep the mines in this country in operation. It is surely of interest to both consumers and producers to avoid, if possible, radical fluctuations.

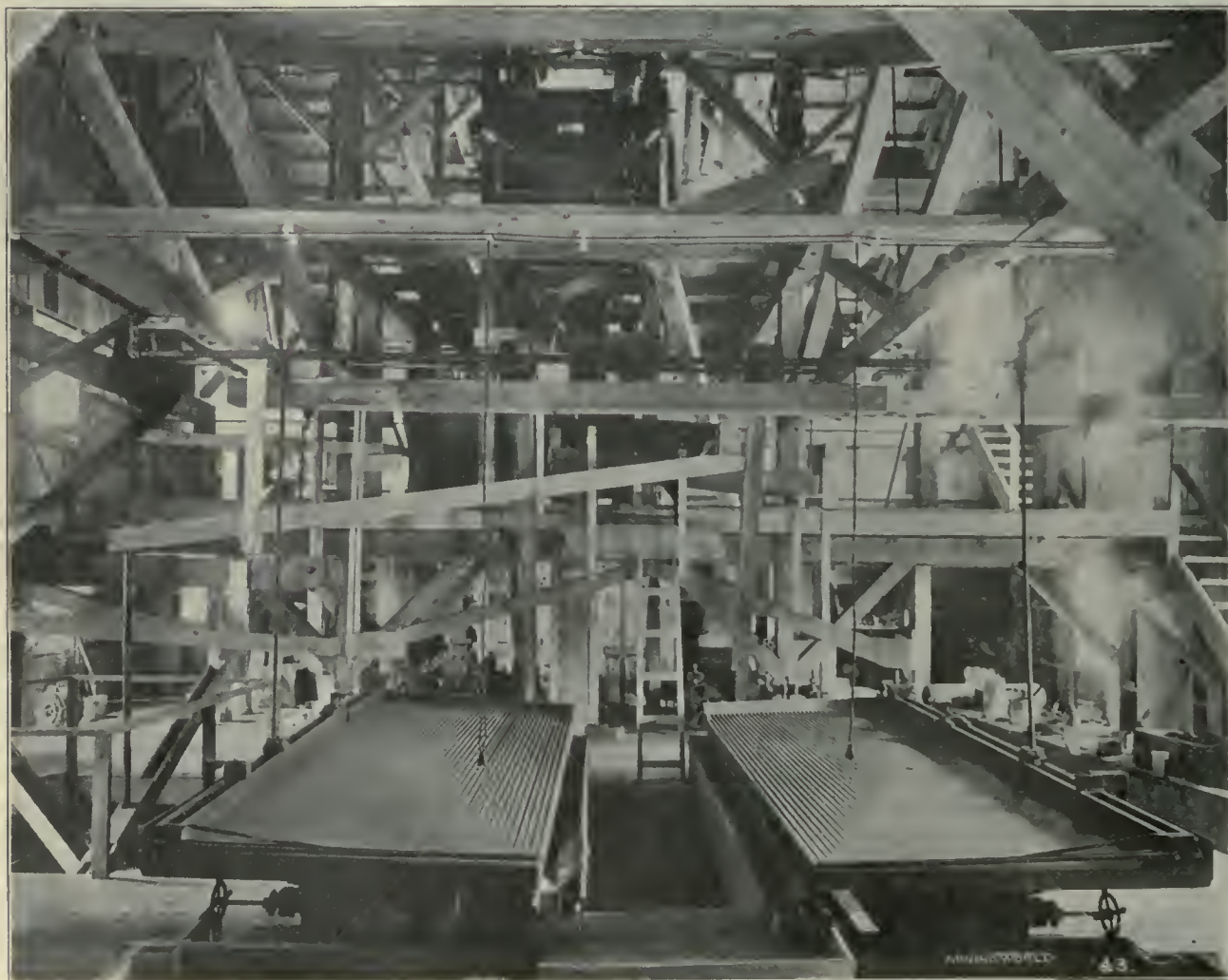
The Wolf Tongue Property.

The writer's main purpose is to report as accurately as he can some of the facts pertaining to milling methods and mill equipment observed in several of the tungsten concentrating plants. The first one visited was that of the Wolf Tongue Mining Co., situated at Nederland. This company's mineral holdings comprise 500 acres lying 2 miles north of that town. All of the 50 tons of ore per day being milled is taken from the company's mines, one-half being produced by the company direct, and one-half by lessees. The ore consists of ferberite, averaging about 7% WO_3 , the gangue being mostly silica and talc. The ore is first crushed to $\frac{1}{4}$ -in. size in a Blake jaw-crusher and a set of rolls. This product, after a 10% sample is cut out,

is passed to two Richards pulsator jigs, operating in series, with a dewatering box between the two units. Each unit is provided with separate pulsator valves and automatic gates for discharging coarse concentrates that accumulate above the screen and a hutch gate for discharging the fine concentrates that settle down through the screen. The coarse product ranges from $\frac{1}{2}$ to $\frac{1}{4}$ -in., and 10 mesh; the screen which holds it is 6 mesh, having 0.113-in. openings. The two products made on jig No. 1 consist of coarse concentrates running 63 to 57% WO_3 , and fine hutch concentrates running 60%; the product of jig No. 2, coarse con-

centrates, runs 20 to 30%. The Richards pulsator jig, made by Denver Engineering Works, has a pulsion stroke, upward, not accompanied by any counter suction. In this installation the total screen area of both jig units is only 2 sq. ft., and the two jigs in series treat 45 tons in 24 hours. The jig tailings are divided into two streams; one part is recrushed in two 5-stamp batteries, having 20-mesh screens, and the other part is reground in a Marcy ball mill, the latter reducing to 65 mesh. The stamps and ball mill are being run on the same material to ascertain comparative results. The pulp in each case is passed to a Richards hydrau-

lic classifier; the overflow from the classifier is passed over Card and Wilfley slime tables, on which are made first-grade and second-grade concentrates, running 60 and 20% respectively. A third cut from the tables is returned to the ball mill circulation. The table tailings are retreated over Monell slimers, on which 40% tungsten concentrates are made, all tailings from Monell slimers passing over canvas plates. Now, the underflow, or heavier slimes, from the hydraulic classifier go to a Bunker Hill 30-mesh revolving screen; the plus 30-mesh is retreated over Card tables, the minus 30 goes to a Bunker Hill 50-mesh screen; the plus 50-



INTERIOR OF RARE METAL ORE CO.'S MILL, ROLLINSVILLE, COLO.

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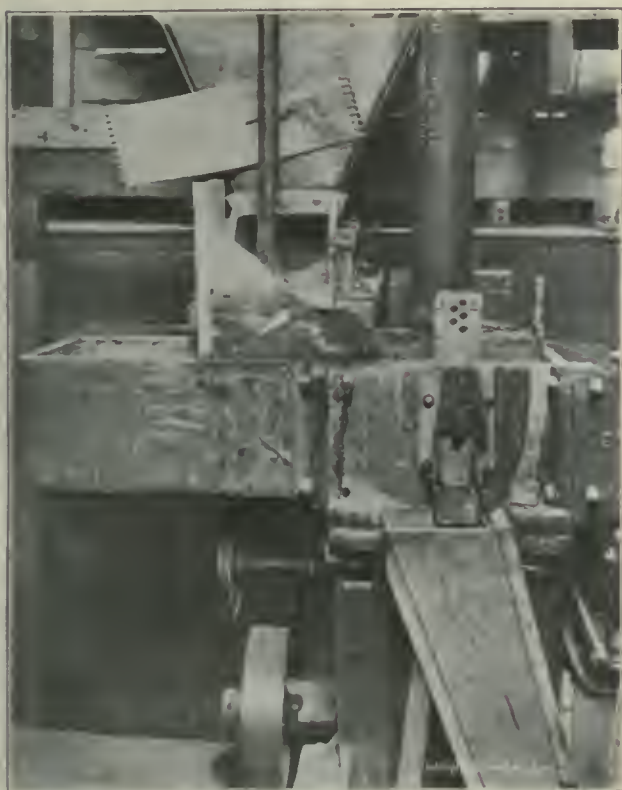
lic classifier; the overflow from the classifier is passed over Card and Wilfley slime tables, on which are made first-grade and second-grade concentrates, running 60 and 20% respectively. A third cut from the tables is returned to the ball mill circulation. The table tailings are retreated over Monell slimers, on which 40% tungsten concentrates are made, all tailings from Monell slimers passing over canvas plates. Now, the underflow, or heavier slimes, from the hydraulic classifier go to a Bunker Hill 30-mesh revolving screen; the plus 30-mesh is retreated over Card tables, the minus 30 goes to a Bunker Hill 50-mesh screen; the plus 50-

The Wolf Tongue property is under the manage-

ment of William Loach, with C. A. De Witt, mill superintendent, and Wm. Todd, mine superintendent. The mines are opened through 10 shafts. The 25 sets of leasers on the property pay a royalty of 25%, the company furnishing all supplies and power for drills and hoists. There are about 150 men employed.

The Vasco Property.

The mill of Vasco Mining Co., situated at Tungsten, or Stevens camp, is being operated on 80 tons of tungsten ore per day. This plant was built and equipped by Hendrie & Balthoff Mfg. & Supply Co., Denver, and is doing efficient work. The Vasco oper-

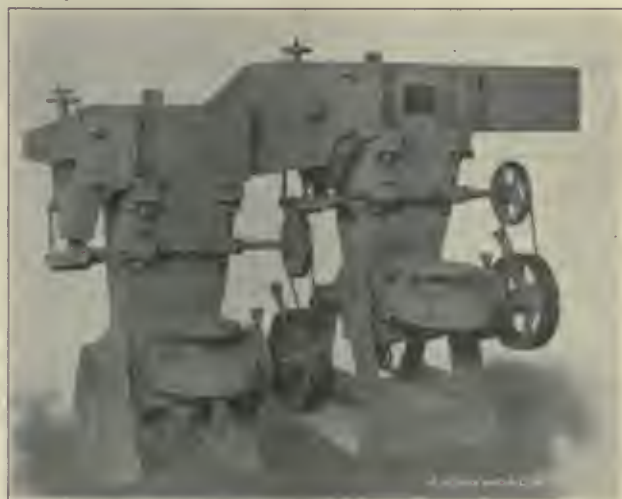


RICHARDS PULSATOR JIG IN DUNCAN MILL.

ations are under the general superintendency of John Connors; Thos. McGrath and W. W. Waldron are mill and mine superintendent, respectively.

The larger tonnage of ore milled is taken from the 450-ft. crosscut, the portal of which is close to the mill. It intersects one principal vein in granite; and mining operations are going on both above and below this crosscut. Ore is dumped from mine cars into mill bins, and is thence elevated to the coarse crushing department, in which there is a Sampson 1½-in. crusher and a Universal ¾-in. The resultant product is reduced to ¾-in. by McFarlane rolls, and this is elevated to the fine ore bins, and from these it passes through three sets of trommels. The first set oversize, which is plus 3 mesh, is returned to the rolls for regrounding. The undersize of first to second trommel, or 10-mesh and the oversize from same, pass to Hurley 3-compartment jigs of different screen sizes. The third trommel undersize, or 14 mesh, is run through

Bunker Hill screens, by which it is classified for table concentration. About 50% of the entire mill recovery is made on these jigs. The jig tailings are sent to the waste dump, except as to certain grades of ore, wherein they are reground. The jig middlings, after being reground in a ball mill of Denver Engineering Works make, are reconcentrated over Card tables. The oversize from the Bunker Hill classifiers passes to tables, and the finer, or 100-mesh product to Callow tanks. The tank settlings are reconcentrated on Card slime tables, the overflow from tank being passed over canvas plates. When the jig tailings are reground in the ball mill, the pulp is first classified in an Akins machine, and thence to Bunker Hill cone classifier for table and canvas plate finishing. In this mill work, the jig product runs 50% WO₃, the table concentrates running 40 to 45%. The two crushers and one set of rolls operate dry, the wet pulverizing beginning with



RICHARDS PULSATOR JIGS IN TANDEM.

the McFarlane rolls. John McKenna, Boulder, is general manager of the Vasco Mining Co.

Tungsten Production Co.

J. G. Clark is manager of Boulder Tungsten Production Co., the mines and mill being at Stevens camp, on South Boulder creek. Principal mine operations are conducted through a 100-ft. crosscut, intersecting four veins of tungsten ore in granite, in which there are also dikes of porphyry and veins of quartz. There is about 1000 ft. of lateral development from the crosscut haulage level, tracks from that level leading to the crusher at the head of the mill. The milling plant, built and equipped by Colorado Iron Works, involves standard coarse and fine crushing, and concentration over jigs and tables.

Degge-Clark Operations.

Degge-Clark Tungsten Mining & Milling Co. is mining and milling 25 tons per day of ore running 7% tungstic acid, the mill concentrates carrying 50 to 60%. This company's highest grade ore is received from its Beaver creek properties, 15 miles southwest

from the mill, and is hauled thereto in auto trucks. The Beaver creek group contains a series of about 20 veins in porphyry, the development being through shafts and tunnels. Some of this ore assayed as high as 71%. The mill is a Colorado Iron Works plant, containing crusher, two sets of rolls, ball mill, jigs, tables, and canvas plates.

Duncan Mill.

John T. Duncan owns and operates the Black Prince tungsten mill, situated in Boulder canyon. It was designed by Geo. S. Love, and was constructed by Denver Quartz Mill & Crusher Co. It has a capacity of 25 tons per day, and this is to be increased to 75 tons. The equipment consists of that company's 8 by 12 steel crusher, its No. 2 ore feeder, the Denver Quartz mill pulverizer, with second unit being installed; a Richards' pulsator single jig, Isbell concentrators, and a Colorado Iron Works' diaphragm pump. The crusher oversize is recrushed in a Peter McFarlane set of 12 by 20-in. rolls, the product of which is elevated to the ore bins, and thence through a Denver ore-feeder to the Richards' jig. The jig middlings are reground in a Denver quartz mill to 30 mesh. This pulp is concentrated by an Isbell table, the slime from which is conveyed by the diaphragm pump to Monell slimers, the overflow slimes from the Monell passing to the canvas plates. By all this equipment four classes of product are made: a coarse jig product, a finer jig hutch product, an Isbell table concentrate, and the slime concentrates collected by Monell tables and canvas plates. This mill is said to be making a saving of 84.3% of the assay value of the ore, the heads running 1.30% tungsten, the tails 0.22%. The jig product runs 48.3%, table concentrates 16.75%, slime product 30.2%.

Boyd Mill.

This mill, situated at Boulder, is operated by the Vasco Mining Co. It is in charge of Henry Kautzsch, and is treating a small tonnage of ferberite ore, ranging from 2 to 45%, making products running 55 to 60% WO_3 . The ore is crushed at the sampling plant, and as it comes to the Boyd mill it is passed to jigs in which a coarse product is made. The jig hutch is re-concentrated over tables. The jig tailings are run through batteries of stamps. The middlings from Wilfley and Card tables are reground in a ball mill, then re-concentrated over tables. The Monell slimers handle the fine slimes from the tables, and Monell tailings are retreated on the canvas plates, of which there are 16 in first set and 14 in other.

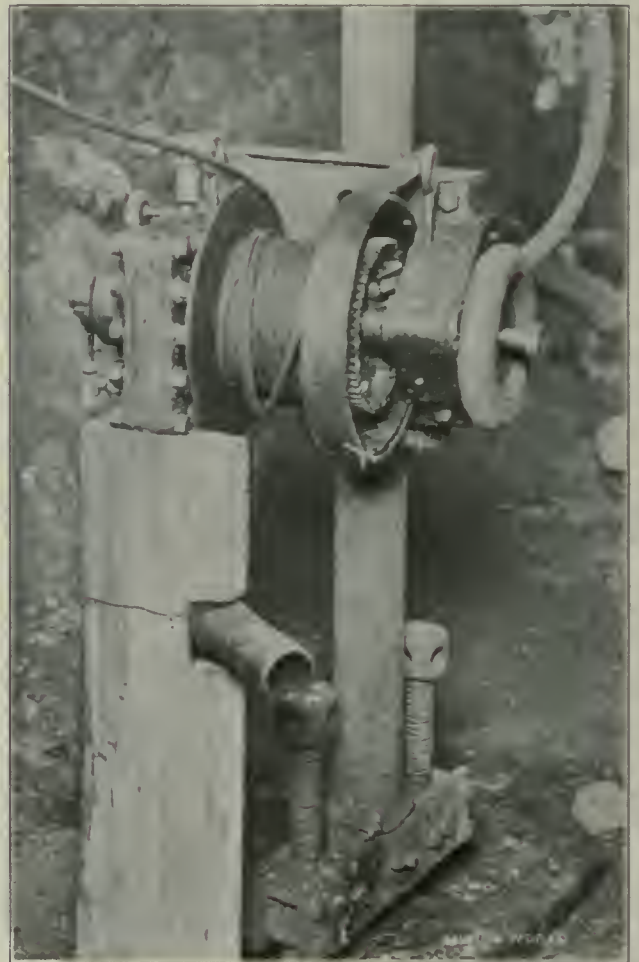
The Luckie Two.

H. B. Holmes is manager of Luckie Two Tungsten Co., which works its mines up Boulder creek, and operates a concentrating mill in Boulder. The ore, like most of the tungsten ores of Boulder county, is a ferberite, or tungstate of iron. The mill is running on 10 tons per day of ore that carries 6 to 7%, and pro-

duces concentrates that run 60% WO_3 . The ore is reduced to $\frac{1}{4}$ -in. size by a crusher and set of rolls, and is then pulverized by Denver Quartz mills to the mesh required for Wilfley tables and Monell slimers. A classifier is used between the quartz mills and tables. The slimer tailings pass to the canvas plant, containing 2400 sq. ft. of canvas.

Black Metal.

The Black Metal Reduction Co. has in operation at Boulder a plant for the production of pure tungstic acid from the 60% tungsten concentrates of the district. The product turned out is said to rank high among those who use tungstic acid. W. B. Stoddard



DRILL COLUMN HOIST IN TUNGSTEN MINE.

is manager for the company. Prof. Ira M. DeLong, of the state University, is concerned in the plant, appliances and chemical methods.

Rollinsville Mill.

The Rare Metals Ore Co. is operating a custom sampler and reduction plant at Rollinsville. The mill capacity is 50 tons per day, and is being operated at about that tonnage. Rollinsville is on the Moffat railroad, and is 4 miles south of Nederland. The company buys ores running 2 to 15% tungsten, and concentrates them to a marketable product. The ferberite, which is the most prevalent of the tungsten ores of

this locality, is said to be the most in demand by consumers. A recent shipment from this mill showed the following contents by analysis: Tungsten, 66.85%; iron, 18.48%; sulphur, 0.98%; phosphorus, 0.0063%; silica, 3.95%; tin, a trace; manganese, 0.25%. The mill, which was built by Colorado Iron Works, is equipped for pulverizing by a crusher, rolls and a ball mill; and for concentration by jigs, and Wilfley and Deister tables. Included are classifiers and Callow tanks. Nelson Franklin, formerly identified with ore sampling in Black Hawk and Cripple Creek, is manager. The officers of this company are: Guilford S. Wood, president; Irving T. Snyder, vice-president; A. J. Zang, who was treasurer, recently passed away; Geo. A. Stahl, secretary. This company is closely affiliated with the Vindicator Con. Gold Mining Co., owner of the Vindicator and Golden Cycle mines, Cripple Creek district.

Primos.

The Primos Mining Co., controlled by Primos Chemical Co., is operating a large mill for the concentration of tungsten ores, same being situated at Lakewood, 4 miles north of Nederland.

Important Mining Matters Before American Mining Congress.

"Had the present coal production of various Western states been under a federal leasing system at the lowest rate of royalty which has ever been considered, such a state for instance as Colorado would now be paying upon its present coal production approximately \$250,000 annually to the federal government, and the state would have been deprived of whatever taxes it now receives from its coal resources."

This statement is made by J. F. Callbreath, secretary of the American Mining Congress, who has just returned from a trip to the west in the interest of the 19th annual convention to be held at Chicago in November.

Elaborating this thought, Mr. Callbreath went on to state that under a federal leasing system, at the lowest rate of royalty which has ever been considered, Wyoming would be paying upon its present coal production approximately \$125,000 annually; Washington, \$160,000; Utah, \$150,000; Montana, \$155,000, and New Mexico, \$50,000 annually.

"The convention of the American Mining Congress," says Mr. Callbreath, "will afford an ideal opportunity for the west to present its claims to representatives from the eastern mining states whose congressional representation acting with western members can prevent unwise legislation and bring about the enactment of laws which will stimulate the development of western resources.

"Whether the Ferris land leasing bills shall be enacted, or whether the amendments made by the senate committee shall prevail, is of vital importance to the west. Whether the California oil claimants whose

rights are based on a compliance with the U. S. Land Office regulations then in force, shall be robbed of their property without right of appeal to the courts, as the Alaskan coal claimants have been, is of vital importance to every loyal citizen.

"Whether the resources of the west are to pay endless tribute to the government through a federal leasing system, or whether these resources shall be subject to the taxing power of the states, concern directly every taxpayer. Whether a cumbersome agency 2000 miles away, without knowledge of conditions, shall control western development, or whether the basic principle of republican government, home rule, shall prevail, and our development be controlled by those who know, is one of the most important and pressing questions now facing the west.

"The coming session of congress at Washington will probably pass finally upon these questions. The leasing bills have passed the house of representatives and are now before the senate. Western senators are entitled to great credit for the work thus far accomplished.

"The senate is likely to approve the work of its committees; but unless the west shall rally to the support of the senate committee recommendations, there is great danger that the house of representatives may refuse its approval. Legislation along several lines of great importance to the west will be thoroughly discussed by those interested in the development of the western states."

Discussing the various issues now pending before congress, Mr. Callbreath said, "The next session of congress will have under consideration the Foster bill, for revision of mineral land laws of the west."

It will be recalled that a bill to investigate conditions at its public hearing in the western mining centers, making recommendations to congress, was introduced by Senator Smoot, and passed the senate, but failed to receive the approval of the house committee on mines and mining.

"In its stead Dr. Foster, chairman of the committee, introduced a bill intended to meet the requirements without the preliminary work of the commission. This bill was severely criticized by the west. A thorough discussion of the subject will take place at the Chicago convention. Dr. Foster himself will lead the discussion and convey the plan he proposes. The discussion will be lively if the critics of his bill meet him on the floor."

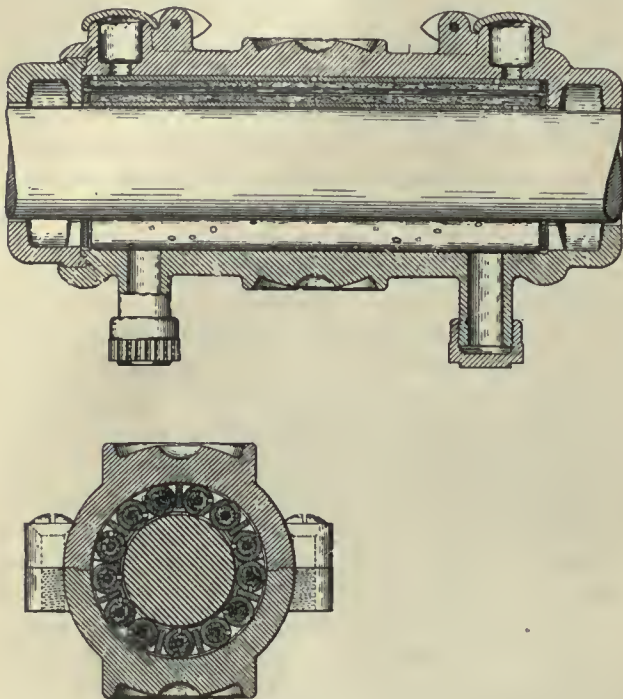
Tin exports from the Federated Malay States in July are returned as 3499 tons, against 3544 tons and 4582 tons for July in 1915 and 1914 respectively. The total to August 1, 1916, is given as 25,224 tons, against 26,862 tons to August 1, 1915, and 29,484 tons to August 1, 1914.

Zinc dust oxidizes rapidly, absorbs hydrogen and is chemically very active, resulting at times in spontaneous combustion or explosion.

Self-Lubricating and Cleaning Roller Bearing.

A roller bearing in which there is free circulation of the lubricant and at the same time a means for dirt and grit to work out from among the rollers, has been patented by three Indiana men—M. O. Reeves, E. Lewellen and L. P. Everroad, all of Columbus. Their patent has been assigned to the Reeves Pulley Co. of Columbus.

As shown in the two sectional views, the casing of cast iron is made with annular openings at each end in which run shoulders or collars on the shaft.



SELF-LUBRICATING AND CLEANING ROLLER BEARING.

This construction prevents the lubricant from escaping from the bearing.

The rollers themselves, as seen in the cross-section, are hollow, the interiors being filled with felt or other absorbent material. Holes are drilled in the sides of the rollers, as shown in the lower part of the longitudinal view.

Oil from the cups in the upper half of the casing flows down to the ends of the rollers and then through the absorbent material, working out to the surface through the holes. Dirt or grit which gets into the rollers is naturally worked downward by gravity and the rolling action, and finally finds lodgement in the wells in the bottom of the lower half of the casing, from which it is readily removed.

Fluxes are divided into three classes—acid, basic and neutral. Silica is the common acid flux. The basic fluxes are lime, magnesia, ferrous oxide, manganese oxide and alumina, which is feebly basic. Fluorspar is a neutral flux.

The Man Who Made Granby.

After having been identified with the management of the Granby Con. Mining, Smelting & Power Co. ever since it was organized, Jay P. Graves of Spokane, former vice-president and managing director of the corporation, has retired from the directorate, and Henry Bruere was chosen to succeed him at the annual meeting in New York on Wednesday, Oct. 4.

It was due to the personal efforts of Mr. Graves that the Granby came into existence, and as vice-president and general manager he was largely responsible for making the corporation one of the most important producers of copper on the American continent. With a small coterie of Spokane men, who, like himself, had confidence in the future of the mining industry in British Columbia, he organized the company, took over the initial holdings that eventually became the nucleus of the mammoth mining and smelting enterprise, and personally enlisted eastern Canadian capital in financing the venture.

This was but the beginning of the difficulties that beset the undertaking, however, and it was as vice-president and general manager of the operating company that Mr. Graves distinguished himself as an executive and a practical mining man of rare ability. Transportation was the vital feature of the situation after the company began producing, and through his efforts alone the Canadian Pacific and Great Northern Railway companies were induced to provide rail communication between the original mines and smelter in the Phoenix and Grand Forks districts, making it possible to get coke and other supplies into the smelter and the ore from the properties to the plant, besides furnishing an outlet to market for the blister copper product.

Having accomplished this, Mr. Graves then turned his attention to increasing the scope of the company's activities, and his success in this endeavor is indicated by the fact that the concern now has important copper-gold properties in different parts of Alaska and British Columbia, and two smelters, one at Anyox and the other at Grand Forks, that are producing approximately 4,000,000 lbs. of blister copper monthly, in addition to a considerable gold and silver output. The corporation is paying 8% annually in dividend on the issued capitalization of \$14,998,500, divided into 149,985 shares at \$100 each, and the surplus on June 30, 1916, was officially reported at \$2,919,384.

At the annual election W. H. Nichols was continued as president and Frank M. Sylvester as vice-president and managing director, a position to which he was advanced 2 years ago when Mr. Graves resigned as managing director. E. P. Earle, W. H. Robinson and Edwin Thorne were chosen vice-presidents; G. W. Woster, treasurer, and Northrup Fowler, secretary. The officers, with J. B. F. Herreshoff, B. Hochschild, William A. Paine and Sanford Steele, New York, and M. K. Rodgers, Brentwood Park, Cal., compose the directorate.

Ore Sampling Conditions in the West

T. R. WOODBRIDGE.*

(Continued from Page 621.)

The Snyder machine is in use at one plant examined, that shown in flow sheet. This machine (Figs. 1 and 2) consists of a cast-iron plate *a*, revolving in a vertical plane on the axis *b*. The spout that passes through the plate receives the sample portion from an inclined delivery chute. When the sample spout is not beneath the ore chute, the ore impinges against the plate and is thereby thrown back into the reject receptacle. Being made of cast iron, these machines have no easily bent or twisted parts, are easily accessible for cleaning and keeping in repair, and, under proper conditions, should give a correct sample. The greatest danger of inaccuracy lies in improper construction. As is shown in Fig. 2, the cutting edges, *ef*, of the sample spout should be parallel and preferably perpendicular to the plate, and the sides of the sample spout should be in planes passing through the center of rotation. With this construction, the opening in

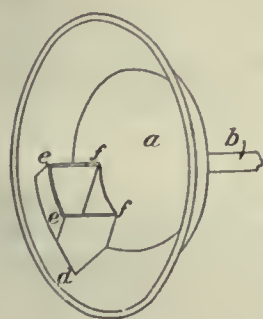


FIG. 1. SNYDER SAMPLER.

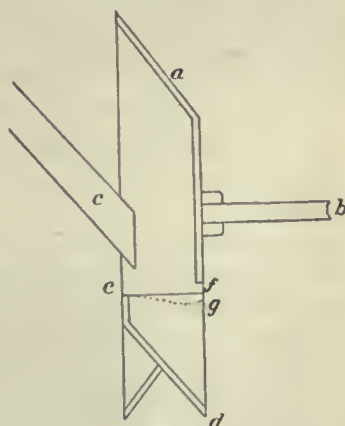
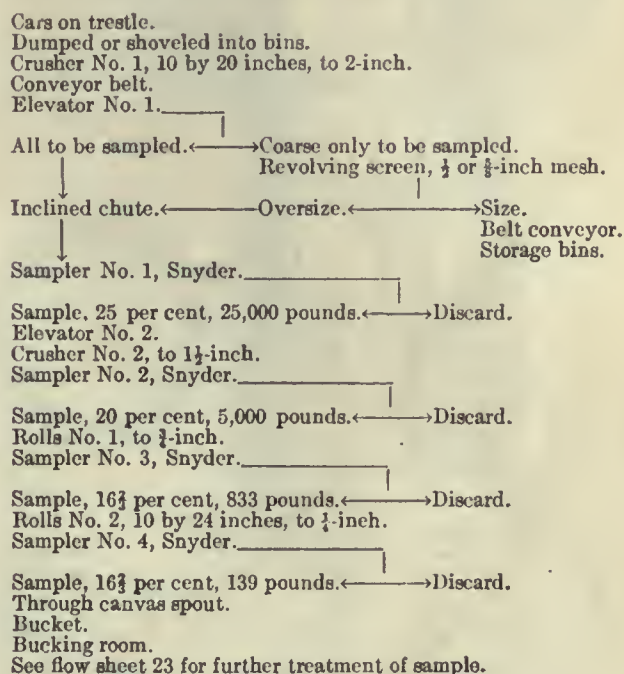


FIG. 2. IDEAL SECTION.

the spout will become wider as the edges wear down, but at the same time it will acquire a longer radius of rotation and will consequently continue to cut the same arc in the same period of time. On the other hand, should these sides vary from the construction described, as, for example, should they be parallel or converging toward the bottom, the wearing of the edges will not cause a corresponding widening of the spout, and the greater the wear the less will be the proportion taken for the sample at that point. If the sides spread more than they should at the bottom, the wear will cause an increasing proportion to be taken in the sample. As the delivery chute is at an angle to the horizontal, the coarser particles will be delivered nearer to *f* and the finer particles will fall near *e*, and therefore the edges of the sample spout will show a greater wear at *f*, as shown by the dotted line *eg*. An error may also be caused

by some of the fine ore that ordinarily would fall into the sample spout, adhering for a time to the plate *a*, and then dropping into the reject, or some of the fine ore that ordinarily would fall into the reject dropping into the sample spout. This occurs principally with damp and sticky ores. Owing to the slowness of rotation, it may be questioned whether the sample is taken frequently enough. This error is largely overcome by having two, three or four sample spouts cut in the disk, though this increases the probability of error through sticky ore, as suggested.

A type of mechanical sampling devices is represented by the various time samplers that have either a rotating or an oscillating motion. These samplers are so constructed and operated that, during one-twentieth to one-fifth of the time of a single rotation or oscilla-



FLOW SHEET USING SNYDER METHOD.

tion the entire stream of ore is diverted for the sample, and during the balance of the period the entire stream of ore falls into the reject receptacle.

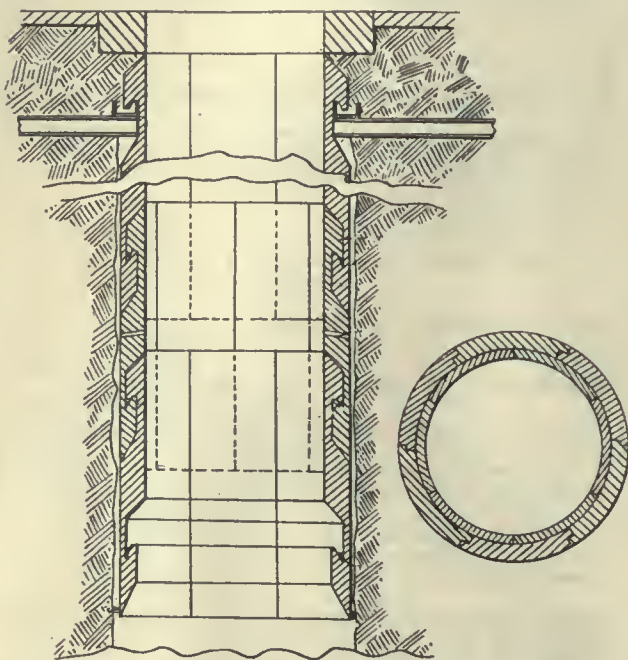
This type has certain special advantages in addition to those already ascribed to mechanical samplers. With proper construction and operation, the manner of delivering the ore is theoretically unimportant. Even though the ore be screened and the fine and coarse delivered to the sample spout from opposite sides of the chute, no error should occur, because the machine cuts across the entire stream, consequently both the sample and reject are under every section of the stream for the same proportion of the time. Owing to the sample spouts being wider than is possible in the riffle system, there is less danger of clogging and the entire machine can be made more readily accessible for clean-

*U. S. Bureau of Mines; excerpts from advance proofs, Technical Paper 86.

ing and repairing. The particular disadvantage of this class is, as already mentioned, that a machine may be as easily built to deliver a deceptive or unreliable sample as a reliable one.

Bricking a Shaft Down from the Top.

This sounds like an impossibility, but Marcel Gilieaux of Leige, Belgium, has hit upon a plan by which it can be done. The bricks, which are curved to the arc of the circle desired for the lining of the shaft, are formed on their outer surfaces with hook-like projections and annular recesses. The longitudinal section of the shaft here shown explains this construction more clearly than words. The top circle of bricks is hung from a ring which forms the mouth of the well or shaft, or from the top edge of



METHOD FOR BRICKING A SHAFT DOWNWARD.

a chimney if it is desired to line it in this manner. As the excavation of the well or shaft proceeds downward, another circle of bricks is hung by the hooks, fitting into the annular recesses in the first circle. Soil is then worked in back of the bricks and concrete also poured in behind them, through apertures left in the bricks. The concrete, when it sets, then holds the bricks to the sides of the shaft so that as the shaft proceeds to a great depth, no excessive weight need be supported by the first circle.

Twenty-five hundred coal miners in the Mercer-Butler bituminous coal district of Pennsylvania have been granted a voluntary increase in wages of approximately 10%.

With 15,834 men employed and 252 mines contributing, Iowa produced 7,530,088 tons of coal in 1915.

Concreting in Cold Weather.

Concrete work can be carried on successfully in cold weather. All that is necessary is to heat the sand and pebbles or broken stone and mixing water so that the concrete mixture will have a certain minimum temperature, then to place the concrete quickly and maintain the heat until early hardening has been completed. This does not mean that there are no limitations to the practicability of doing concrete work in cold weather, but that if a few simple precautions and protective measures are used, winter concrete work will be as successful as that done in warm weather.

Many contractors have found their working season profitably lengthened by using these precautions and protective measures. This means that men and equipment can be kept profitably employed almost regardless of season. In this way the contractor can keep his efficient organization together. The resulting advantages are far greater than the seeming disadvantages—principal among which is that applying the necessary precautions slightly increases the cost of cold weather work. This, however, is usually offset by the builder's willingness to pay for the privilege of having the use of his building or structure earlier than would be possible if work were postponed until warm weather.

It is well to remember that during the first few days following the placing of concrete, alternate freezing and thawing at comparatively short intervals will damage it.

Remember, therefore, that it is necessary to so mix, place and protect the concrete that early hardening will be complete before the work is exposed to freezing temperatures.

To do this:

- (1) Sand and pebbles or broken stone used must be free from frost or lumps of frozen material.
- (2) If these materials contain frost or frozen lumps, thaw them out before using.
- (3) As cement forms but a relatively small bulk of the material in any batch of concrete, it need not be heated.
- (4) Mixing water should always be heated.

Although adding common salt to mixing water will prevent freezing of concrete that has not hardened, there is a limit to the quantity of salt which may be added if the final strength of the concrete is not to be affected. Salt simply lowers the freezing point of the mixing water; it does not supply what is most needed—heat and warmth. It delays, instead of hastens, the hardening of the concrete.

Sand and pebbles or broken stone and mixing water must be heated so that the concrete when placed, shall have a temperature of from 75 to 80°.

Some sands are injured by too much heat. The same applies to certain varieties of pebbles and broken stone. A temperature not exceeding 150° Fahrenheit will generally prove the most satisfactory.

Recent Developments in Drilling Apparatus

Improvements of considerable importance to drilling apparatus have been made recently by two Denver men—Niels C. Mickelson and William A. Smith. The former has worked out a simple but practical method for cleaning drill hole—compressed air or steam being introduced through the drilling apparatus and readily controllable as to volume. The latter has confined his efforts to the design of a drill which is rotated at the same time that it is reciprocated; this

the pressure behind auxiliary piston (22). Then the plunger is withdrawn and the point (24) pulled out of the opening, leaving it unobstructed and unthrottled for passage through to the drill point.

Attachment for Rotating a Drill.

One form of Smith's rotating apparatus is shown

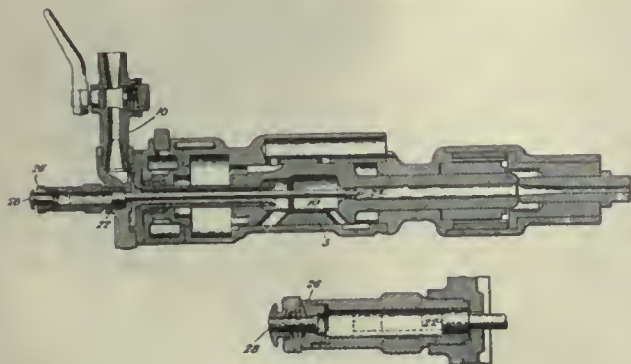


FIG. 1.

rotation being accomplished by steam or air-driven auxiliary apparatus, which is a part of the drill itself. He has designed two methods of operating this auxiliary device.

Drill Hole Cleanser.

Mickelson's drill is shown in Fig. 1, a longitudinal section of the device complete, and also an enlarged detail of the supplemental cylinder and piston for operating the controlling valve.

The hammer piston which operates the drill (5), and (10) being an internal compression chamber which receives the air or steam from the outside source. It will be seen that the piston head is hollow, also the drill, a sort of plunger, like the firing pin of a rifle extending clear through from the piston head. This plunger has a piston head of its own (22) at the rear,

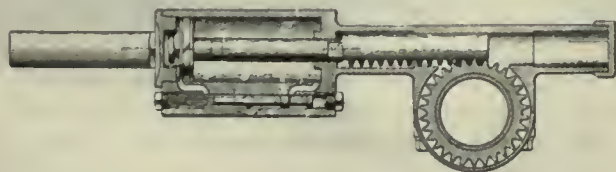


FIG. 2.

operating in a small auxiliary cylinder. Normally this plunger is in the position shown, because there is little back pressure on the point (24), while full pressure is exerted on the head (22). In this position some of the air or steam is admitted to the hollow drill past the point (24), and blows out the cuttings at a moderate rate. If the operator wishes to inject a stronger jet—the full pressure of the main source—he presses the cap (28) which opens the port (26) and relieves

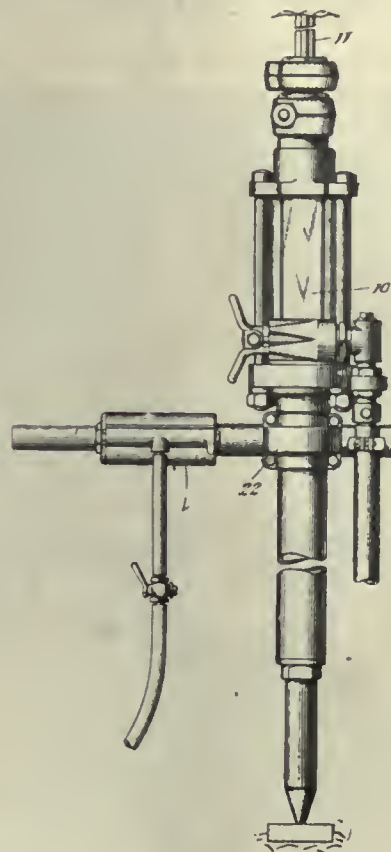


FIG. 3.

in Fig. 2. The drill point is shown (11). The cylinder is the hammer (10) piston for driving it. A casing (22) is clamped around the drill, from which

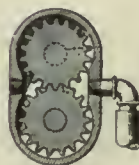
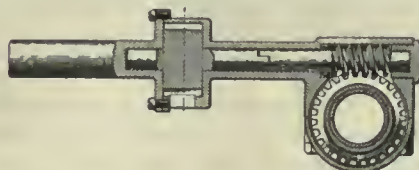


FIG. 4.

extends an auxiliary cylinder (25) with air or steam inlet. The arrangement of this casing and cylinder is better shown in Fig. 3.

Here it will be seen that the plunger in the aux-

iliary cylinder carries a gear rack, the teeth of which engage those of a gear mounted on the main drill. When the operator turns on the air to the auxiliary cylinder, its piston, working back and forth, oscillates the drilling apparatus and consequently the bit.

Fig. 4 shows a different way for accomplishing practically the same results in drilling, except that the

drill is completely and continuously revolved. Here a worm gear is used to mesh with the gear on the main drill. This worm is turned by a small rotary motor as shown in the detail view, steam or air being admitted at the right and turning the two intermeshing fluted cylinders, one of which is connected with the worm shaft.

New Development in the Copper Leaching Art

In testing various ores for the Koering method of extracting precious metals through process of cyaniding, it has been found oftentimes ores carrying a considerable amount of copper. In ores of this character, the copper always interfered with cyaniding, and, even if it were possible to overcome such interference, the copper became a total loss. By very exhaustive experimenting for the sole purpose of overcoming and eliminating the interference of copper with the cyanide solution, and at the same time to save the copper values, metallurgists of the Koering Cyaniding Process Co. finally discovered the means by which to overcome both ends, by making the drum adaptable to the most efficient copper recovery process.

In order to leach copper by means of its new method, it became necessary to construct all parts of the drum coming into direct contact with sulphuric acid used as dissolvent of copper, absolutely acid proof. It is now claimed to be able to extract the copper in a very similar, almost identical manner, by using sulphuric acid instead of cyanide.

The filtering material with which the drums are lined, is in every respect, acid proof, and therefore, it was unnecessary to make any changes for leaching copper. In order to utilize the present advantages of the method for copper leaching, it was only necessary to render the interior steel construction of the drums acid proof also. This has been accomplished by coating all of the metallic parts of the drums exposed to the solution of sulphuric acid, with lead, and this is being done by a newly invented and patented electrical process. This lead coating in the drums withstands the acid perfectly. The cost of lead lining is so inexpensive that the difference in price between the standard recovery drums and the lead-coated ones is but very slight. The lead-coated drums can be used for the recovery of copper, as well as for the recovery of gold, silver and platinum.

Ore containing copper, after being ground to a mesh most suitable to the quickest and highest extraction, is dumped into the drum, the sulphuric solution added, and then start agitation by revolving the drum.

Steam can also be added to heat the solution, as heated solution produces a quickening effect of dissolving copper, and in sulphide ores, steam will liberate and create sulphuric acid. Copper dissolves very readily in sulphuric solution, and the time of agitation is about one hour. After finishing agitation, filtration

is begun, and it requires but very brief time to filter out all of the copper pregnant solution even from very slimy ore. The copper then can be recovered from the solution either by precipitation on scrap iron or by electricity. The copper extraction in all of the experiments has never been less than 95%, and at most times just a trace was left.

The standard drum is 15 ft. long and 6 ft. diameter, and has in the gold recovery process a daily capacity of about 40 tons; one drum of these dimensions in copper treatment, will have a capacity from 80 to 100 tons per 24 hours.

In operation, if the lead-lined drum is to be used for extracting precious metals and copper, the copper is leached out first. Apply thorough wash to remove sulphuric acid in order to prevent the interference of same with the cyanide solution; then without stopping the revolving of the drum, sluice off the cake by a back-wash, add cyanide solution and start agitation, filtering and washing in the same manner as before; sluice out the barren pulp and stop revolving, and the drum is again ready to take in a new charge.

The copper leaching is generally perfected in one-half the time of the cyaniding, therefore, where a larger tonnage is to be handled, it is preferable to use a battery of two cyaniding drums to one copper leaching drum.

To leach one charge of copper in the lead-lined drum, and to conduct the gold and silver tailings therefrom to the cyaniding drum, it takes from 1½ to 2½ hours. After completing the process, in order to extract the precious metals (gold, silver and platinum) the whole cycle of agitation, filtering and washing requires about 3 hours.

While the gold recovery drum is being agitated, another charge can be leached in the copper drum, and the pulp conducted into the second drum. In this manner three drums can be operated simultaneously, and thereby about 100 tons per day of ores containing copper and precious metals can be treated very effectively.

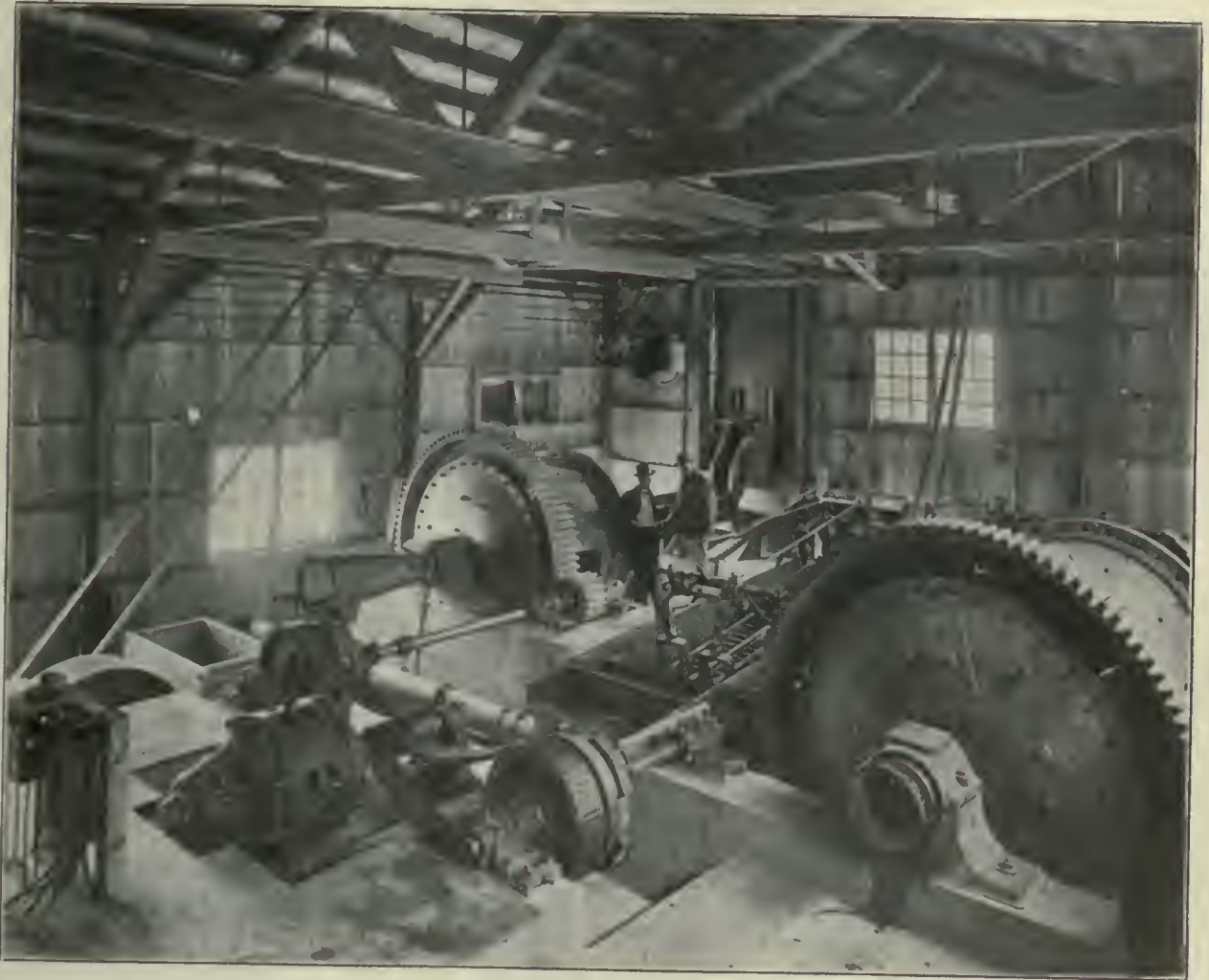
By this process it has been found that in gold and silver ores containing only ½ of 1% of copper the recovery of copper alone will fully pay for the complete treatment of copper, gold and silver.

The borax deposits of the United States are of great extent and there seems to be little danger of their exhaustion.

Mill of the Nevada Packard Mines Co.

The Nevada Packard Mines Co., Reno, Nev., is operating a mine and mill at Lower Rochester, the mine being near the eastern limits of Rochester's mineralized zone. The principal vein is on the contact between rhyolite and lime, and has a width of 25 ft. The ore, as broken, without sorting, is said to mill \$10 in gold and silver. The gold is finely disseminated, and the silver occurs as a chloride, in a gangue of quartz and schist. What seems an overflow from the

ery of 96% is said to be made. The company's cost sheet places the average mining cost at \$1.23 per ton of ore, and milling costs at \$1.27. Development charges, incidental to mine production, are placed at \$1.34 per ton of ore milled. The mill has a gyratory crusher, a set of rolls, two tube mills, leaching tanks, Oliver filter, and Merrill precipitating presses. The pulp passing from tube mills is 200 mesh. Pebbles are being replaced by manganese steel



MARCY MILLS IN CYANIDE PLANT OF NEVADA PACKARD MINES.

contact vein has mineralized the surface rhyolite and schist, forming a deposit of considerable extent, assaying about \$12 in gold and silver. This deposit is being mined by quarrying methods. It is said to extend 600 ft. in length, 50 ft. wide, and excavations in ore have reached a depth of about 10 ft. Shipments last year of selected ore, amounting to 2300 tons, sampled \$48.

The mill, equipped for crushing, fine pulverizing and cyanidation, was completed and started last December, and is now treating 90 to 100 tons per day of ore running \$12 to \$14. The ore is well suited to extraction of metals by cyanide treatment, and a recov-

balls in the tubes. Water supply is brought in for mill and domestic use through a $1\frac{1}{2}$ -mile line of 4-in. steel pipe from springs, under 600-ft. head.

The officers of the company are: Mark Walser, president; Jacob Nolde, vice-president; Frank Margrave, secretary; J. W. Wilkey, superintendent. All machinery is operated by electric power.

Researches on the treatment of low-grade ores have been rich in results, particularly with respect to gold and copper-bearing ores. Perfection, however, has not yet been reached and there are still attractive fields of investigation yet to be explored.

The "Combination Shot."

S. R. RUSSELL.

In some of the coal mines of this country, especially those in the anthracite field, the practice of making what is known as the "combination shot" is common. It is so called because a charge of dynamite and a charge of blasting powder are used in the same bore hole. One or more cartridges of 40% dynamite is loaded at the point of the hole and then a charge of blasting powder on top of this. Sometimes a blasting cap is inserted in the dynamite cartridge next to the blasting powder to insure detonation and often not.

The blasting powder is ignited either by fuse or miner's quib, the explosion and heat of the blasting powder being depended upon to detonate the dynamite. The miner believes that by loading holes in this manner he is assured that the hole will break clear to the point on account of the extra strength and extreme quickness of the dynamite.

Laws have been passed and are still in the mining laws prohibiting the making of combination shots, but the reprehensible practice is still employed by the miners to a considerable extent, with or without the assent of the operators.

According to the best authorities and theory, the combination shot is both dangerous and inefficient. It is very probable that in such shots, the dynamite is set on fire by the blasting powder, burns for a while, then upon reaching the critical temperature, explodes. It may happen that the burden of coal on the hole is entirely moved by the force of the blasting powder alone, in which case the dynamite burns up in the open, doing no useful work. If, however, a blasting cap has been primed in it, it burns until the fire reaches the blasting cap when it explodes in the open, doing no work but presenting many dangerous possibilities. The fumes from burning dynamite are extremely poisonous and dangerous, which is another reason for not using the combination shot.

There is such a wide variation between the velocities of detonation of blasting powder and dynamite that little benefit is obtained from the explosion of the dynamite. The combination as practiced is really theoretically reversed as it would probably do more good to make the bulk of the charge blasting powder and detonate it with dynamite, having a blasting cap and fuse connection in dynamite cartridge.

The use of the combination shot should not be allowed not only because it is inefficient, but especially on the ground of safety.

Allis-Chalmers is Prosperous.

The Allis-Chalmers Mfg. Co. is enjoying unusual prosperity founded upon a wise development of its resources and products. The aim of the present administration has been to perfect and enlarge the lines for which there is a constant demand at home, and at

the same time to improve the manufacturing facilities so that satisfactory prices and deliveries could be made upon a greatly increased output. The results of this policy are now seen in the large volume of orders for standard product at very satisfactory prices.

The company handled its large orders for machining projectiles so that they not only interfered in no way with its regular work, but all additions to plant and equipment were made with a view to their ultimate utilization in the standard business of the company. This is now being done and the capacity of the company increased accordingly.

One important new line which the company has recently taken up is that of farm tractors, and from the success of these tractors at the demonstrations and in actual service this year, a large annual business seems assured.

At the present time, the unfilled orders on the books of the company approximate \$12,000,000, all for its standard products, which cover practically all phases of the mining and manufacturing development of the country.

There are no labor troubles at any of its plants, and it is increasing steadily the number of its employes, so that it is able to give good service to all customers.

Cosna-Nowitna Region, Alaska.

In central Alaska south of the Yukon river there is a large area which prior to 1915 was practically unknown. In the summer of 1915 a small Survey party in charge of H. M. Eakin made a rapid exploration from Tanana river at Cosna to the headwaters of Nowitna river and thence down the Nowitna to the Yukon. A preliminary statement of the important geologic and topographic observations made on that expedition has recently been published as part of Bulletin 642, entitled "Exploration in the Cosna-Nowitna Region." Much time has been spent by a few prospectors in a search for placer gold on Nowitna river, but so far as is known the occurrence of commercial placers in that region has not been demonstrated. In much of the region prospecting is beset with considerable difficulty, owing to the great depth and breadth of the alluvial filling in the larger valleys. Although no lodes have yet been discovered the evidence available seems to suggest that the gold in the bedrock was probably introduced as a result of the igneous activities that produced the monzonites and granites, so that gold is most likely to be found near these intrusive masses. The map accompanying this report indicates the distribution of these intrusive rocks as well as of the other geologic formations.

The equipment of a mine should be up to the requirements for economical operation to a capacity which prospecting and development work has assured, but to equip lavishly before that stage has been reached is the height of folly.

What the Mining Companies are Doing

Mason Valley Mines Co., Nevada.

The balance sheet of the company shows as follows as at August 31, 1916:

Assets—	
Mines, claims and land.....	\$956,318.21
Expenditures on properties under option.....	14,030.81
Less sale of Gregory ranch.....	\$ 16,000.00
Mine and smelter bldgs. and equipment.....	954,349.02
	667,742.68
Mines, claims and plant, total.....	\$1,622,091.70
Government land scrip.....	12,000.00
Prepaid insurance.....	1,481.47
Sinking fund bonds.....	4,028.40
Current assets:	
Inventory of ore, matte, flue dust.....	\$ 9,883.09
Inventory of supplies.....	40,835.84
Accounts receivable and advances.....	10,323.19
Gregory ranch payment due Nov. 1.....	10,000.00
Securities owned at cost.....	255,330.90
Accrued interest (due Nov. 1).....	4,340.00
Cash in banks.....	6,058.99
	336,772.01
	\$1,976,373.58
Liabilities—	
Capital stock:	
Authorized 500,000 shares at \$5 par.....	
Issued 155,750 shares at \$5 par.....	\$ 778,750.00
First mortgage 6% convertible gold bonds.....	869,500.00
Current liabilities:	
Sundry creditors and taxes accrued.....	\$ 15,565.91
Accrued int. on bonds (due Oct. 1).....	21,737.50
	37,303.41
Reserve for doubtful accounts.....	\$ 10,000.00
Surplus accounts:	
Balance Jan. 1, 1916.....	\$338,396.51
Net loss 8 mos. per profit and loss acct.....	280,820.17
	\$1,976,373.58
Income:	
Interest received, net.....	\$ 7,660.39
Interest accrued.....	4,340.00
Rent.....	15.00
Income from Gregory ranch, net.....	118.45
Total income.....	\$ 12,133.84
Expenses:	
Loss on purchase and sale of securities.....	\$ 1,241.05
Taxes, insurance, watchmen and other mine and smelter expenses.....	16,720.06
Examinations of properties and engineering.....	11,804.22
Legal and New York office expenses.....	5,014.55
Federal income tax.....	120.30
Interest on bonds.....	34,780.00
	69,710.18
Net loss for 8 months carried to surplus account.....	\$ 57,576.34

Greene-Cananea.

Greene-Cananea Copper Co.'s September results compare as follows:

	Copper, lbs.	Silver, ozs.	Gold, ozs.
September.....	4,900,000	153,495	814
August.....	5,000,000	144,480	862
July.....	4,600,000	116,800	745
June.....	4,500,000	123,700	800
May.....	5,948,000	183,809	1,199
April.....	5,348,000	205,748	1,193
March.....	5,338,000	200,709	1,146
February.....	5,180,000	181,895	984
January,*.....	3,348,000	113,691	716

*Does not include custom ores.

It is expected that October production will exceed 5,000,000 lbs. Under existing conditions in Mexico this output is satisfactory to the management, although each new tax imposed in Mexico adds to costs and this is now around 11 cts. a pound.

Tennessee Copper.

Under the underwriting agreement which is now being arranged for issuance of 200,000 shares of Tennessee Copper new stock, the bankers, J. S. Bache & Co. and Adolph Lewishohn & Sons, will pay \$14 a share for the stock. Members of the underwriting syndicate will pay \$15 a share, and stock will be offered to shareholders at \$16 a share.

One of the purposes for which new capital is being raised is to provide funds to settle the matter of advances on this

contract. Russia advanced Tennessee Copper approximately \$1,000,000, and while the company still contends that the contract should be continued in force, if Russia can be induced to compromise on a satisfactory basis there is no question that a refund of part of this sum will be made, and the contract abandoned—as it virtually is already.

Suits are pending against the company for over \$1,000,000. It is possible some of these may also be compromised, but it is intimated others will be fought through the courts, as the management of Tennessee is confident of ultimate result. The matter of insurance on the burned plant, involving over \$500,000, will almost certainly be carried to the courts.

If Tennessee Copper can settle all its existing difficulties, it should be able to report fair earnings on its increased capital, for some time at any rate. Its present profits from copper would be equivalent to about 15% annually, or \$3.75 a share, on the larger capital; while the acid business should show a substantial profit if unprofitable contracts are done away with.

Butte & Superior, Mont.

Butte & Superior returned in September to a normal rate of production, the figures comparing with the same months in previous years as follows:

	Tons milled.	Recovery, %	Lbs. zinc in concentrates.
September—			
1916.....	50,150	93.46	14,496,000
1915.....	40,360	92.79	12,950,000
1914.....	34,850	89.69	11,058,000
1913.....	30,870	90.09	11,553,000

Kennecott Copper.

Kennecott Copper Corporation's production was 8,000,000 lbs. of copper in September, comparing as follows:

	Lbs.		Lbs.
September.....	8,000,000	March.....	10,150,000
August.....	10,200,000	February.....	9,750,000
July.....	10,750,000	January.....	10,000,000
June.....	10,500,000	December.....	10,500,000
May.....	10,500,000	November.....	10,000,000
April.....	10,500,000	October.....	10,000,000

Trinity Copper Co., California.

In contrast to the oft-repeated excuse that Trinity Copper was unable to operate on account of the low price of the metal comes this year's report that the company's idleness was due to the high price of the metal. A "one-man payroll" still exists, for a single miner is doing assessment work. The company had cash on hand at end of year as of Sept. 1 of \$464, compared to \$1234 the year previous. John B. Rock was elected a director succeeding Homer Albers.

The balance sheet of the company as of Sept. 1 shows as follows:

Assets—	
Mining claims.....	\$5,221,000
Development.....	711,980
Expenses.....	218,798
Railway.....	36,500
Cash.....	464
Total.....	\$6,188,742
Liabilities—	
Capital stock.....	\$6,000,000
A. S. & R. account.....	28,548
Ore.....	39,471
Accounts payable.....	120,723
Total.....	\$6,188,742

Nipissing Mines Co., Ontario.

Shipments of bullion by the Nipissing Mines Co. last month were, with two exceptions, the heaviest of the year, totaling \$413,000, against \$447,500 and \$420,900 in April and May, respectively. This bullion came from Nipissing ores and from custom material.

The gross value of September's yield was \$236,873, com-

pared with \$203,000 in the previous month. A record by months of the company's operations so far this year follows:

	Yield—		Ship-
	Gross.	Net.	ments.
January	\$169,800	\$103,600	\$147,000
February	171,800	104,600	309,000
March	170,000	105,500	322,100
April	167,400	101,800	447,500
May	291,900	218,800	420,900
June	294,600	220,688	193,400
July	288,500	218,000	280,100
August	203,800	121,551	
September	236,800		413,000

Cedar Talisman Con. Co., Utah.

The company reports its operations for the period, Jan. 1 to April 30, 1916, as follows:

General expense	\$ 430.09
Electric power	208.11
Ore hauling	684.98
Labor	3,859.28
Supplies	852.97
Profit on operation, Jan. 1 to April 30, 1916.....	2,851.37
	\$ 8,386.80
Zinc ore sales, lot 10 to 17.....	\$ 8,386.80
	\$ 8,386.80

Statement showing "loss" on operations May 1 to Sept. 16, 1916:

General expense	\$ 619.16
Electric power	293.21
Ore hauling	704.17
Labor	8,088.54
Insurance	139.75
Supplies	1,911.31
	\$11,756.14
Zinc ore sales, lot 18 to 21.....	\$ 1,116.56
Lead ore sales	2,446.90
Loss on operations, May 1 to Sept. 16, 1916.....	8,192.68
	\$11,756.14
Loss on operations, May 1 to Sept. 16, 1916.....	\$ 8,192.68
Profit on operations, Jan. 1 to April 30, 1916.....	2,851.37
Net loss, Jan. 1 to Sept. 16, 1916.....	\$ 5,341.31

The following is a statement of the company's financial condition:

Cash on hand May 1, 1916.....	\$ 2,500.52
Zinc ores at sampler May 1, 1916.....	2,574.65
	\$ 5,075.17
Less April operating expense paid after May 1, 1916..	1,139.99
Balance net cash turned over to new management May 1, 1916.....	3,935.18
Indebtedness unpaid Sept. 16, 1916:	
Notes payable	3,559.91
Supplies and labor unpaid.....	697.59
	\$ 4,257.50
Balance equals loss May 1 to Sept. 16, 1916.....	\$ 8,192.68

Colorado Fuel & Iron.

Colorado Fuel & Iron Co. reports for the year ended June 30, net profit for dividends was \$2,201,171, which, after deducting 8% for preferred dividends accruing during the year, left a balance equal to \$5.96 per share on the \$34,235,500 common stock. This compares with a deficit of \$334,661 reported in 1915, without any deductions for preferred dividends and \$1,640,229 earned for common, or \$4.79 a share, in 1912, the best previous year.

The company is not as well located as are its competitors to take advantage of present demand for steel from abroad, its distance from the seaboard handicapping it materially in seeking European business. It is believed in the steel trade, however, that it has made large sales of steel to Russia, shipping via Pacific coast points to Vladivostok, and also to Japan.

In the current year Colorado Fuel should do better than in that just reported. The report states that it has business on hand, making capacity operations certain until the close of the current year, and it may be presumed that this business was taken at a scale of prices averaging a good deal higher than those of last year. A better idea of probable profits for the year will be afforded when its report for the September quarter is published.

Granted continued fair earnings for some time, it must be remembered that the company has accumulated 30% in

dividends on its preferred stock, which will have to be cleared off before holders of the junior issue can hope for any return.

Miscellaneous Company Notes.

The United Verde Extension Mining Co. is now producing at a rate of approximately 36,000,000 lbs. of copper annually at a cost of between 7 and 8 cts. a pound. At present the company has its ore treated at a customs plant, but a site has been secured for the erection of a smelter.

At the annual meeting of Utah Apex Mining Co., to be held in Portland, Me., on Nov. 9 stockholders will act on the amendment providing that present capitalization of 600,000 shares, par \$5, be reduced to 125,000 shares, and that the par value be raised to \$25. It also recommends that the number of directors be reduced from nine to not less than five.

In September the Consolidated Arizona Smelting Co. produced approximately 1,170,000 lbs. of copper, according to an official. This is the largest production of any single month in the company's history. Earnings, it is understood, are running at a rate considerably in excess of \$500,000 per annum, which will compare with earnings in 1915 of \$190,000. The company's smelter, which was damaged by fire early last summer, has been repaired.

Should production continue the balance of the year at the present rate Utah Con. will have a total production for the year of about 12,000,000 lbs. of copper and 18,000,000 lbs. of lead. Higher wages and greater cost of materials have naturally been reflected in increased cost of production but estimated earnings of at least double present dividend requirements are possible. In addition to income from its own mining operations, Utah Con. has an investment in 8,250 shares of Anaconda.

*Stockholders of the Consolidated Coppermines Co. are offered \$150,000 7% first mortgage bonds for subscription until Nov. 1 at 90. Additional funds are necessary for the reconstruction of the old Giroux concentrator in order to secure production under the present price of copper, and to utilize it as an experimental plant to determine the best method for the treatment of the company's ores. It is expected that the reconstructed mill will be ready for actual operation by the end of this year.

The property of the Granby Mining & Smelting Co. has been turned over to the American Zinc, Lead & Smelting Co., actual payment for the properties having been made. The acquisition of the property places American Zinc third among the large spelter producers of the country. As a result of the consolidation American Zinc will now be able to produce all grades of spelter. Heretofore the company specialized on its Mascot high-grade and intermediate grades, while Granby has been producing prime western and Granby special.

According to D. C. Jackling, managing director of the Utah Copper Co., the company is earning \$1,000,000 a week and the report for the third quarter will show earnings of \$11,000,000 from Utah Copper and \$2,000,000 from Nevada Con. This makes \$13,000,000 for 13 weeks for the quarter. Utah is producing over 20,000,000 lbs. of copper a month, or 240,000,000 lbs. a year, and the company has about reached its stride. Plant is gradually being added to, and by Jan. 1 next production will show a larger increase. Ray, Chino and Nevada Con. are expected to show greatest production and earnings in their history for third quarter.

Isle Royale's 1916 production, it is estimated, will total better than 12,000,000 lbs. of copper. With high record production and earnings shareholders can look for increased dividends. August operations resulted in 84,000 tons of rock being stamped and as the rock ran about 11 lbs. of refined copper per ton it means that production for that month amounted to over 1,175,000 lbs. of copper. With present production it may safely be estimated that with copper at its present price Isle Royale is earning \$9 per share, or more than twice the present dividend rate. As the company has no large construction expenditures ahead of it and has ample working capital, practically all the current earnings are applicable to dividends. On Aug. 1 cash and copper sold amounted to over \$800,000.

Concernin' Good Roads.

1

Prospectin' round th' mountains for a score of years or so,
Don't always mean a fellow lays aside a lot of dough;
But he gets a deal of knowledge which will assay pretty fair,
An' veins of rich experience he's strikin' everywhere.

2

I don't claim I'm a know-it-all, but sometimes when I see
A mine that ain't apayin' like I think it ought to be,
I feel like my advice would help perhaps to make it pay,
An' folks can take or leave it, for I'm givin' it away.

3

Fer instance, there's th' Silver Gem, as fine a minin' claim
As any in th' mountains more than worthy of her name;
An' yet the ore is trundled down a rough and rotten road,
That makes th' haulin' misery and costs a lot per load.

4

That's just a sample pardner, other mines is just as bad,
It gets me when I think how cheap a good road can be had;
Eventually they'll see it, and figure what they lost
By careless commutation of th' ore production cost.

5

They may be quaint an' picturesque, those rough old mountain trails,
But when yer huntin' dividends, pick out a pair o' rails
That hold a donkey engine, or a solid hard pan road
That's built for motor truckin' an' will stand a powerful load.

—Frank Adams Mitchell.



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*Illustrated.

American Mining Companies Protest Against Mexican Taxes.

American-Mexican mining and smelting interests to the number of 45, with William Loeb, Jr., of the American Smelting & Refining Co. as chairman, protested to the American members of the American-Mexican commission recently against the prohibitory taxes levied against mining properties in Mexico.

According to the memorandum submitted the 45 companies concerned have sustained a loss in depreciation of property and actual wastage of more than \$7,246,031 in a year of enforced idleness. A wage loss to Mexicans alone amounts to \$16,088,363.

As shown by a census of the operation of the companies, mining and smelting is practically at a standstill. Only 6000 were employed during the first half of 1916, as compared with 62,216 in 1912. Wages were \$3,671,302 as compared with \$18,726,090. Copper production fell off from 74,984 tons to 23,156 tons; zinc from 46,765 tons to 11,183 tons; lead (bullion), 70,939 tons to 2928; silver, 31,892,735 ozs. to 6,200,339 ozs., and gold from 252,843 ozs. to 39,895 ozs., as showing the burden of new taxes as compared with those in force in 1912, total taxes under the Constitutional law of 1912 amounted to \$1,726,600 and under the arbitrary decree of 1916 based on 1912 production amounts to \$7,665,790.

Under existing tax decrees, companies mining and treating large tonnages of low-grade ores, which constitute the most extensive mining operations in Mexico, will be unable to resume operations, since export taxes on the metal, which in the new rates are shown as 10% and 5%, often figure out as high as 50%. This results because no allowance is made for cost of transportation, treatment and marketing.

Those appearing before the commission besides Mr. Loeb were former Judge D. J. Haff, attorney for Phelps, Dodge & Co.; George Young of the Greene-Cananea Co.; Charles Earle of the United Smelters; Henry Bruere and Julian W. Beatty of American Metals Co. The 45 companies represented a total investment of \$125,000,000.

Present Copper Prices Prove Absence of Manipulation.

The placing of an Italian order for 1,000,000 lbs. copper this week is the chief development in the copper situation. As indicated in our market reports a week ago, business in copper is expected to taper off and the first signs of a receding volume of demand have already been noted. Leading producers assert that incoming business is smaller and it is possible that inactivity will replace the pressure for the metal that has existed since early August. The winding up of the buying movement is welcomed. Orders have been written into the books of the producers that assure them of a protracted period of activity and the

advent of an off-period is not regarded as making for an easier market.

Reviewing what has transpired in the past 10 weeks, the fact that producers held copper below the 30-ct. level stands out prominently in disputing the oft-stated assertion that manipulation of copper prices is at all times rife. When the movement now closing had its inception last August the price of copper held around 26¾ cts., whereas at the winding up of the movement the price stands at 28 cts., indicating an advance of only 1¼ cts. per pound. Taking this advance in contrast with the tremendous business booked since August first it is manifest that the upward movement in prices has been conservative.

Producers can now face the future with definite assuredness of a continued strong market. With over half of their production in the first 6 months of next year already sold and the fact that a considerable amount of domestic buying will develop around January of next year that will easily absorb the balance of the output, the future holds much in store for copper producers.

The termination of the war is not in sight. Generally the viewpoint is accepted that hostilities will continue into 1918, possibly until the summer of that year. The longer the war lasts the greater strength will the copper situation assume. With the profits of 3 years conserved to act as a bulwark against the era of repression that some claim will follow peace, the copper producers are in a position to hold their own until peace demands for copper assume proportions that will necessitate the continuation of capacity production. Europe's reconstruction and the dependence of Europe on the United States for materials for its rehabilitation are the factors that go towards making our present day prosperity stable and sufficiently powerful to resist the reaction that peace will bring.

Wants More Reliable Copper Price Quotations.

And now comes first-hand information as to the general unfairness of the copper metal prices as put forth by Engineering & Mining Journal. As editor of that journal at one time, T. A. Rickard necessarily became familiar with the method by which price quotations were arrived at, and now, as editor of Mining & Scientific Press, he, after all these years, discusses the question editorially. Being good and timely and in order that it may be read by *all* the people vitally interested we gladly give space to the following excerpt:

It is about time to discover some better method of adjustment between buyer and seller. Why not base the wage-scale and the ore-settlement alike on the price that the mining or smelting company gets for its copper? Why depend on the guess of any trade paper when the essential fact can be ascertained by reference to an authentic record, namely, the books of the copper producer or the smelter, as the case may be? What does it matter to the manager of the Little Bullion mine what other people are getting for

their copper? He settles with the smelter on the basis of the price that the smelter is supposed to get for the copper that it buys from him. What does it matter to the copper miner at Bisbee what the Anaconda company gets for its copper? He is only concerned with the price obtained by the particular company that employs him. It may be objected that an interval must elapse between the purchase of custom ore or of miner's labor and the marketing of the copper sold by the one or mined by the other, but that is easily adjusted; pay a nominal price on settlement, and adjust the balance at the end of a specific period. The price at which copper is sold by a given individual or company can be ascertained definitely; the average price at which a variable number of producers sell varying quantities of copper cannot be determined by anybody.

In the event of war it is estimated that this country would need approximately 40,000 tons of nitrogen in the form of 180,000 tons of nitric acid per year. In 1915, enough bituminous coal was mined in the United States to yield, if properly treated, 1,000,000 tons of nitrogen, which could produce 3,600,000 tons of nitric acid, or, on the above basis, enough for 20 years of war. The "if" is the obstacle; our present industrial methods of coal treatment if applied would recover but one-fifth of this nitrogen as nitric acid or, in one year, enough for four years of war, if we were properly to expand and extend these industrial methods and appliances, and also further, to convert the so-recovered ammonia into nitric acid.

Probably at no time in the history of the mining industry have American manufacturers of mining machinery been so prosperous as at the present time. The investment of capital in this industry is enormous and despite the hundreds of immense plants spread all over the United States, great prosperity is evident. That these manufacturers do not have to depend wholly on home consumption is evidenced by the reports of heavy shipments to foreign countries, despite the European war. The fame of "made in the United States," as relating to mining machinery, is reaching farther and farther and today there is no country in which U. S.-made machinery is not seen.

Upon the outcome of the hearing before the Supreme Court of the United States next month depends the very life of the Minerals Separation patents in the United States. As a result of the stay secured in the injunction issued by the United States Court of Delaware, the Miami Copper Co. must file with the court a monthly statement of operations so far as it concerns the use of flotation. A bond of \$250,000 is also required. Similar statements to the Montana courts are being made by the Butter & Superior Co. as a result of the decision of the Montana court rendered in favor of Minerals Separation, Ltd.

The importance of an efficient system for keeping track of costs of ore production and treatment cannot be overestimated. Excessive cost at some stage may mean the entire loss of profits. To the careless manager the reason for such losses may remain undetected for lack of a proper system of cost keeping. By the introduction and use of such a system the sources of loss can be readily found and the proper remedies applied.

PERSONAL.

Dr. L. D. Rickets has been inspecting Arizona copper properties.

A. O. Jacobson has returned to Salt Lake City from his recent eastern visit.

Pope Yeatman recently examined the Cresson mine at Cripple Creek, Colo.

Louis D. Huntoon recently completed an examination of several South Dakota properties.

A. C. Nebeker is superintendent of the Antelope Star property in Beaver county, Utah.

Frank Steffee will supervise the construction of a 500-ton custom mill to be built at Chloride, Ariz.

Morton Webber has completed mine examination work in California and returned to New York.

Wm. O'Neil has been made general manager of the Janet Copper Mining & Milling Co. near Vernal, Utah.

Kirby Thomas recently investigated the iron ore resources of East Tennessee for New York clients.

S. N. Williams, purchasing agent for the Copper Queen Con. Mining Co., is enjoying a vacation on the coast.

Arthur W. Jenks has been appointed smelter superintendent for the Burma Mines Corporation in Burma.

Edmund L. Hiatt has resigned as chief engineer of the Ray Con. Copper Co. to become manager of the Arizona Ray Copper Co.

J. C. Simmons, manager of the Rare Metals Mining & Milling Co., Telluride, Colo., has been in New York city on company business.

W. H. Weyher, general manager of the Silver Reed Mining Co. of Utah, is in Chicago on a vacation trip which will include other eastern cities.

John D. Wanvig, general manager of the Golconda mine, in Mohave county, Arizona, has returned to the property from a several months' vacation.

Louis Procissi, recently on the mining staff of the Copper Range Copper Co., is going to Laredo, Mexico, for the Cia de Minerales y Metales.

J. F. Erisman of Denver, Colo., recently inspected the holdings of the Blue Flag Gold Mining Co. in Idaho, for which company he is general manager.

Max J. Welch has completed the construction of an experimental concentrator for the Cerro de Pasco Copper Co. in Peru and returned to Los Angeles.

A. P. Allen has left the efficiency department of the Calumet & Hecla and has taken a position with the Highland Mining & Development Co., at Ashcroft, B. C.

B. S. Butler, of the U. S. Geological Survey, has completed a detailed study of the Cottonwood-American Fork section of Utah and has returned to Washington, D. C.

Capt. Wm. Corkhill of the Volunteer iron mine, which is located on the Cascade range and which has been shut down as its ore supply is exhausted, has gone to Butte, Mont., to take charge of development work at the North Butte property.

F. Ward Paine is in charge of the diamond drill exploration operations which the Copper Range Con. Co. is now doing upon land under option from the St. Mary's Mineral Land Co. in the copper country.

Andrew N. Fox, for many years advertising manager for the Benjamin Electric Mfg. Co., Chicago, has retired from the electrical business to become president of the R. & F. Copper Co. of Nevada, with headquarters in the Harris Trust

building, Chicago. Years ago Mr. Fox and Thomas C. Rea staked claims to 660 acres of copper prospect property in the Lida mining district. Mr. Rea has continued development on the property each year and now has several shafts and considerable ore developed.

SCHOOLS AND SOCIETIES.

Denver Mining Bureau.—Denver mining men recently organized the Denver Mining Bureau. Following a discussion of the Ferris bill to lease lands containing coal, oil and other minerals, with special reference to its menace to the mining industry, the first board of directors of the bureau were elected: R. A. Parker, L. P. Hammond and P. M. McHugh for the one-year term; W. L. Loveland, D. W. Brunton and O. E. Carey for the two-year term, and Charles A. Chase, R. B. Moore and Fred M. Carroll for three years. The directors then elected Mr. Parker chairman of the bureau, Mr. Hammond vice-chairman, and P. M. McHugh secretary.

NEW PUBLICATIONS.

Gold, Silver and Copper in Alaska in 1915. By Alfred H. Brooks. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 1:8; pp. 12.

A general review of the entire territory is made and

Fifth Annual Report by the Director of the Bureau of Mines for the Year Ended June 30, 1915. Washington, D. C., U. S. Bureau of Mines. Report; pp. 106; illustrated.

This report is an account of the work done during the year by the Bureau both in the field and office. A chart is included showing the organization of the Bureau.

Spirit Leveling in South Dakota, 1896 to 1915, Inclusive. By R. B. Marshall. Washington, D. C., U. S. Geological Survey. Bulletin 643; pp. 100.

The elevation and location of bench marks established in primary leveling are given and the bench marks with their elevation and exact location are subdivided according to the quadrangle in which they are located.

Mining on Prince William Sound, Alaska. By Bertrand L. Johnson. Washington, D. C., U. S. Geological Survey. Bulletin 642-D; pp. 9.

A brief account is given of the country and followed by separate accounts of gold and copper mining. Under these two headings the contents is divided into districts under which the operations of the different companies and properties are briefly spoken of.

The Turnagain-Knik Region, Alaska. By Stephen R. Capps. Washington, D. C., U. S. Geological Survey. Bulletin 642-E; pp. 48; illustrated.

Sketch maps, showing the geology, distribution of timber and location of towns, etc., are shown separately. The introduction is a geographic description of the area and this is followed by a description of the geology of the country. Mineral resources, principally gold placers, and gold and silver lodes, are subdivided and reviewed in the concluding pages of the bulletin.

The History and Development of Gold Dredging in Montana. By Hennen Jennings. Washington, D. C., U. S. Bureau of Mines. Bulletin 121; pp. 63; illustrated.

A chapter is included in the bulletin by Charles Janin on "Placer Mining Methods and Operating Costs." Early operations are briefly taken up and followed by a complete description of present and past operations and methods of dredging in the Ruby district. The text is confined mostly to the Conrey Dredging Co., as this company is the principal company in the Ruby district. Cost data and methods of accounting are described, as well as the occurrence of the gravels, dredge construction and operation, etc. The chapter by Charles Janin is more general in its scope and foreign

countries as well as states other than Montana are considered.

Report on the Fertilizer Industry. Washington, D. C., Federal Trade Commission. Report; pp. 269; illustrated.

Tables and composite curves comparing the production of fertilizers from different sources, both natural and artificial, are reproduced, and in general the report is a review of the industry as regards both production and sales. The report was the outcome of a resolution of the U. S. Senate whereby it was authorized to investigate the causes of the advance in prices of ammoniates and nitrates used in the manufacture of fertilizers.

Density and Thermal Expansion of American Petroleum Oils. By H. W. Bearce and E. L. Peffer. Washington, D. C., U. S. Bureau of Standards. Technologic Paper No. 77; pp. 26; illustrated.

The paper gives an account of the experimental work on which are based the expansion tables of Circular No. 57. Detailed descriptions of the methods employed and apparatus used in the determination of the density and thermal expansion of petroleum from the various fields in United States are given. Results, formulas, etc., are also given.

The American Petroleum Industry. By Raymond F. Bacon and William A. Hamor. McGraw-Hill Book Co., New York. Books; Vol. I; pp. 446; Vol. II; pp. 517; illustrated. For sale by Mining World Co., \$5 each.

Vol. I is on the operations and nature of the wells, while Vol. II is mostly confined to "oil refining technology." Much of the information has been obtained from other authors, who have written in some cases special chapters, as well as from U. S. Geological Survey and Bureau of Mines publications. In reviewing the purpose of their work the authors state that they have endeavored to prepare a book of value as a general reference for those engaged in the industry as well as a text for students. The subject matter is essentially descriptive of actual operations and only so much theory is brought out as is of value in bringing about a clear understanding of the description of operations. The book is well illustrated and supplemented with drawings and tables and will be found as complete as the number of pages allotted to the subject will allow.

Anuario de Minería, Metalurgia, Electricidad y demas Industrias de España. By Adriano Contreras and Roman Oriol. The Revista Minera, Madrid, Spain. Book; pp. 1000. For sale by Mining World Co. \$2.

Translated, the title reads, "An Annual Directory of Mines, Metallurgy, Electricity and Commercial Chemistry in Spain." The book has been published annually for the past 20 years and contains a list of all mines, classified according to the metal mined and province in which the mine is located. Metallurgical, electrical and chemical societies, in Spain, with their capitol, address and administrative boards, are also classified, as are chemical and metallurgical plants. A directory of Spanish civil engineers is given and a classification of railroads of interest to mining is made. Fees of the laboratory of the School of Mines for examining and analyzing ore; custom-house duties and commercial treaties; official laws and arrangements referring to the metallurgical and mining industry; commercial arrangements by the government; Spanish industry according to class and provinces; useful and numerous commercial advertisements, etc., are included in the text of this book, which is confined to the country of Spain.

gotten up in a similar manner. The construction, operation, uses and featuring points of each is brought out in the separate texts. Tables and curves are also given of general use in hydraulic and pump designing and work.

Plant and Railroad Oil Storage Systems. S. F. Bowser & Co., Inc., Fort Wayne, Ind. Booklet; pp. 40; illustrated.

Many good-sized views, with brief descriptions, are shown of different departments of the company's plant. Self-measuring pumps and similar devices for drawing specific quantities from the tank by means of the pump only are illustrated and described and oil-filtration and complete storage houses are considered in a like way. In bringing out the use and applicability of the company's appliances views of practical installations are given in preference to lengthy descriptions and discussion.

Brick Making and Clay Working Machinery. The American Clay Machinery Co., Bucyrus, Ohio. Bulletin No. 96; pp. 242; illustrated.

It is often found in mine and plant work that the cost of a machine for making bricks plus the cost of making bricks is cheaper than purchasing the bricks and shipping them in. Such a machine is made by this company, besides a complete line of machinery for large plants. The bulletin describes most of the company's new line of machinery. Each different machine is illustrated, its particular uses noted in a description and followed by complete specifications of the machine in question. In most instances this information is contained in two pages. Cars, trucks, elevators, etc., are included in this line of clay working machinery.

Imperial Welding and Cutting Hand Book. Imperial Brass Mfg. Co., Chicago. Book; pp. 56; illustrated.

Though views and some information regarding the company's equipment are given, the book is not intended as a bulletin or catalog of the company's products. It is rather a complete text on correct welding and cutting practice with the oxy-acetylene torch. Many drawings and illustrations have been inserted to make the description clear. The principles and theory underlying the practice are brought out and descriptions of different outfits and operations accomplished with this system are dealt with. Special attention has been given to making the book of value to the inexperienced and all technical phraseology has been omitted. Many diagrams are also included showing the correct way of using the torch to accomplish different forms of cutting and welding.

Marcy Ball Mill. The Mine & Smelter Supply Co., Denver, Colo. Catalog; pp. 32; illustrated.

The mill, its construction, requirements, particular uses, accomplishments and advantages are taken up in the first pages. They recommend the mill first for 3 or ½-in. feed to 10-mesh direct. Second, for crushing the same feed to as low as 40-mesh and in this case using a hydraulic classifier for returning oversize. Third, in crushing to as low as 100-mesh when a mechanical classifier should be used or combination of the same with screens. In the concluding pages is an article by F. E. Marcy, "Notes on the Practice and Design of Wet-Crushing Ball Mills," which is confined to practical theory. Formulas are derived in the article and reproductions of curves given showing the work done by a Marcy mill and comparing the products from crushers, rolls and ball mills made by expending the same amount of energy.

INDUSTRIAL AND TRADE NOTES.

G. L. Simonds & Co., 230 South La Salle street, Chicago, announces that in the future the company will be known as the Vulcan Fuel Economy Co. The company's specialty is the Vulcan soot cleaner for water tube and tubular boilers.

P. H. Reardon has severed his connection with the General Machinery & Supply Co., San Francisco, having disposed of his interest to his associates. Joseph A. Buckley succeeds Mr. Reardon as president. A. L. Green is vice-president and H. F. Jurs manager.

TRADE PUBLICATIONS.

Centrifugal and Turbine Centrifugal Pumps. A. S. Cameron Steam Pump Works, New York. Bulletins Nos. 151, 152, 153, 154; pp. 52; illustrated.

Bulletin 151 is on the company's turbine centrifugal pump; No. 152, a single-suction volute pump; No. 153, a two-stage house pump; No. 154, a double-suction vertical pump, all being of centrifugal design. Each bulletin is

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Seward.

A. Clementua, manager of the land and industrial department, has given out the following official account of the government work in rebuilding the Alaska Northern railway, extending the line north from Seward.

The Alaskan Engineering Commission is now employing 525 men and 64 station men in the rejuvenation of the Alaska Northern railway, which was purchased by the Government. The work consists of rebuilding bridges, elimination of high trestles with fills, improvement in the alignment and some slight reduction in the grades. There will be a small reduction in the maximum grades on the 12-Mile and 45-Mile summits. Many of the fills have been widened and considerable ballasting has been done. Across Placer river in front of Spencer glacier, temporary trestles and fills have been made for a distance of over 3000 ft., which will be replaced next year by a permanent trestle raised 10 ft. above the present level of the track. New shear and division dams are being constructed so as to control the waters of the river and to prevent washouts which have been an annual occurrence since the road was constructed. Seventy-five thousand new ties have been laid, and it is contemplated that before the work is finally completed to Mile 71 over 200,000 ties will have been laid.

A machine shop has been built at Seward to replace the one which burned early last year, and all repairs are now being made in that shop.

The road is now in operation to Mile 64 from Seward and a freight train is operated over the line every Sunday and a passenger train on Mondays, Wednesdays and Saturdays. It is expected that the line will be opened and in operation to Kern Creek (Mile 71), the end of the track, by Oct. 20. Kern creek will be a distributing point for that part of the work on Turnagain Arm, which will be done from the Seward end, as well as for points along the Arm, and considerable increase in traffic is expected as soon as the line is completed to that point.

The work is under the supervision of R. J. Weir, engineer in charge, who before being employed by the Commission was a locating and construction engineer with the Southern Pacific railroad in California. He has also charge of the new construction work along Turnagain Arm between Kern and Glacier creek, a distance of 4 miles. This is all expensive rock work and it is estimated that it will cost approximately \$250,000. There are now several station gangs at work on this portion of the line. It is expected that it will be completed by spring when the work along Turnagain Arm will be prosecuted as fast as funds and material will permit.

Altogether contracts have been let at Seward to station men aggregating \$150,000 on work between Seward and Glacier creek, and in addition to that the monthly pay roll of the Alaskan Engineering Commission at Seward now amounts to between \$40,000 and \$50,000.

ARIZONA.

Hayden.

Plans for the construction of a \$500,000 mill, to re-treat the vast amount of tailings from the Ray Con. Copper Co.'s mill, are now being prepared. The new plant, which will be erected on the banks of the Gila close to the great tailings

dump, will have a daily capacity of 6000 tons, and will employ about 250 men. The tailings dump contains a large tonnage of copper, but in the form of an extremely low-grade material, the copper content being a fraction of 1%. The fact that even this waste material is to be recovered is another demonstration of the economical methods which the company is putting into operation in extracting the copper from the low-grade ores. News that a new mill giving employment to hundreds more men is to be erected at Hayden will be received jubilantly by residents of the smelter city and by the entire district, for while Hayden will in the main profit most from the erection of the new mill, it all means a greater district in the Pinals. Erection of the new re-treating plant at a cost of half a million dollars will give employment to hundreds of workmen, while the increased capacity of the Hayden smelter by fifty per cent means the coming of a greater Hayden.

Chloride.

F. E. Steffy, of Salt Lake, who has just completed a 150-ton reduction plant for the Arizona Butte Mines Co., on Stockton Hill, announced he will install a 500-ton custom mill here.

The Schuylkill has just installed a 90-hp. Western gas engine, a Sullivan 500-cu. ft. compressor, a drill sharpener, two pumps and an electric light plant.

The Distaff has been unwatered and development work begun after a shutdown of several years. The Hercules has also been unwatered and development work is about to begin.

After being closed down for a number of years the Silver Hill property, the oldest in the district, will be started up this week. A. W. Henning, of Los Angeles, is now in camp making necessary arrangements.

Work of unwatering and repairing the Molly-Gibson-Chloride shaft is being pushed. Hoisting machinery is now on the ground.

The Georgia Mining Co. has begun sinking. The next drifting will be done on the 300 level when that point is reached. Good ore has been found on the 100 level.

The Guggenheims have finished sampling the Payroll mine and it is rumored that they will take it over. Also that they will take over the North Georgia property adjoining. They are now unwatering and retimbering the old Elkhart mine here.

Specimen gold ore, an unusual thing in this camp, was found on the Gold Back property. There is much gold here, but it is usually closely associated with the lead and zinc.

A pack train of burros is being used to get a shipment of 250 tons from the Black Jack mine. This shipment is expected to go much higher than \$100 a ton. Ore contains gold, silver, lead, copper and zinc.

Senator Guggenheim, of Colorado, has had men sampling the Golden Hammer mine. Deal seems assured.

The mill of the Arizona-Butte is working perfectly. Samples of the concentrates taken from the bins show a value of 66% lead, \$45 gold and 12 ozs. silver. Splendid ore bodies are being opened up in the mine.

The Hidden Treasure has just completed installation of compressor and air drills; now running a 500-ft. tunnel through granite to open big vein at depth of 500 ft., with 300 ft. yet to drive.

The Keystone made rich find on 300 level, uncovering 8 ft. of high-grade ore. A mill is now being built.

Desert Power & Water Co., who is building a high-tension line into camp, is now within 12 miles of town. Over 200 houses are already wired and electricians busily engaged

in wiring more. Camp has doubled in population in past 60 days.

Rich copper ore has been found in the Weaver district by G. W. Lynch. The same deposit has been opened on adjoining claims by Richings and Southworth; ore runs high in copper and carries good gold content.

The Schenectady is installing a compressor. Boston investors are inspecting the property. Good ore is showing in the shaft.

Jerome.

Additional impetus has been given development work on the Venture Hill and Verde Apex properties since the owning companies entered into an expense sharing agreement and placed mining operations in charge of John S. Riley. The joint plans were drawn up with a view to opening at depth the deposit of native-copper-bearing ore that was recently encountered in the Venture Hill tunnel. This deposit is one of the most promising opened of late in the Jerome field. At a recent meeting of the Venture Hill in Prescott, Ed Shumate succeeded Boas Duncan as president of the company, and will in the future act jointly with John H. Robinson, secretary of the Verde Apex Co., in the financial management of both corporations.

Development of the Ewing and Hooker group is being pushed with two shifts. The group consists of six patented claims, has been held by the original locators (Ewing and Hooker), since 1894, and is surrounded by the Green Monster, Copper Chief and Copper Chief Extension companies. The group is crossed by one of the boldest outcrops in the Jerome field—an iron gossan showing copper at surface. It lies in the Upper Verde contact about 2 miles from Jerome. A tunnel has been driven on the Porous Iron claim of the group 285 ft., and will be continued to crosscut a ledge that lies about 20 ft. in advance of the present face and to a shaft that lies about 100 ft. ahead. This shaft shows ore carrying as high as 15% copper at a depth of 98 ft. Above that point sand carbonates were encountered that assayed \$90 gold. Ninety-four feet from the mouth of the tunnel a body of ore showing iron pyrites and chalcopyrite was encountered. This ore dipped out of the tunnel 49 ft. beyond the point where it was first found and for that distance gave a general average of 2% copper and \$4 gold per ton.

Three shifts are pushing the drift on the 1200 level of the Jerome Victor Extension toward the United Verde's line, and are making fast progress now that the company's water problem has been successfully solved. The objective is the extension in the Victor ground of the bodies of high-grade copper ore that have been followed in No. 3 United Verde workings, well toward Victor Extension boundaries. As the drift is advanced, copper indications are becoming more pronounced. The present showing encourages Supt. Salisbury to believe that copper ore in commercial tonnage will in due course be encountered.

Prescott.

Under the direction of M. N. Andrews a camp will be established on the Union group in the Chaparral country. This decision follows the purchase of the property last week from John S. Jones by D. M. Locey. St. Louis and Chicago capitalists are interested with Locey in the venture. The transfer involves approximately \$300,000 on the deferred payment plan. A substantial payment was made at the time of signing the contract and other payments are to be made on Nov. 15, Dec. 15 and Jan. 10. The contract likewise provides for yet other payments as the property is opened and developed. The work will be in charge of Andrews, who interested Locey in the project.

The customary carload shipment of copper ore went out late in September from the Pittsburg mine on Castle creek. It averaged 15% copper as well as zinc and gold contents. The dump holds a large tonnage of second-grade ore that could be profitably worked by establishing a concentrating plant at the mine.

Chloride.

The Keystone Con. Mining Co. is constructing a concentrating mill of the Fields flotation type, with an initial capacity of 100 tons. In mine development this week a rich ruby silver strike was made, sampling 226 ozs. silver and 1.41 ozs. gold.

CALIFORNIA.

Jackson.

Efforts to resume operations at the South Eureka mine brought the first clash between the striking miners and authorities last week. About 400 armed strikers surrounded the property, drove back deputies and strike breakers, and stopped pumping operations. Sheriff Lucot has asked for assistance from Governor Johnson, stating the situation is beyond his control. It is probable several companies of California militia will arrive here shortly. Most of the strikers are foreigners.

Large numbers of miners have left Amador districts for other fields, but some have returned with the declaration that companies at Grass Valley, Sonora and other camps refused them employment. Leading operators state that fully 1200 of the 1800 men on strike are prepared to return to work on the old scale of wages, and that fully 400 men have left the county since the trouble begun.

The Plymouth Con. is still operating at full capacity near Plymouth, and unwatering of the Old Eureka, at Sutter Creek, continues steadily. Pumpmen have walked out at the Central Eureka, and other companies are facing water problems. Events of the past week indicate the strike will be bitterly contested by both factions.

Marysville.

Arrangements are being made to start work at the Red Ravine and Elk mines in the Indian Ranch district. A patent will first be secured, and subsequently a large amount will be expended on equipment and developments. The group is largely owned by Otto Kipp of Milwaukee, Wis., and Otto Wulwebber of Sheboygan, Mich.

The Pacific Dredging Co. is rapidly transforming the old settlement of Parks Bar into one of the most animated dredging camps in California. Numerous buildings and residences are going up, and the new dredge will soon be ready for operations. Two more boats will be constructed next summer. The camp lies in the Yuba River field, between Marysville and Smartsville. The company continues to explore adjacent territory with drills and prospect pits. The new dredge will operate on territory adjoining the main holdings of the Yuba Con. Gold Fields. The company is controlled by the Yukon Gold Co.

Oroville.

So satisfactory has preliminary redredging of old tailings in this district been that the Natomas Con. has arranged to place another dredge in operation. The ground being reworked was the first to be successfully dredged in California, and the work proves that the old boats failed to clean the bedrock thoroughly and that considerable gold escaped the buckets. It is likely that other companies will arrange to redredge their holdings, as the profitable character of the work has been established.

Pike City.

The owners of the Alaska quartz mine have completed arrangements for the driving of a main working and drainage tunnel. It will be about 6000 ft. long and is expected to intersect the vein system about 600 ft. below the bottom of the shaft. Water has seriously handicapped operations in the Alaska since the shaft gained fair depth, and the tunnel is expected to facilitate this trouble and facilitate economical operations. Eastern people are largely interested. General W. S. Schuyler is president.

Spenceville.

The Spenceville copper mine has been acquired by the Navajo Copper Co. and preparations have been made for work. A good tonnage of excellent ore is exposed and the small smelter will be enlarged and improved. The ore carries some gold. Sinking of the shaft will be started soon and exploration of new ground prosecuted.

Copper Creek.

It is stated here that Manager Elzie of the Valley View Mining Co. is now in San Francisco on business in connection with the raising of funds to develop this property by driving a tunnel at the foot of the mountain.

Miller and Bowen are developing their claims, especially

the Backbone, late assays of which gave 14% copper and \$8.40 gold. They have just reached the hanging wall in a crosscut and may sink on the ore shoot.

On the Copper Gold group, two new ore shoots have lately been opened on the surface, showing strong veins and ore carrying copper and gold. These veins are the same as Miller and Bowen are now developing to the north of this group.

Railroad surveyors are camped within a mile of here and have run their line on the side of the mountain crossing the Copper Gold group and Miller and Bowen ground, all on the east side of the range.

This road connects with the Southern Pacific and Western Pacific roads near Gerlach, Nev.; runs north through Surprise valley to Cedarville and Lake City; then climbs the range on the east side and by a tunnel $1\frac{1}{4}$ miles reaches the west side under Fandango pass; thence down Fandango valley and into Goose Lake valley, passing the foot of the mountain, where High Grade is situated; thence on to Lakeview, Ore., where it will have connections with the Hill and Harri-man lines now under construction. This information is from apparently a very reliable source. This road will assist very materially in opening up this mining section and that of High Grade, which is now much handicapped by the extortionate rates.

Forest.

What is believed to be the north extension of the Bald Mountain channel has been intersected in the Bald Mountain Extension. The discovery was made in the Rock Creek tunnel. W. F. Copeland is manager.

Quincy.

The Buckeye-Belmont Co., of Tonopah, has secured control of the Empire Plumas placer mine and is preparing to work it in conjunction with its Chippis Creek Con. group. The channel is about 400 ft. wide and 20 to 40 ft. thick. The tunnel will be enlarged, additional sluices installed, and operations prosecuted on a broad scale. Abundant water is assured.

C. W. Becker and Walter Robinson of Toll Gate have installed some equipment on their placer claims near Hartman's bar, on the middle fork of Feather river. Prospecting will be carried on by the diving system, and it is possible a suction dredge may be installed.

Grass Valley.

A complete pumping and hoisting plant, together with a compressor and machine drills, have arrived at the California mine, about 4 miles below town. Machinery will be installed at once and unwatering of the shaft rushed. The property lies in the Deadman Flat district, and was recently acquired by eastern capitalists headed by King C. Gillette.

Sawyers Bar.

A strong quartz vein which is believed to be the source of the rich placer deposits of this vicinity has been uncovered in the Burro creek Specimen creek section by Holmes and Puttman. The ore body is said to be large and shows much rich quartz. The discovery has stimulated prospecting at several points.

Sutter Creek.

An examination of the Rose mine has been completed by San Francisco engineers and it is reported a deal for the property is pending. The Rose, often known as the Poundstone, has been developed by two shafts and extensive lateral workings, and has yielded much good ore. It is equipped with a 20-stamp mill and excellent mine plant.

The W. J. Loring Co. is busily engaged in reopening the Hardenberg. A new cable has been placed in the shaft and unwatering and retimbering of the shaft is to be pressed energetically. The property is provided with a 20-stamp mill and modern mine equipment and lies in a noted district.

Big Pine.

The Bunker Hill mine, located across the White mountains from Big Pine, has been sold to a group of Whittier people by Arthur Perry. The ore is chiefly valuable for its silver and lead, but considerable high-grade zinc occurs. A large tonnage is exposed underground and the ore on the dumps is estimated to be worth from \$70,000 to \$100,000. Caterpillar engines will be used to move the ore to the Saline Valley tramway, from which point it will be delivered to the

railroad. The tramline is 1800 ft. long and has a vertical drop of 600 ft. It is planned to start heavy shipments immediately. First payment on the purchase price has been made.

COLORADO.

Colorado Springs.

With a surplus in its treasury of \$60,500, which sum is being increased at the rate of \$10,000 monthly, affairs of the Isabella Mines Co. are in an exceptionally good condition, according to announcements made after a meeting of the board of directors. The company's mill is running smoothly and the first clean-up is expected next week. Within a few days the new ore house will be completed, and it is believed that with the mill running capacity good profits will be realized by the company.

The directors of the Mary McKinney Mining Co. have declared a dividend of 1 cent a share, payable Oct. 26, to stockholders of record the 16th. This is the first dividend to be paid by that company since July 25, 1914.

Returns have been received by Alex. Hickman & Co. on the last 2 carload shipments from the Shoo Fly mine on the southwestern slope of Womack hill. Both carloads were of mixed ores, coarse quartz and screenings and brought settlement at close to the same figure. One car of 25 tons was settled for at \$49.60 a ton, and the second brought \$48.80. The second car contained a little better than 26 tons.

Rico.

In the Smuggler drift at the Syndicate mine, some fine lead-zinc-silver ore is being taken out by the Rico Mining Co. Assays run as high as 400 ozs. of silver. The stuff will average close to \$300 per ton. About 4 tons are already sacked, and the vein is showing up strong.

Idaho Springs.

F. B. Hall of New York has taken over the Silver Horn group of 9 claims, situate up Ute creek, owned by L. McLean. The property has about \$20,000 of development work, a 900-ft. tunnel having been driven through the center so that all the claims could be worked from it, and has produced more than \$10,000 in doing the development. It is the intention of Hall to install a new plant of machinery on the property and inaugurate development and thoroughly prospect the property.

Breckenridge.

The two dredging companies sent in three lots of gold to the Denver mint last week valued at \$25,000.

The Wellington Mines Co. paid this month its 12th dividend. This one was for \$200,000, making a total of \$600,000 paid during 1916. The principal product of the company is zinc blende; both crude ore and concentrates are also produced. The two concentration mills on the property are kept running full time on ore from the mine, which is situated on Mineral hill, about $2\frac{1}{2}$ miles easterly from Breckenridge, more than one hundred 25-ton carloads of ore and concentrates were shipped from the property during September. In addition to the usual mine development, the company has started a prospecting shaft on the "fraction" near the west end line of the property. The shaft is now down about 40 ft. and a hoist is being placed on the new shaft. R. M. Henderson is the general manager of the property and Charles Altland, the superintendent.

Telluride.

The Matternhorn management is working a double shift through the lower level of the Butterfly drifting into their veins which lie to the south of the Butterfly property. As the tunnel is not equipped with power, hand work is being done.

Frank Ensign has this fall opened up a big lead of lead ore on a property that he and others own on Mt. Wilson and which he is working at this time. It is one of the few big leads on Wilson. There is said to be about 10 ins. of solid lead.

It is given out that the Standard Chemical Co. will soon begin active work on its properties in the Paradox Valley, and that the company will concentrate the mine product and haul by wagon to Placerville, thence ship east by freight.

IDAHO.

Wallace.

The development of the Vienna-International, situated on Placer creek, about 6 miles from here, is progressing satisfactorily, and unless all signs fail the Vienna-International will prove to be an important lead producer and mark the beginning of greater mining activity in a section that has to a great extent been ignored by capital seeking investment in mines. The property is under bond to F. C. Bailey, of Spokane. The main development consists of two tunnels, the upper, or No. 2, having been driven 635 ft. and intersects both the Vienna and International veins. Drifts have been run east and west on the last named, exposing considerable ore of milling grade. No. 3 tunnel is 90 ft. below No. 2. This has been driven 334 ft. to the Vienna vein, disclosing a good showing of lead-silver ore. From the face a raise has been made to No. 2, all in ore. Drifts east and west have also been run for about 50 ft., showing from 3 to 5 ft. of good milling ore. A shaft has been sunk from this tunnel to a depth of 120 ft. and the vein crosscut showing it to be 25 ft. wide, 3 ft. of which is ore of fair grade and the balance of the ledge strongly mineralized. A drift is now being run west from the bottom of the shaft and the character of the ore is rapidly improving.

Negotiations are pending for the purchase of the holdings of the Portland Mining Co., consisting of the Sitting Bull, Silver Tip, Mule Deer and Red Dragon claims, in the Beaver creek district, by the Sunshine Mining Co., which also is endeavoring to secure the Parrot claim. The Sunshine group consists of 6 claims lying west of the Idora and extending to Beaver creek near the Idora mill. The Sunshine company also holds the Toughnut under bond, which lies to the north and joins the Tuscumbia on the west, and the new company now in process of formation will have holdings extending from the Sunset mine to Beaver creek, with one link missing in the chain, the Tuscumbia. Efforts were made to bring the Tuscumbia into the consolidation, but without success. It is understood that the organization of the new company will soon be completed, when plans for development on a large scale will begin. Some ore has been exposed in the upper tunnel of the Sunshine, but the main development is the tunnel started near Beaver creek, which will cut the Idora vein at a depth of probably 1200 ft. It is expected that this tunnel will cut the vein within the next 40 or 50 ft. This vein is about 400 ft. south of the Toughnut vein, to which a crosscut will no doubt eventually be run from the Sunshine tunnel. A compressor has been ordered by the Sunshine. The foundation is in readiness and the Montana Power line is being extended to the plant. The following officers and directors were elected by the Sunshine Co.: David C. Smith of Missoula, Mont., president; D. L. McGrath of Wallace, Ida., vice-president and manager; Dr. E. G. Ellis of Missoula, treasurer; G. W. Dougherty of Wallace, secretary. These with E. R. Day and James R. McGrath of Wallace and Mrs. Matilda Ellis of Missoula compose the directorate.

Adair.

The Richmond Mining Co., of which Martin Woldson, president of the Spokane Scandinavian-American bank, is president; Charles Heidenreich secretary and general manager, and T. W. McGowan, a Spokane hardware dealer, is treasurer, is now operating the Richmond mine, near here, at a profit, according to Henry M. Lancaster, mining engineer, who states that 6 cars of crude ore were shipped in September. Extensive development had revealed an immense shoot, but the owners were not aware that much of it, regarded as too low grade to mine profitably, was really shipping product, carrying average values of 7.5% copper, more than \$2.50 in gold and a tenth of an ounce of silver, until Lancaster made exhaustive samplings of the body. "More than \$500,000 worth of ore is blocked out above the first level at a depth of about 100 ft.," said Lancaster. "It lies in a shoot having a length of 372 ft. and an average width of 7 ft. Probably as much ore lies above the tunnel level, 260 ft. below. A connection between the tunnel and the shaft will have been made in 30 days, when shipments may be made to Adair, 3 miles distant,

at half the cost for cartage, now \$3 a ton, to Saltese, Mont. We have six 4-horse teams hauling and have contracted for five more. In a few days we will be shipping at the rate of a carload a day. The cost of mining transportation and treatment at Greenwood is about \$15 a ton. The property has been opened by 351 ft. of shaft in three places, 1576 ft. of drifts, 819 ft. of crosscuts and 96 ft. of raises. It is the best little copper mine I know of that has not been shipping."

Burke.

Since building a wagon road and installing a compressor at old Union tunnel the Sherman Development Co. has been engaged in enlarging and straightening the tunnel to permit using a horse in handling the ore cars. This tunnel is 1800 ft. in length and has many curves. This work has been accomplished and the old drift is now going forward. It is 1500 ft. from the face to a point under the ore shoot opened in a crosscut from the Oreano and 500 ft. below, giving a total distance from the surface of 950 ft. Another tunnel was run by the former owners of the Union 500 ft. below, known as the Hidden Treasure, and which will probably be utilized eventually as the main outlet for the mine.

LAKE SUPERIOR.

COPPER.**Houghton.**

Carp Lake is sinking the winze of the old workings. Sinking is also being carried on at shaft No. 16, located a mile west in the same part of the lode. Richard T. Looney of Houghton, who controls the options, with H. T. McKean of Cleveland, president of the Cleveland Paper Co., E. S. Hough of Chicago, manager of the American Cross-Arm Co., and E. C. Jones of Appleton, Wis., who is a large land holder in Ontonagon county, recently visited the mine and inspected its workings.

Franklin during the week ending the 7th averaged 1000 tons daily, consequently its profits will be greater than those of last month, which were about \$30,000. Its yield is now between 13 and 15 lbs. The management is figuring on compounding the stamps and equipping the mill with regrinding machines.

Cherokee, which now has about 110 ft. of heavy copper in its shaft, has been a great and agreeable surprise. The disclosure is so remarkably consistent in its high grades as to give great promise for the lode both on the strike and dip.

Keeweenaw's delay has been in the completion of its rock-house, as carpenters are scarce; but the rope was changed over on to the new shieve wheel the 10th, some hoisting was done the next day, and some rock shipped to the mill the 14th. All three of the lower levels are now in the foot-wall side of the Ashbed lode; the 10th has been proceeding in very good ground ever since it reached that side; the 12th is now in a narrow fault or crossing in broken ground and is almost through it; and the 14th is only just coming in. The latter milled all the rock in the bins the 4th and has been waiting on the rockhouse.

South Lake is maintaining the daily production of 150 tons and will soon raise this figure. The Butler lode is looking better than ever and is now in a particularly rich stretch in the southwestern drift. A rich shoot has been entered for some distance on North Lode No. 1. A recently made survey gives the distance from where the drills are now working on south lode No. 3 to the drift on the same lode at the Lake, along which work is being carried to connect the two mines for ventilation, to be about 800 ft.

Adventure is laying the stringers for the track at No. 3 shaft and will begin to bail out the water and explore the mine's third level, which is the first here. The work will proceed quite fast from now on.

Lake will soon be able to run its hoist and then the work of examining the old workings for deciding on the plan for resuming the exploration can soon be completed.

Ahmeek is doing better than last month and will be able with the 20 cars that are coming from the La Salle weekly to

operate the 7th stamp about 4 days a week. The 8th stamp is practically installed and all the wash is ready with the exception of the jigs, which have not yet come from the Calumet & Hecla shops.

New Arcadian will be in 10 days down to the 1500 level at No. 1 shaft, and will immediately start the 150-ft. crosscut to the New Arcadian lode. The rockhouse at this shaft will require about 25 days more work.

New Baltic is putting up the building for the engine, compressor and boiler, and it will be ready with the machinery by the time the shaft pit is down to the rock; a depth of 25 ft. has been reached so far.

Hancock is increasing its tonnage, both at its own shaft, No. 2, and at Quincy No. 7, the former shipping about 650 tons daily.

Calumet & Hecla has a daily output of 9900 tons. The total tonnage for September for the whole district was less than that of August, as there was one working day less, though the daily rate was slightly higher. The tonnage for October will be a little higher than that of September, as there is a higher daily rate, though the number of working days is the same.

Calumet & Hecla is cutting out at the Red Jacket shaft a large sump or basin about 950 ft., vertically, measuring, from the surface, so as to catch the water that seeps down through the rock. This work will effect some saving and shows how carefully in this whole district every reasonable effort possible is being made to lower the costs. At this shaft and at the others of the Calumet conglomerate, there are fewer changes in the men than at any other point in the district, but even here a few more could be taken on. As a whole the district is in better condition as to the number of men than for some time past, and the mines that are expanding their work are having more success in getting the additional men needed.

Copper Range is shipping about 3200 tons daily from the Champion, 1300 from the Baltic, and 1200 from the Trimountain. The Trimountain is at the lower levels showing some improvement in the grades of copper.

La Salle is being entered from the 42d level at the Osceola where the ground is much better than in the rest of the present workings at that mine, and it is understood that the same grades are being met with.

Houghton copper is finding, north of the shaft, some fair copper on the 4th level, which was recently opened on the Superior lode. The northern drift at the bottom of the winze, the 12th level, is continuing in good ground but the drifts on the west vein at the same level are meeting with copper only occasionally. The stoping on the 6th level is in good rock and is aiding somewhat towards the expense of the present operations.

IRON.

Ashland.

The Grant & Smith Construction Co. has been awarded the contract to build the third ore dock for the North-Western road here. The road, in making provision for the increase of its ore dock facilities at Ashland, appropriated \$2,000,000 for the purpose, and while the contract figures have not been given out, it is expected that they will be found somewhere in that vicinity. Twenty-seven cars of piling have already arrived at the site of the proposed new dock, and work on the new structure, which is to be rushed, will begin next week.

Duluth.

There are some sales of ore, small lots, at an advance of 50 cts. a ton over prices fixed at the beginning of the year, this for immediate deliveries. Next season, iron ore miners should have at least \$1 per ton over prices received during 1916. The ore producers have made a record shipment, but profits have been very low. Based on what the manufactured end of the steel trade has received prices were beggarly. Steel is still booming, another advance in prices having just been made. Pig iron is also up another notch. If Hughes is elected we expect a great business in iron ore next year. If he isn't then we look for a great slacking up

immediately after the war ends, because in these events we will have free steel coming to us in great quantities and at low prices compared with what we are now receiving for it.

The Florence mine, of the Florence Iron Mining Co., located at Florence, Wis., has closed for the season. Other properties of this company are still in operation at that point. The company had trouble securing boats to take the ore to lower lake ports, and has some ore in stock that will have to be carried over until next season. Freight rates are too high to warrant sending the ore down at this time. The men who worked at the Florence will be given places at other properties of the company.

The mark set for ore shipments from the Lake Superior region to the eastern furnaces this navigation season were 60,000,000 tons, away ahead of any former year, but the belief is growing that it will be much closer to 65,000,000 tons. Never has there been such a demand for iron ore. All furnaces want supplies from Lake Superior, and the mines on the Michigan and Minnesota ranges are endeavoring to meet the want. Ore has been sold to the Atlantic coast furnaces for delivery next spring and it is understood that still further demands from these furnaces are to be met before long, as negotiations are under way for more contracts. The demand from the Atlantic coast is something unusual, for they generally depend upon Cuban, Chilean, New York and Pennsylvania mines for their supplies. Next spring will see the beginning of heavy shipments from this part of the world to the coast. So far as the interior furnaces are concerned, the demand has been getting heavier and heavier as the season has advanced. Stock-piles on the docks at Lake Erie ports have been wiped out. Ore that has been piled up there for years is gone and next spring will see a start with cleaned docks, scarcely anything left in the stock-piles at the furnaces, and with a bigger demand for shipments from there than even this year has enjoyed.

Marquette.

The Cleveland-Cliffs Iron Co. has sold the old Carp River furnace to the Lake Shore Engine Works. The purchase was made for the amount of cast iron it contains. The plant was originally sold to the Cleveland-Cliffs Iron Co. by Charles Schaffer. There are several reasons why the furnace has not been operated for several years past, one being that it has so depreciated in latter years that it would have been necessary to practically reconstruct the plant in order to use it, and another that there was never a chemical plant in connection with the furnace.

The Hoose & Person Construction Co. is employing about 40 men on the stripping contract at the Munro mine, Dickinson county. A considerable territory has been stripped, but the company will not finish the work this fall. The Munro Mining Co. is hopeful of making a considerable shipment of ore to the docks before the close of navigation. A new shaft house is in course of erection and the plant of machinery, including the crusher, is now being overhauled. One of the Hoose & Person Co. steam shovels will be employed in the mining operations. Manager Woodworth is desirous of sending 30,000 tons of ore to the docks, if possible.

Iron Mountain.

The new electrical generating plant at the hoist on Dead river is now turning out 900 kw. of power for the Cleveland-Cliffs Iron Co., and within 10 days it is expected to reach its maximum development of 1000 kw., or approximately 1300 hp. The plant first began the generation of electricity some 10 days ago, and it has been gradually tuned up under direction of O. D. McClure of Ishpeming, the company's mechanical superintendent, until its capacity is now nearly approached. The installation was made under Mr. McClure's direction, the company doing all the work on the plant without resort to contracts. The old dam used in lumbering operations was found in good condition and was utilized in the project with only minor changes. The power house is located 600 ft. below the dam, but in this 600 ft. the water has a fall of 100 ft. For 250 ft. the water is carried in a tunnel, 8 by 8 ft., through solid rock. At the point where it leaves the tunnel it is received by a penstock, 9 ft. in diameter and 250 ft. in length, which carries it to the water wheel.

MISSOURI-KANSAS.

Joplin, Mo.

This week saw another advance in the price of both lead and zinc ores, a feature which distinctly marked the passing of a pessimistic feeling which has existed in the field for some time. Zinc ores brought as high as \$70 for 60% grades, and lead ore reached a maximum of \$80 for 80% grades. At these prices heavy sales were made, and marked depletion of stocks was again noted in practically every camp in the field.

There is a promise of rain which if continued will bring the long needed surface water for the west Joplin group of mines, which depend upon this source for milling ores. Several of this group of mines have tried operations since last week, but met with indifferent success due to the inadequate water supply. While other camps are suffering to a certain extent for the same reason, none have had the extreme limitations forced upon them as have the West Joplin group.

This week notes a decided increase in production, however, in camps at favored points of vantage. There has been sufficient increase in production under the stimulus of better prices to bring the output up to a point between 5000 and 6000 tons weekly.

In addition the resumption of activities of producing character, there is also noted a desire on the part of investors to seek entrance into the field. A number of properties are being examined and there are some prospects of sales being consummated before the winter season sets in.

The St. Paul Mining Co. has undertaken a drill prospecting campaign on a portion of its tract at Granby, operations now being conducted by the Granby Mining & Smelting Co. on the south end of the camp. A drill hole was put down to a depth of 237 ft. and struck ore at 221 ft. with cuttings being found down to 237 ft. This gives a 16-ft. face of zinc blende ore which runs in the neighborhood of 5 to 6%. The St. Paul Co. expects to put down a number of other holes in the development of its Granby property.

The Lucky Star Mining Co., which has a lease on a 40-tract south of Joplin, has opened up a rich run of ore in two shafts, and is now making a good production over hand jigs. The property occurs in soft ground, and ore of a very high grade is being marketed. Last week's ore sales assayed 53%. W. S. McDonald of Joplin is general manager of the property.

Operating under the name of the Big Sandy Mining Co., a group of Joplin men are taking out ore on a new lease of the Gregg land at Tanyard Hollow, southwest of Joplin. In 3 weeks the company put down a shaft to a depth of 35 ft., opened up ore on the 27-ft. level and is still sinking through ore. Those interested are A. J. Poyner, W. E. Jones, O. K. Williams, Chas. Ashley, Bert Lake, B. Roller, and O. Smith.

Preparations are being made for the erection of a new mill on the S. R. & S. Mining Co.'s lease west of Joplin. The ore occurs in soft-ground formation at a depth of 140 ft., and there is a report of considerable ground having been cut at this level. The company has been treating its ores over a custom mill and obtained from 5 to 6% recovery. Those interested in the mine are Homer Seals, Henry Rader, and Homer P. Sewall, all of Joplin. It is expected that a contract will be let on this mill some time this week.

Operating on a 10-acre lease of the Missouri Lead & Zinc Co.'s tract, the Yellowstone Mining Co. has opened up a very rich property and has been turning out from 1 to 2 cars of zinc blende per week. The company is now contemplating erecting a 150-ton mill. Operations have opened up two drifts at the 110-ft. level, which showed a face of ore 50 ft. wide and 25 ft. high. The ore is milling out 17 to 20%. In addition to this developed ore, drill prospecting has showed the occurrence of a lead ore deposit at the 60-ft. level. Those interested in the property are Rob. Kittrell, H. M. Ramsey and John Jarrett, all of Joplin.

A 300-ton mill of the Adirondack Mining Co. on the City of Joplin land is rapidly nearing completion. The mill will be modern and equipped with gas engines. W. H. Roberts of

Joplin is manager and J. H. Gayley, formerly of Pittsburgh, who is now at Carthage, represents eastern investors. Mining is being conducted at the 200-ft. level.

Goodman & Co. have made a rich strike of ore at the 50-ft. level on a 20-acre lease of the Mattes Bros. land west of Joplin. The ore face developed is 6 ft. high and the dirt so far taken out is believed to run from 15 to 25%.

Galena, Kan.

An interesting mining venture in the Galena camp is that being undertaken by a company consisting of C. J. Rhodes of Joplin, E. Davenport of Kansas City, W. H. Pease of Joplin, and Edward Ryan of Galena. They are attempting to re-handle all of the mine sands and gravel which have been washing down stream from the mines at Central City, Galena, and North Empire, which have accumulated along the sand bars just before the stream empties into Spring river. Assays of sand and gravel show values ranging from 2 to 20% zinc and some lead. The company is undertaking the erection of a barge upon which will be placed Diesel engines and sand pumps, which will pump the sands and gravel to a sludge mill erected on the bank of the stream. This will be the first of what might be termed placer or hydraulic mining of zinc ores in the Joplin field.

The Charter Oak Mining Co., operating a lease in Galena Heights, has opened its ground sufficiently to warrant the building of a concentrating plant. The company has been cleaning its ores over hand jigs for several months. The concentrates will run 63% zinc, but the owners believe that with the operation of a mill a much larger tonnage of ore can be treated and profits correspondingly increased.

On a 40-acre tract of the Hurlbut land at Lawton, the Acme Mining Co. is opening up a prospect which promises to become as large a producer as any of the mines so far developed in that camp. Fifteen drill holes have been put down, and some of the cuttings range as high as 10% zinc. A shaft has been put down to the 120 level and the company has been taking out ore and cleaning it over hand jigs. The company expects to build a 200-ton mill and at present are putting down two shafts in order to thoroughly open up the lease.

MONTANA.

Butte.

From present indications stockholders will receive a dividend before the close of the year from the East Butte. The company has recently shipped 44 cars of copper, which are due in New York within the next few days. Upon payment for the shipment, which was sold payable in 60 days, the company will have cash on hand of over \$1,500,000. Just how large a surplus the directors will consider necessary before considering dividend payments is not known, but it seems that the company will soon have an ample amount for its needs. The production for September showed a slight falling off from that of the previous month, but the production for the 9 months of the present year amounted to 13,803,000 lbs., the largest total on record for this period. On its present production, which is at the rate of nearly 21,000,000 lbs. a year, the company is earning, on 25-ct. copper, from \$6 to \$7 a year on its 410,000 shares.

Articles of incorporation have been filed by the Richmond Flats Gold Mining Co. The property is located near Norris and the company office will be in Butte. Directors are: W. A. Reel, J. W. Stiver and W. W. Lamb of Norris, and W. C. Sider and Fred J. Furman of Butte. The capital stock is \$500,000.

Dillon.

Oil operations in the Big Muddy in Sheep creek basin are now going on without interruption and at present the drill is down 700 ft. According to reports from that section the indications for oil were never better and the promoters are very enthusiastic over the outlook. During the past few weeks the oil fields have been visited by several experts.

Hamilton.

The Duluth capitalists who have been associated with James B. Stevens in the Lent mine in the Mineral Hill dis-

trict, have decided to build a 40-ton concentrator near Alta, for the purpose of reducing the copper-silver ores for shipment. There are thousands of tons of this ore on the dump and in the mine and it will be hauled by motor trucks. The high price of metal, together with motor trucks, have solved the problem of operating the mine at a profit. The Duluth men who are associated with Stevens are I. Freinuth, J. B. Sadler and Thomas Klorin.

NEVADA.

Midas.

A new road has been completed from the Lucky Boy mine to the Elko Prince mill, and ore shipments will start shortly. The main vein ranges from 8 to 24 ins. wide and averages around \$30. The 150-ft. shaft is to be deepened to 300 and a crosscut extended to open the Grizzly claim. Eastern people are reported to be negotiating for an interest in the property, which is controlled by R. T. Noble and C. A. Stone.

The Rex mill is running on ore from the Queen mine. Three teams are hauling ore of which there is sufficient for a long run of the plant. Some rich quartz has been extracted recently, and the main ore body continues to show strength.

Bullion to the value of \$90,000 is shipped monthly from the Elko Prince. The June Belle vein is yielding ore of excellent grade, and the company is preparing for more extensive operations on the ledge. Lessees are mining good ore at several points.

Jarbridge.

The Sloss interests of San Francisco, represented locally by George Shoupe, are operating the Long Hike, Starlight, Alpha, and O. K. mines in Bourne gulch. An option has also been taken on the Jarbridge Central group of 9 claims. The Alpha mill is running on good grade ore from the O. K. The Long Hike is apparently developing into a big producer, with the veins persistent and of pronounced strength. A large tonnage of profitable ore has been blocked out and it is reported a large mill will be erected next summer. Rich ore has been intersected in the Starlight, and is thought to be an extension of the Long Hike ledge.

The Bluster Con. and Success mines are being developed by a main tunnel which is planned to open the ore deposits to a depth of 600 ft. The Bluster vein has been opened to a depth of 250 ft. by a crosscut and shows much ore of good milling grade. The company owns an excellent water right and plans building an electric power plant next year. Options have been taken on the Pick & Shovel, Flaxie, and Legitimate properties. All these mines have produced good ore and promise well.

Berlin.

The Alexander group, 6 miles south of Berlin, has been acquired by W. J. Webster and associates. The old mill has been remodeled, and cyaniding and leaching equipment is being installed. The old dumps are said to contain 100,000 tons of ore assaying \$15 to \$25, consisting largely of silver. Plans have been made for extensive work underground.

Round Mountain.

Hydraulic mining ceased several weeks ago at the Round Mountain property, but the management is still maintaining a reduced output by means of scrapers. The richer gravel is scraped into wagons and dumped into the sluices that are still supplied with a fair amount of water. The material is yielding \$2.50 in gold gross. Sluices and flumes are being placed in shape for resumption of extensive hydraulicking as soon as water is available.

Goldfield.

The Silver Pick Co. has moved the Calyx drill to a point westerly of the last hole bored and is again prospecting a wide area of virgin ground. At a point 450 ft. west of the main shaft the drill penetrated three distinct veins, and these will be opened by drifts from the shaft, which is now close to the 1000-ft. point. Exploration of the shale-latite contact and alaskite-shale zone will begin at an early date.

The Atlanta Co. has started a drift near the center of the

Consolidated vein, recently penetrated by the crosscut from the 1750 level. The ledge at this point is 60 ft. wide and gives low assays in gold and copper. The drift is designed to pick up a rich shoot formerly worked near the 1500 level, while making connections between the Atlanta and Grizzly Bear mines.

Tonopah.

The West End Co. has declared a 5-ct. dividend, payable Oct. 24. It amounts to \$89,545, and makes a total of \$625,970 distributed to stockholders. Retimbering of the old Ohio shaft is proceeding rapidly, and sinking will be resumed at an early date. Most of the ore from the main West End mine is drawn from the 300 and 400 levels. Considerable ore is also coming from the ground disputed by the Jim Butler Co.

Dayton.

A Salt Lake syndicate, consisting of G. T. Hansen, Col. J. F. Cowan, B. Binnard, John Pingree and others, is undertaking the treatment of about 400,000 tons of mill tailings at Dayton, to recover gold, silver and mercury contents. These tailings were deposited by the Virginia City mills 25 to 35 years ago. By long exposure they have become thoroughly oxidized, and will be treated by cyanidation. It is stated that they have a gross value of \$8 per ton, based on present metal prices, the silver content being the most valuable. The quick-silver, originally lost in the amalgamation processes, is to be recovered by mechanical means.

Fairview.

Nevada-Rand Mines Co. has been organized to develop and operate a property, located and partly developed by miners, and situated 30 miles from Nevada Hills, and 15 miles east of Nolan station. Chas. Huber, Tonopah, is president; Chas. Kogel is vice-president and superintendent; C. R. Murdock, Reno, is secretary and consulting engineer. The holdings contain a fissure, in andesite, rhyolite and dacite. The ore produced thus far was rich enough in silver and gold to bear sacking and shipping. Considerable development has been done through shafts from the surface to a depth of 250 ft., showing a vein 30 to 40 ft. wide. At this depth the ore is oxidized, but the plan is to sink 200 ft. deeper to get into sulphide ores. A mill in that locality may be leased to treat the oxidized ores by cyanide. It is claimed the mill ore will average over \$10. The Queen Regent Merger Mines Co. and the Gold Pen Mining Co. are developing and operating on the same ore belt. All these properties have produced close to \$150,000.

Good Springs.

Ingomar mine, situated 22 miles from Good Springs, and 16 miles from Roach station, controlled by S. S. Arentz and W. A. Perkins of Salt Lake, is producing zinc carbonate and lead sulphide ores. The last three shipments of zinc ore, to Bartlesville, sampled 43%. A car of lead ore, sent to Salt Lake smelter, ran 70.8%. The analysis of the zinc ore was as follows: Zinc, 44.22%; lead, 2.8%; iron, 1.6%; silver, 0.5 ozs.; insolubles, 9%. That of the lead ore was: Lead, 70.8%; zinc, 6.8%; sulphur, 9.6%; silver, 2.65 ozs.; iron, 0.6%; insoluble, 1.8%. A quantity of mixed lead-zinc ore has accumulated, which will be separated by hand jigging. The ore is conveyed by gravity from the mine to the loading bins, a distance of 1100 ft., through a metal chute, 11 ins. diameter, placed at an incline of 30°. The ore occurs in two fissures in limestone, 200 ft. apart. Most of the development is confined to one fissure. The mine is opened by an adit level on the vein, with much stoping ground above it. It is possible to get an additional depth of 1000 ft. on the vein by driving another adit from a point farther down the hill.

NEW MEXICO.

Mogollon.

At the Pacific mine the past week a 3½-ft. vein was cut on 600 level and it will be developed both north and south. Headframe and loading bins for the wire rope tramway are about completed.

The new 3-compartment shaft of Mogollon Mines Co. has reached a depth of 950 ft. Ore pockets and sump are being cut and development will be started from both the 800 and

900 levels. This mine has been producing steadily for a number of years, and from a block of ground 2000 ft. long by 700 in height has yielded upwards of \$6,000,000 in gold and silver. This new development will open up virgin ground and will undoubtedly add large ore reserves to the property.

The Socorro Mining & Milling Co. has eliminated concentrating tables in mill and will turn all the product into bullion. The change has effected an increased saving of values. The plant treats about 230 tons of ore daily.

OREGON.

Sumpter.

Active mining operations will be resumed at the Cougar mine, near here, in the next 30 days, according to C. C. Robbins, secretary-treasurer of the United Gold Mining Co., a Spokane corporation, which recently purchased the property from the former owners, among them John Larkin of Spokane, who is heavily interested in the new concern. The old mill is being remodeled and equipped with modern machinery, and a 2½-mile pipe line is being installed to provide water for power and milling purposes. As soon as these betterments are completed production will begin. "The former operators of the property did not make a success because the concentrating system employed was not suited to the ore," said Robbins. "We have had exhaustive tests of different treatments made, and we have discovered that a satisfactory recovery is possible by finer grinding before cyanidization. The former management used cyanide, but did not reduce the ore to sufficiently small mesh to get the desired results. The plant has a capacity of 125 tons, provided by two 5 by 8-ft. tube mills and five 20-ft. cyanide tanks, but this can be expanded to 250 tons by the addition of tube mills and tanks. About \$150,000 had been expended on development and improvement up to the time we bought the property. About 5000 ft. of work had been done on the ledge, blocking out 100,000 tons of ore having a value of more than \$1,000,000. The engineer who supplied these figures took 176 samples and in measuring the total value he eliminated all assay returns above \$20. It has been estimated that 34,000 tons above the first and second levels have an average value of \$14. The cost of stoping and milling is \$3. The shoot is continuous for 1100 ft. and has a back of 390 ft. at its interior extremity. Another \$1,000,000 will be added to the resources by driving a tunnel 100 ft. below the upper block if the ore continues. This tunnel is now at the 500-ft. point."

SOUTH DAKOTA.

Deadwood.

E. S. Shepard, assayer, Deadwood, has for some time been conducting an investigation of ores of the Montezuma and Whizzers property, located between Deadwood and Lead. The veins are not unlike the Homestake in classification of the rocks. Large parallel veins pass through the property. An east blind vein is showing by drill samples some nickel and Cobalt—the former in commercial quantities. Another large nearby vein also shows nickel values.

Custer.

Some time ago a tramway was installed from the Two Johns mine to the railroad tracks near Crown Hill, a distance of about 4000 ft. When first placed in operation the cars, which are hauled up to the summit of the tramway by a steel cable, and which descend by gravity, had been moved by a gasoline engine. This method proved too expensive. The Consolidated Power & Light Co. is building a line from its main feed line to the plant of the Two Johns near the railroad tracks at Crown Hill. This line will be completed in a few days; when the wires shall have been strung they will be connected up with the 50-h.p. motor which has been installed in the plant and electricity will hereafter be employed to operate the cars on the tramway. At the present time the Two Johns is hauling about 30 tons of ore daily for delivery to the Trojan milling plant. The new installation will increase this output.

UTAH.

Alta.

The Cottonwood-Atlantis Mining Co. is developing and mining at Atlantis mine, situated at the head of Collins gulch, Little Cottonwood canyon, Alta district. A tunnel was driven in 450 ft. some time ago, and from a point on this tunnel a crosscut is being driven southeast to cut the ore in the well-known thrust contact on which the Cardiff is operating. This contact vein is in limestone, overlain by quartzite. A portion of the property is under lease to miners who will take ore from the quartzite. Ore running high in silver, lead and gold, with some copper, was mined there many years ago. I. A. Clayton, of the Inland Salt Co., Salt Lake, is president of the Atlantis company.

Bingham.

The Bonanza tunnel of the Utah Bingham advanced 37 ft. Total 557 ft. The vein filling, after becoming soft during the past few feet, has become wet and loose, requiring timbering. The vein carries 4 ins. of iron sulphide on the hanging wall. With a little further drifting an upraise is to be made on this iron sulphide. The West Rough & Ready vein has not yet been encountered. The broken condition of the Giant Chief may indicate the approach of the intersection of the Giant Chief and the West Rough & Ready. The Giant Chief main level No. 6 sub-level advanced 32 ft. Total 58 ft. This face has broken into the porphyry foot wall. It carries a little mineral but no ore body. The Giant Chief main level No. 6 raise advanced 28 ft. Total 94 ft. Small spots of ore are being found in the vein. The back shows a large stratum of chert and altered lime and a few tongues of porphyry. This condition is very favorable for ore. The ground, in fact, is ore bearing but no actual ore body has been encountered.

Scranton.

Property of Scranton Mining & Smelting Co., 12 miles south of Eureka, being operated by Scranton Leasing Co., of which J. M. Wade is in charge, is producing 500 tons of ore per month. The larger part of this runs 29 to 35% zinc and 25% iron; the other part runs 20% lead. All this consists of carbonates and oxides. The zinc-iron and lead ores occur in different shoots, and are mined and shipped separately. Most of the operations are carried on through tunnels, drifts, raises and winzes. R. M. Deighton represents the owner company in Salt Lake.

Alta.

Michigan-Utah mine, Alta, is shipping 2 cars per day of ore running \$18 to \$20 per ton, all of which is produced by leasers. The ore samples 12 ozs. silver, 10% lead, 3% copper and 50 cts. gold. All operations are through tunnels and raises. The holdings extend from Alta over the divide to the Big Cottonwood side. The company is extending its Copper Prince tunnel, and is driving a crosscut from the face of this tunnel to intersect several veins. Also, a drift is being run from that tunnel on the line of a contact between limestone and quartzite, to open ore in the lime. N. W. Haire, Salt Lake, is president; A. O. Jacobson is general manager.

Big Cottonwood Con. Mining Co. lately installed a Sullivan single-stage 12x10 air compressor and 50-hp. G. E. motor at its property on south fork of Big Cottonwood canyon, 1¼ miles from Cardiff mine. A crosscut has been driven 740 ft. toward the lime-quartzite contact, supposed to be the same as that of Cardiff and others. The crosscut heading is now close to contact, where they expect to find ore. J. F. Dunn is president, with J. P. Waite as secretary and treasurer. Jay Elliott Johnson is manager.

Park City.

It is reported that the Three Kings has struck a body of ore. One story is that the find was made near the surface and the other that it is at a depth of about 500 ft. The report has not been confirmed.

Shipments of crude first-class ore and products from the mills this week totaled 1707 tons, estimated at \$70,000. This is compared with 1578 tons the previous week. There are nine shippers in the list this week, which is a much larger number than usual. The list is as follows: Silver King Coalition,

963,360; Judge Smelting, 891,200; Ontario-Silver, 652,850; Daly West, 330,500; Silver King Con., 205,470; New Quincy, 108,200; Naildriver, 105,320; American Flag, 82,570; Daly, 76,000; total, 3,415,470 lbs.

The Naildriver is getting in shape to do more extensive mining. Everything is reported in good shape now that the pumping has been pretty well accomplished, and operations can be expedited.

Salt Lake.

Stockholders of the King William Mining Co. received notices this week signed by President Blanchard giving outline as to the reorganization. The officers of the new company chosen were as follows: C. H. Blanchard, president; F. G. Morse, vice-president; N. G. Hall, treasurer, and W. A. Wight, secretary. The statement calls for $\frac{1}{2}$ ct. from old stockholders, who will receive share for share.

According to word from Provo, the Blue Bells Mines Co. has been organized to develop the Blue Bell and the Blue Bell Nos. 1, 2 and 3 mining claims in Little Cottonwood mining district, which are made the basis of a capitalization of \$10,000, in shares of the par value of 1 ct. each. Springville is the company's principal place of business. The directors and officers are: George A. Storrs, president; C. A. Daley, vice-president; Fred Dunn, secretary and treasurer; C. L. Daley and A. L. Daley.

Utah stockholders in the Ohio Copper Mining Co. are still unsettled in their minds as to which is the best plan held out to them in the two propositions for reorganization just presented from the east. After the meeting Thursday in this city a wire was sent to both the eastern syndicates. In substance it is that the Utah stockholders, representing 31,000 shares, cannot yet give preference to either plan without giving them further investigation. A Salt Lake man in close touch with the situation estimates that the Ohio stock held in Utah, Montana and Idaho will probably reach 70,000 shares. This is made up mainly in small blocks and up possibly to 2000 shares. This man says: "Personally, I favor the plan of Hubert E. Rogers. It is a 2,000,000 share corporation with 1,300,000 underwritten at \$1 a share. Stockholders will get share for share on payment of \$1 a share. This assumes that the \$750,000 sheriff's sale of the property will be taken care of with this money. The other plan is backed by the International & Intercontinental Mining & Refining Co. It calls for \$2 a share, the stockholders participating in the underwriting. It proposes to require the bondholders to pay off practically all the debts and receive stock in part payment. The present bonded indebtedness of Ohio is \$1,242,000. The floating debts will probably amount to not more than \$60,000. It will be noted that A. Frank, present leaser of the Ohio mine and mill, recently testified that he had paid into the company \$450,000 royalties. I think the New York receivers now must have at least \$600,000 cash on hand. The Frank lease will expire Dec. 1, and I expect the company to be under competent management by that time and ready to step in and take over and operate the property. No doubt the mill will be found in bad shape, but under the Rogers plan all the debts could be cleared and a working capital left of \$300,000 to \$400,000. With this the plant could be placed in first-class condition and the mine should be put on a paying basis. I figure that the Ohio tailing dumps alone make up an asset worth more than \$3,000,000. You know that the saving in the mill has not been much over 45%, which indicates that 55% of the values must be in the tailings."

Eureka.

Shipments of ore from the mines of Tintic in the past week totaled 197 carloads. This is estimated at 9850 tons, valued at \$245,000. It is compared with 175 carloads the week previous. Grand Central is showing a heavy increase in tonnage, equalling this week the Centennial-Eureka. The Chief Con. still holds the lead, with the Dragon following close on its trail.

The shaft at the Eagle & Blue Bell mine is down a distance of about 1950 ft. and sinking will be continued until the 2050 level is reached, when another station will be cut and drifts sent out after the ore. At 1925 ft. a drift was driven in ore for 20 ft. There was no change in that distance and being confident that the ore is making to much greater depth the management decided to put the shaft down at least an-

other 100 ft. before trying to get any further line on the ore. It is practically a cinch that the big ore body, which has been opened in such a splendid manner on the levels above and which was also cut by the main shaft, will be located without difficulty at a depth of 2050 ft., which would give the mine almost unlimited stoping ground.

WASHINGTON.

Spokane.

The Intermountain Mining Co. is placing its property in a condition for operations at increased profit, according to F. H. Walker of Jackson & Walker, who spent a day at the mine recently. Receipts will soon be on a basis of \$23,000 a month, he estimates. "A contract has been closed with the LaCasse Brothers, the operators of a dredge, for the use of their electric power and of two motors during the winter," Said Mr. Walker. "A new shoot has been found at depth on a side of the gulch opposite that in which the shaft was sunk and two on the No. 2 level. The shoot across the gulch will have 500 ft. of backs at the point of its intersection. A stope on the No. 2 level has a width of 17 to 20 ft. This body has a copper content of $2\frac{1}{2}\%$, but streaks having a width of 1 to 2 ft. contain 10 to 11%. The Hardinge mill has been in operation several weeks. A carload of concentrates is being obtained every fifth day from the jigs and tables and a carload every fifth day from the flotation system. One to two carloads of clean ore are taken from the grizzlies every month. This production should raise the rate of shipments to 12 carloads a month. Concentrates from the jigs and tables have a value of 15% and copper from the flotation system 18%. At \$1800 to \$2000 net to the car the receipts should be about \$23,000 a month. The expenses are about \$6000."

Two placer claims, Baxter and Bradner, located near Sugar Loaf mountain in the Leavenworth mining district, have been sold by Robert Wilson of Tacoma to the Central Products Co. for \$70,000 cash, according to the deed filed.

Fine progress has been made on the Security Copper Co.'s property, according to word from Chewelah. The shaft is now down 495 ft. and will reach the 500 level this week. From this point Manager L. K. Armstrong will run a drift to the ledge, which on the surface is shown to have great width. Work will be commenced at once making the station and sump from which the drift will be run. With the two shafts now employed it is expected that the ledge will be cut by the end of the year.

"Our plant is handling 250 tons of ore a day," said Conrad Wolfe, president of the United Copper Co. "The mill is doing good work and making a good saving, and the company is getting in good financial shape. We also are building an additional mill to treat the tailings. The concrete foundation is completed, the lumber and part of the machinery for it are on the ground and it will be completed in from 4 to 6 weeks. It will cost from \$15,000 to \$20,000."

WISCONSIN-ILLINOIS.

Platteville.

Returns for the week of Oct. 14th of zinc ore to track show it to be the greatest week ever recorded, 197 cars, 7828 tons, all grades being marketed. Buying was heavy; the Mineral Point Zinc Co. receiving 50 cars, 1949 tons; Wisconsin Zinc Co., 37 cars, 1493 tons; Grasselli Chemical Co., 34 cars, 1385 tons; Eagle-Picher Lead Co., all high-grade refinery product, 24 cars, 968 tons; National Separating Co., 17 cars, 715 tons; M. & H. Zinc Co., 13 cars, 496 tons; Illinois Zinc Co., 5 cars, 183 tons; scattering 17 cars, 369 tons. One car of lead ore cleared, 35 tons. Shipments of pyrites came from the National Separators, 277 tons; Mineral Point Zinc Co., 144 tons; Benton Roasters, 120 tons; Linden Zinc Co., 80 tons; Monmouth Zinc Mining Co., 80 tons—about evenly divided between Grasselli Chemical Co., General Chemical Co.

and Commercial Acid Co. Recovery of crude concentrates broke all records with a turnin of 6482 tons net to smelters; mine run direct and finished ore from refineries, 4035 tons. The Mineral Point Zinc Co. shipped 18 cars high-grade ore from separating plants to DePue, 650 tons.

Prices again showed advances especially on the lower-grade ore, the base being raised from \$50 to \$55 on ores down to 50%. Top and standard 60% grades held at \$60 base. Independent operators experienced the best single week thus far this year, 70 cars of ore coming from mines many of which have been denied a market for months.

Benton.

Reports for week of 14th continue at the rate steadily maintained, 79 cars of concentrates being delivered to track for an aggregate of 6,432,000 lbs. Frontier interests marketed 13 cars, 548 tons; Vinegar Hill Mining Co., from the Blackstone, Martin and Kittoe mines to Cuba, 10 cars, 420 tons; Fields-Thompson and Crawhall mines 10 cars, 385 tons; Wisconsin Zinc Co. to separating plants 16 cars, 645 tons; Penna-Benton mine to Mineral Point 8 cars, 330 tons; Wilkinson, Indian Mound and Sally Mining Co. to separating plants, each 2 cars, 240 tons total; Grand View Mining Co., a new producer to Linden Zinc Co., 35 tons. The Eagle-Picher Lead Co., high-grade separator ore from the Skinner plant of the Wisconsin Zinc Co., 15 cars, all to Collinsville, 613 tons. Several new producers recently developed are ready to contribute concentrates and will be reckoned with in shipments within the next 2 weeks. It is contended by expert mining men familiar with conditions in this district that shipments of 100 cars of crude concentrates will be made weekly in the near future.

Highland.

Five cars of carbonate zinc ore were shipped from here last week, all from the mines of the New Jersey Zinc Co. The Red Jacket mine idle several years figures in the late returns.

Linden.

In shipments last week the Linden Zinc Co. ore refiners sent 4 cars high-grade ore to smelters, 160 tons; H. Lewis, from locals in mixed lots to Collinsville, 2 cars, 72 tons; Milwaukee Linden to refinery, 2 cars, 92 tons; Stoner Bros. to Mineral Point, 30 tons; Ross Bros. 30 tons.

Spring Hill Mining Co., Chas. Singer, manager, has its main hoisting shaft down to ore, and a new mill ready. Drilling operations continue for Optimo No. 3 with splendid results. The main pitch has been struck and heavy production is assured. On the Optimo No. 2 a connection has been struck between two runs of zinc ore that will guarantee 2 years' production. Drills continue with success on the lease cuttings assaying 15 to 20% zinc.

Montfort.

The O. P. David reported out 1 car high-grade ore to LaSalle last week, 44 tons.

Mifflin.

Reports covering 2 weeks' returns from the Coker mines made last week show deliveries of 17 cars of zinc ore to Mineral Point, 687 tons; Peacock Mining Co. shipped to Grasselli Chemical Co., a contract with American Metals Co. having expired recently. Lucky Six continues shipments under contract. B & M. to Benton Roasters, 2 cars, 54 tons, and 1 car high-grade to Eagle-Picher Co., 43 tons; Biddick mine to Benton Roasters, 5 cars, 202 tons.

Mineral Point.

From the Mineral Point Zinc Works, one 25-ton tank of commercial sulphuric acid is being shipped each 24 hours. The oxide department is running on triple schedule, with 300 men, and shipments of finished product are made constantly. A strike among Italian laborers was promptly put down and 25 were discharged. Locals operating on the Mitchell land shipped 1 car last week, 32 tons zinc ore.

Cuba City.

Shipments of high-grade ore from the National Separating Works last week were made to Granby Con., 6 cars, 211 tons; Illinois Zinc Co., 4 cars, 143 tons; Standard-Metals Co. shipped 1 car low-grade ore to Wisconsin Zinc Co., 44

tons; Linden Zinc Co., operating the Campbell plant, 1 car 60% ore to LaSalle, 40 tons.

Hazel Green.

Reports for week of 7th were included with returns for week of 14th, showing shipments of 27 cars of zinc concentrates to separating plants in the field, and to Grasselli Chemical Co. under contract. The Maranoff Mining Co. figures for the first time with a car of ore shipped to Galena, 39 tons. Monmouth Zinc Co., also a new producer, resumes shipping after installing additional pumping machinery. Shullsburg made its regular report to Winskill, sending 4 cars to track, 176 tons. From the Potosi district came report of 1 car of high-grade ore from the Wilson mine to LaSalle, 34 tons. Three new power and milling plants will come into operation in the Potosi district before the end of the year.

Galena.

Galena mines are showing better on shipments, the Graham mine among new producers, sending 2 cars to Cuba, 85 tons; Hellman Mining Co., a new outfit, 2 cars to Grasselli Chemical Co., 80 tons; Wisconsin Zinc Co. from the Joplin Separating Works to LaSalle, 5 cars, 179 tons. Galena Refinery Co. has not reported in 2 weeks. Black-Jack shipped 4 cars mine run to Mineral Point, 180 tons; Federal to Wisconsin Zinc Co., 2 cars, 80 tons.

WYOMING.

Holmes.

Manager Dorchester Mapes of the Rambler Copper & Platinum Co., in a recent report states: "We have exposed our high-grade ore vein on the upper levels west of old workings, and are drifting (with machine drills) to cut the vein on the third (145-ft.) level. We are now mining about 3 tons of high-grade ore per day and already have a car load in the bins. At present we are taking out ore through the old works, which were in bad shape from caving, but we are cleaning up and retimbering this ground, and Supt. McMurray is confident we can soon be shipping 3 or more cars of high-grade per month. We have arranged to put on two 6-horse teams, with trailers, and this will take care of at least 7 tons per day. We are developing plans for improvements in our milling methods, which I am confident will enable us to handle our large bodies of lower-grade ores at a good profit. I have instituted a simple system of accounts and records which will enable me to know just how we stand, what we are doing every day, and what every part of the work is costing. The high-grade ore should sell for \$5000 or more per carload. We begin hauling high-grade for shipment this week. The mine is now on a paying basis, even calculating only the copper values in the ore we are hoisting daily."

Lander.

The Wyoming Petroleum Co. has received lately 9 cars of machinery and storage tanks and has another car on the way. Manager I. E. Segur is placing this machinery and tanks on the reservation lease held by his company 9 miles north of Lander in what is known locally as the reservation light oil fields. In the shipment besides the storage tanks were an air compressor and a complete electric light plant. The compressor will be used in erecting the storage tanks. The company has six producing wells and will increase the number to 20 under its present plans. Two more wells are nearly finished and the rigs will be kept at work until the expected number is completed. No statement has been made as to the present production by the management but it runs into several hundred barrels a day. The oil is the best grade light oil so far found in Wyoming. At present owing to a lack of storage the producing wells are not pumped to their full capacity. The company has installed a skimming plant and has been making all the gasoline used by it in its engines. It has not been able to secure the necessary steel barrels to market the surplus. As soon as the storage tanks are completed and the necessary barrels secured it will enter the local field as a wholesaler and supply many retail customers from Lander. The work of completing the storage and drilling the wells planned on will take several weeks.

CANADA.

BRITISH COLUMBIA.

Ainsworth.

The Leo Mining Co., capitalized for 1,000,000 shares at 5 cts. each, of which 200,000 shares are to be held in the treasury, has been organized in Spokane to take over and continue development of a group of claims near here. The officers are Thomas Hooker, president, and G. W. Roche, secretary-treasurer. These, with Walter G. Merryweather, W. S. McCrea and Samuel Hanauer compose the directorate. There are two claims in the property and in addition it has a perpetual right to use the long tunnel of the Highlander property adjoining, from which a drift has been run into Leo ground. It is expected that a continuation of this drift for an additional 100 or 200 ft. will reach the ore body at a depth of 1000 ft. North of the Leo property is the Banker mine, being worked by the Consolidated Mining & Smelter Co. On the Highlander, adjoining on the south, \$200,000 worth of work has been done. Other highly developed properties lie on the south and west.

Sandon.

The new 100-ton mill being built by the Surprise and Ivanhoe companies jointly on the site near Sandon, of the old Ivanhoe plant, which was destroyed by fire while treating Lucky Jim ore, will be in operation in a few weeks. The Ivanhoe tramway has been rebuilt and W. H. Yawkey of New York has resumed the development of that property, which is now in shape to resume production at any time. The ore bodies in the Surprise mine are unquestionably the largest and cleanest in the Slokan district. They are opened to a depth of 1200 ft. below the apex of the vein in Surprise basin. The mine is managed by Alexander Smith, who has been financed entire for 20 years by Congressman Charles Kent of California. The mine now contains vast ore reserves and netted \$180,000 last year.

The Canadian group, adjoining the Ivanhoe, has been reopened and Bruce White has just let a contract to haul 100 tons of silver-lead ore from the Noonday mine at Cody to the railroad at Sandon. The Noble Five is working 3000 ft. below the apex of the Last Chance mine and is taking out a good grade of mixed lead and zinc ore.

Vancouver.

Despite the advance in wages and the increased price of material and supplies, incident to the European war, the Granby Con. Mining, Smelting & Power Co., with mines in different parts of British Columbia and Alaska and smelters at Anyox and Grand Forks, reports net earnings of \$3,819,295 during the fiscal year ended June 30, 1916, as compared with \$1,070,140 for the previous 12 months. Dividends amounting to \$899,911 were paid during the year, and the total surplus at the end of the period was \$6,587,471, as against \$3,668,086 in 1915. This establishes a new high record of earnings and production for the corporation, but it is predicted that the current fiscal year will witness greater accomplishments in this line, the result of increased production and better average prices for metals. During the year 1,807,251 dry tons of ore were smelted from which were recovered 42,198,083 lbs. of copper, 487,845 ozs. of silver and 44,848 ozs. gold. In the previous year 1,098,020 dry tons of ore were smelted, the recoveries being 26,638,912 lbs. copper, 377,881 ozs. silver and 31,388 ozs. gold. The ore reserves of the various mines comprise 9,947,000 tons of 2 to 2½% copper, 3,718,000 tons of 1 to 1½% copper, and 9,491,000 tons of less than 1% copper, a total of 23,156,000 tons. The development work at Phoenix did not replace with new ore the amount shipped from the mine during the year by 721,400 tons, while at Anyox the new found ore exceeded that which was shipped during the year by 182,833 tons. During the year the Anyox plant treated 822,919 tons of ore, yielding 29,562,177 lbs. copper. Tons of charge treated, exclusive of coke, were 1,103,825. There were sent to Grand Forks for conversion 21,428 tons of matte, averaging 14% copper. The ore mined and shipped to the smelter from the Hidden Creek mine during the year amounted to 725,821 dry tons, bring the total shipments to date to 1,270,484 tons. Dr. William H. Nichols, president of the company, in his report to the stockholders says that the output at

Anyox was unfavorably affected both as to volume and cost by the serious curtailment of water power due to an unusual winter. The danger of a possible recurrence of this difficulty will be obviated by the installation of an auxiliary steam power plant, which is nearing completion. "As affecting the question of costs," he says, "allusion might also be made to the high cost of labor and supplies prevailing throughout the year and it is extremely gratifying to note that in face of these conditions the cost of blister copper at Anyox for the year was 8.54, as against 10.09 for the previous year, indicating that considerable progress will yet be made in the line of further reduction of cost. The assessment for the purpose of war tax is in process of adjustment and it appears to be the policy of the Canadian government to avoid making the tax unduly burdensome."

ONTARIO.

Cobalt.

Although not so great as the months of early summer, Nipissing's September production increased greatly over August. During the month the company mined ore of an estimated value of \$236,873, and shipped bullion from Nipissing and Customs ores of an estimated net value of \$413,753. Total for 9 months, \$1,995,013. Results from development appear to have been of a gratifying nature on the whole.

Dome Lake's mill, enlarged from 60 to 200 tons, was expected to be running again at the first of the month, after being shut down since August. Delays in getting shipments on minor parts have held it up, however, and while the mill may resume treatment of ore this week, it is probable that it will be another week at least. In the meantime development work has been pushed, and when the mill does start, production may in a small measure be overtaken by the higher quality ore that has been blocked out lately on the lower levels.

Shortage of material and labor are given as the reasons for abandoning plans made for the construction, before winter, of mill foundations on West Dome. Treatment of ore is set back, at the least, by 5 or 6 months. The proposed new shaft will not be started this year. Orders for equipment for the new shaft, and other machinery for the mine, have been either canceled, where given, or not given at all, for the reason, it is stated, that without lumber no protection from the weather for the machinery could be erected. Opening up of ore is proceeding steadily. From Nos. 1 and 2 veins ore that assays up to \$12 is being taken in drifts at the 300 level, and dumped. Ore taken out in development and dumped is averaging around \$7. While the two new drill holes have not yet reached the high-grade ore system, one diamond drill has struck 17 ft. of low-grade that will average \$5, on the 500 level.

The official report of Hollinger Con. Gold Mines for the 4 weeks ending Sept. 8 shows an increase in tonnage and decrease in grade over the previous 4-week period. Running 90.4% of the possible time, in the 4 weeks 50,177 tons of an average value of \$8.59 were treated. In the previous 4 weeks, ending Aug. 11, tonnage was 43,355 of an average value of \$9.61. Milling costs came down from \$1.053 a ton in August to \$0.927 a ton in the September statement. The tonnage treated was at the rate of 1792 a day. The 200 level provided almost half the ore hoisted. Gross profits for the period were still below dividend requirements. Gross profits for the period ending Sept. 8 amounted to \$221,543.30.

The recent find at the Miller Lake O'Brien continues to show an enormous body of ore in every direction. The find, which is seemingly a solid body of ore, has a width of over 2 ft. and seems to carry its size so far as it has been drifted upon. The winze was put in over 30 ft. which showed ore all the way. Afterwards sinking was done to the same extent and a drift was driven along the body of ore for about 50 ft. The manager is now sinking a winze for that distance. Men working in the mine who have had years of experience in Cobalt, say that there has never been anything to compare with the O'Brien strike. There is no reason to doubt that the working of other properties in the Montreal River section may develop into mines as the O'Brien was not much better looking on the surface than hundreds of other claims in the district.

World's Index of Current Literature

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(6) Number of pages. Illustrated articles are indicated by an asterisk (*).

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Blackwelder, Eliot.—*The Geologic Role of Phosphorus*. [Treats on the action of phosphorus in solution with respect to the formation of minerals and other substances in a general way].—*American Jnl. of Sci.* Oct. 1916; p 285; pp 14*; 60c.

Emery, Wilson B.—*The Igneous Geology of Carrizo Mountain, Arizona*. [Published by permission of the U. S. G. S., giving the petrology and general nature of the rock as a formation].—*American Jnl. of Sci.* Oct. 1916; p 349; pp 15*; 60c.

Jessup, Douglas W.—*The Lakeview Mine, Utah*. [On the geology of the deposits, methods of operation and other general description].—*E. & M. J.* Sept. 30 1916; p 573; pp 3½*; 25c.

Roesler, Max.—*Geology of the Iron-Ore Deposits of the Firmesa District, Oriente Province, Cuba*. [A very complete description of the geology, mineralogy and genesis of the ore bodies and formation related thereto].—*Bull. A. I. M. E.* Oct. 1916; p 1789; pp 51*; 35c.

Singewald, Joseph E.; Miller, Benjamin L.—*Prominent Mines of Junin, Peru*. [Three mines in the same district are described as regards their ore deposits. One is vanadium, one bismuth and the last silver].—*E. & M. J.* Sept. 30 1916; p 583; pp 4½*; 25c.

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*The Manganese Ores of the Lafayette District, Minas Geraes, Brazil*. [Separate descriptions on different districts and mines, also the nature of the ore and geology].—*Bull. A. I. M. E.* Oct. 1916; p 1745; pp 18*; 35c.

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the formation and ore bodies].—*Bull. A. I. M. E.* Oct. 1916; p 1763; pp 25*; 35c.

Ore Genesis

Blackwelder, Eliot.—*The Geologic Role of Phosphorus*. [Treats on the action of phosphorus in solution with respect to the formation of minerals and other substances in a general way].—*American Jnl. of Sci.* Oct. 1916; p 285; pp 14*; 60c.

Knight, Cyril W.—*Geological Relations of Sudbury Nickel Ores*. [Reviews the nature of the deposits and geology of the related formation. The whole is in the form of discussion].—*E. & M. J.* Sept. 23 1916; pp 1¾*; 25c.

Roesler, Max.—*Geology of the Iron-Ore Deposits of the Firmesa District, Oriente Province, Cuba*. [A very complete description of the geology, mineralogy and genesis of the ore bodies and formation related thereto].—*Bull. A. I. M. E.* Oct. 1916; p 1789; pp 51*; 35c.

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*The Manganese Ores of the Lafayette District, Minas Geraes, Brazil*. [Separate descriptions on different districts and mines, also the nature of the ore and geology].—*Bull. A. I. M. E.* Oct. 1916; p 1745; pp 18*; 35c.

Mineralogy and Petrography

Blackwelder, Eliot.—*The Geologic Role of Phosphorus*. [Treats on the action of phosphorus in solution with respect to the formation of minerals and other substances in a general way].—*American Jnl. of Sci.* Oct. 1916; p 285; pp 14*; 60c.

Emery, Wilson B.—*The Igneous Geology of Carrizo Mountain, Arizona*. [Published by permission of the U. S. G. S., giving the petrology and general nature of the rock as a formation].—*American Jnl. of Sci.* Oct. 1916; p 349; pp 15*; 60c.

Larsen, S. Esper; Steiger, George.—*Sulphatic Cancrinite from Colorado*. [This paper is published by permission of the U. S. G. S. The mineral is principally a sodium aluminum silicate].—*American Jnl. of Sci.* Oct. 1916; p 332; pp 2½; 60c.

Roesler, Max.—*Geology of the Iron-Ore Deposits of the Firmesa District, Oriente Province, Cuba*. [A very complete description of the geology, mineralogy and genesis of the ore bodies and

formation related thereto].—*Bull. A. I. M. E.* Oct. 1916; p 1789; pp 51*; 35c.

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*The Manganese Ores of the Lafayette District, Minas Geraes, Brazil*. [Separate descriptions on different districts and mines, also the nature of the ore and geology].—*Bull. A. I. M. E.* Oct. 1916; p 1745; pp 18*; 35c.

II. ORES AND METALS

(I) METALS AND ORES

Chromium

Van Name, R. G.; Hill, D. U.—*On the Rates of Solution of Metals in Ferric Salts and in Chromic Acid*. [A discussion and description of experimental work. The nature of the different experiments and results obtained are given].—*American Jnl. of Sci.* Oct. 1916; p 301; pp 3½*; 60c.

—*Quebec Mining Industry—A Review for the First Half of 1916*. [Brief accounts of operations at various properties].—*Canadian Mg. Inst. Bull.* Sept. 1916; p 796; pp 4; 50c.

Copper

Clayton, C. Y.—*Experiments from the Flotation Laboratory*. [Considerable of the text has to do with the nature of different oils. Description of laboratory flotation machines and tests made on different ores are also given].—*Mo. School of Mines Bull.* Aug. 1916; pp 40*.

Gahl, Rudolph.—*History of the Flotation Process at Inspiration, Arizona*. [A paper read before the A. I. M. E., dealing in detail with the subject and equipment used].—*Met. & Chem. Engg.* Oct. 1 1916; p 393; pp 12½*; 35c.

Rawdon, Henry S.—*Notes on the Occurrence and Significance of Twinned Crystals in Electrolytic Copper*. [A paper read before the American Inst. of Metals].—*Met. & Chem. Engg.* Oct. 1 1916; p 406; pp 3*; 35c.

Rickard, T. A.—*J. Parke Channing and Copper Mining*. [A bibliography of Channing's life with respect to the mining industry, principally iron and copper, in this country].—*M. & S. P.* Sept. 30 1916; p 487; pp 12*; 20c.

Stead, J. E.—*Influence of Some Elements on the Mechanical Properties of Steel*. [Gives the results of tests made on steels containing small amounts of other metals, as copper, tin, silicon, phosphorus, sulphur, etc.].—Iron & Steel Inst. Adv. Copy; pp 91*; 50c.

Stead, J. E.—*Notes on Nickel Steel Scale and on the Reduction of Solid Nickel and Copper Oxides by Solid Iron*. [Gives the method of procedure and results obtained in experimental work].—Iron & Steel Inst. Adv. Copy 7A; pp 9*; 50c.

Gold Fields and Mining

Clevenger, G. H.—*Electrolytic Precipitation from Cyanide Solutions*. [A paper read before the American Electrochemical Soc.].—E. & M. J. Sept. 30 1916; p 579; pp 3½*; 25c.

Hillen, A. G.—*Review of Conditions in the Eureka Mining District, Nevada*. [A general review of operations and conditions, both past and present].—Mg. World Sept. 30 1916; p 571; pp 4*; 10c.

Purinton, C. W.; Smith, R. E.—*Winter Sluicing at the Lenskoi Gold Mines, Siberia*. [Describes the methods and plant used for handling the frozen gravel by thawing and treating at once. Mining, construction and other operating costs are given].—Mg. Mag. Sept. 1916; p 143; pp 9*; 50c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

Rickard, T. A.—*J. Parke Channing and Copper Mining*. [A bibliography of Channing's life with respect to the mining industry, principally iron and copper, in this country].—M. & S. P. Sept. 30 1916; p 487; pp 12*; 20c.

Roesler, Max.—*Geology of the Iron-Ore Deposits of the Fimreza District, Oriente Province, Cuba*. [A very complete description of the geology; mineralogy and genesis of the ore bodies and formation related thereto].—Bull. A. I. M. E. Oct. 1916; p 1789; pp 51*; 35c.

Wolff, J. F.—*Recent Geologic Developments on the Mesabi Iron Range, Minnesota*. [A complete geological review of recent findings which tend to correlate the formation and ore bodies].—Bull. A. I. M. E. Oct. 1916; p 1763; pp 25*; 35c.

Iron and Steel

Brearely, A. W.—*Some Properties of Ingots*. [A metallographic review of the peculiarities of ingots made under varying conditions. Reproductions of the structure of the steel are shown].—Iron & Steel Inst. Adv. Copy 1; pp 34*; 50c.

Campbell, Edward D.—*The Influence of Heat Treatment on the Thermo-Electric Properties and Specific Resistance of Carbon Steels*. [The results and nature of the tests are described and 8 curves are reproduced showing the results of these and other tests].—Iron & Steel Inst. Adv. Copy 2; pp 18*; 50c.

Hayward, Carle R.—*The Effect of Sulphur on Low-Carbon Steel*. [A review of metallographic tests giving both the structure and change in physical properties due to the presence of sulphur].—Bull. A. I. M. E. Oct. 1916; p 1841; pp 10*; 35c.

Kilby, J. N.—*Steel Ingot Defects*. [The principles of things affecting acid and basic openhearth and Bessemer steel. Various pieces of equipment and methods are also described].—Iron & Steel Inst. Adv. Copy 4; pp 12*; 50c.

Stead, J. E.—*Influence of Some Elements on the Mechanical Properties of Steel*. [Gives the results of tests made on steels containing small amounts of other metals, as copper, tin, silicon, phosphorus, sulphur, etc.].—Iron & Steel Inst. Adv. Copy; pp 91*; 50c.

Stead, J. E.—*Notes on the Effect of Blast-Furnace Gases on Wrought Iron*. [Tests of various kinds were made to determine this effect].—Iron & Steel Inst. Adv. Copy 7C; pp 7*; 50c.

Stead, J. E.—*Notes on Nickel Steel Scale and on the Reduction of Solid Nickel and Copper Oxides by Solid Iron*. [Gives the method of procedure and results obtained in experimental work].—Iron & Steel Inst. Adv. Copy 7A; pp 9*; 50c.

Van Name, R. G.; Hill, D. U.—*On the Rates of Solution of Metals in Ferric Salts and in Chromic Acid*. [A discussion and description of experimental work. The nature of the different experiments and results obtained are given].—American Jnl. of Sci. Oct. 1916; p 301; pp 31½*; 60c.

Iron and Steel: Foundry and Furnace Practice

Kilby, J. N.—*Steel Ingot Defects*. [The principles of things affecting acid and basic openhearth and Bessemer steel. Various pieces of equipment and methods are also described].—Iron & Steel Inst. Adv. Copy 4; pp 12*; 50c.

Stead, J. E.—*Notes on the Effect of Blast-Furnace Gases on Wrought Iron*. [Tests of various kinds were made to determine this effect].—Iron & Steel Inst. Adv. Copy 7C; pp 7*; 50c.

Lead

Clayton, C. Y.—*Experiments from the Flotation Laboratory*. [Considerable of the text has to do with the nature of different oils. Description of laboratory flotation machines and tests made on different ores are also given].—Mo. School of Mines Bull. Aug. 1916; pp 40*.

Hillen, A. G.—*Review of Conditions in the Eureka Mining District, Nevada*. [A general review of operations and conditions both past and present].—Mg. World Sept. 30 1916; p 571; pp 4*; 10c.

Scott, W. A.—*Operations in the Tintic District, Utah*. [Describes the district and its operations in general, and then gives separate descriptions of the operations and methods of some of the companies].—Mg. World Sept. 30 1916; p 583; pp 1½*; 10c.

Sims, Clarence E.; Ralston, Oliver C.—*The Electrolytic Recovery of Lead from Brine Leaches*. [A paper read before the American Electrochemical Soc.].—Met. & Chem. Engg. Oct. 1 1916; p 410; pp 4*; 35c.

Manganese

Scott, Herbert K.—*Manganese Ores of the Bukovina, Austria*. [A concise but complete description of the country, the ores, geology, methods of handling and preparing and costs of the same].—Iron & Steel Inst. Adv. Copy 5; pp 20*; 50c.

Stead, J. E.—*Influence of Some Elements on the Mechanical Properties of Steel*. [Gives the results of tests made on steels containing small amounts of other metals, as copper, tin, silicon, phosphorus, sulphur, etc.].—Iron & Steel Inst. Adv. Copy; pp 91*; 50c.

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*The Manganese Ores of the Lafayette District, Minas Geraes, Brazil*. [Separate descriptions on different dis-

tricts and mines, also the nature of the ore and geology].—Bull. A. I. M. E. Oct. 1916; p 1745; pp 18*; 35c.

Silver

Hillen, A. G.—*Review of Conditions in the Eureka Mining District, Nevada*. [A general review of operations and conditions, both past and present].—Mg. World Sept. 30 1916; p 571; pp 4*; 10c.

Scott, W. A.—*Operations in the Tintic District, Utah*. [Describes the district and its operations in general, and then gives separate descriptions of the operations and methods of some of the companies].—Mg. World Sept. 30 1916; p 583; pp 1½*; 10c.

Singewald, Joseph E.; Miller, Benjamin L.—*Prominent Mines of Junin, Peru*. [Three mines in the same district are described as regards their ore deposits. One is vanadium, one bismuth and the last silver].—E. & M. J. Sept. 30 1916; p 583; pp 4¼*; 25c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tin

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*Silver-Tin Mining in Bolivia*. [Old stope filling is being taken out, chloridized, leached and then concentrated for the tin residue].—E. & M. J. Sept. 23 1916; p 533; pp 3*; 25c.

Stead, J. E.—*Influence of Some Elements on the Mechanical Properties of Steel*. [Gives the results of tests made on steels containing small amounts of other metals, as copper, tin, silicon, phosphorus, sulphur, etc.].—Iron & Steel Inst. Adv. Copy; pp 91*; 50c.

Vanadium

Fischer, Sigfried, Jr.—*Contributions to the Knowledge of the Electrolysis Aqueous Solution of Vanadium Salts*. [Gives the results of previous investigations showing the behavior of vanadium and its salts under various conditions, especially in solution as an electrolyte].—American Electrochem. Soc. Adv. Paper 9; p 119; pp 45*; 35c.

Singewald, Joseph E.; Miller, Benjamin L.—*Prominent Mines of Junin, Peru*. [Three mines in the same district are described as regards their ore deposits. One is vanadium, one bismuth and the last silver].—E. & M. J. Sept. 30 1916; p 583; pp 4¼*; 25c.

Zinc

Clayton, C. Y.—*Experiments from the Flotation Laboratory*. [Considerable of the text has to do with the nature of different oils. Description of laboratory flotation machines and tests made on different ores are also given].—Mo. School of Mines Bull. Aug. 1916; pp 40*.

Jessup, Douglas W.—*The Lakeview Mine, Utah*. [On the geology of the deposits, methods of operation and other general description].—E. & M. J. Sept. 30 1916; p 573; pp 3¼*; 25c.

Miscellaneous Metals and Ores

Blackwelder, Eliot.—*The Geologic Role of Phosphorus*. [Treats on the action of phosphorus in solution with respect to the formation of minerals and other substances in a general way].—American Jnl. of Sci. Oct. 1916; p 285; pp 14*; 60c.

Stead, J. E.—*Influence of Some Elements on the Mechanical Properties of Steel*. [Gives the results of tests made on steels containing small amounts of

other metals as copper, tin, silicon, phosphorus, sulphur, etc.].—Iron & Steel Inst. Adv. Copy; pp 91*; 50c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Crankshaw, H. M.—*Methods of Mining in the Anthracite Field*. [The formation here is more thin and more nearly flat than in the other fields and mining machines and slushing here find a better application].—Coal Age Sept. 30 1916; p 530; pp 4*; 20c.

Evans, David.—*Nationalization of Coal Mines*. [A discussion of the subject from the point of view that this will be necessary because of the conflicts now starting between labor and capital in Great Britain].—I. & C. Tr. Rev. Sept. 8 1916; p 271; pp 2½; 35c.

Fay, Albert H.—*Monthly Statement of Coal Mine Fatalities in the United States*. [Contains a list of permissible explosives, lamps and motors tested prior to Aug. 31 1916].—Bur. of Mines Statement July 1916; pp 28.

Fear, Thomas G.—*Getting Clean Coal*. [A paper read before the Alabama Coal Operators' Assn. It states that the human factor, methods of mining and dockage have considerable to do with the question].—Coal Age Sept. 30 1916; p 541; pp 1½; 20c.

Graham, J. Ivon.—*The Occlusion of Gases by Coal*. [A paper read before the Institution of Mining Engineers, dealing with the permeability of coal, with respect to gases, etc.].—Coll'y Guard, Sept. 15 1916; p 513; pp 1. I. & C. Tr. Rev. Sept. 15; p 308; pp 1; 35c.

Hines, Richard P.—*Natural Gas Operating Coal Mines*. [Speaks of a central gas power station of the Consolidated Coal Co., W. Va., and the distribution of the electricity from this station to the mines].—C. Tr. Bull. Oct. 2 1916; p 34; pp 1¾; 25c.

Hopwood, William.—*Mining and Dealing with Mine Water in the Buckley Coalfield, England*. [A paper read before the National Assn. of Colliery Mgrs. Details are given of the methods used in this mine].—I. & C. Tr. Rev. Sept. 15 1916; p 314; pp 3*; 35c.

Smith, Watson.—*Early and Modern Coal Mining Methods in Japan*. [From the Jnl. of the Royal Soc. of Arts, being a brief general description of the mines in the country].—C. Tr. Bull. Oct. 2 1916; p 43; pp 1¾; 25c.

Sterling, J. T.—*Mine Rescue Work Developed in Alberta*. [Abst. from a paper read before the Canadian Mg. Inst., being a general description of the advances made along that line in the province].—C. Tr. Bull. Oct. 2 1916; p 31; pp 1¾; 25c.

Warden-Stevens, F. J.—*Coal and Bunkering Ports of Canada*. [Speaks of the extent of operations of bunkers in the Dominion].—I. & C. Tr. Rev. Sept. 8 1916; p 449; pp 3*; 35c.

British Association for the Advancement of Science. [A report of the Fuel Economy Committee dealing with the use, consumption and conservation of coal in different industries].—Coll'y Guard, Sept. 15 1916; p 499; pp 4*. I. & C. Tr. Rev. Sept. 15; p 299; pp 5*; 35c.

Carriden Coal Co.'s New Pits, England. [Describes the formation and methods and equipment used in sinking its No. 1 and 2 shafts].—Coll'y Guard, Sept. 15 1916; p 497; pp 1½*; 35c.

Coke

— *A Modern Plant for Making Coke*. [Describes how coke and by-products are made on a commercial scale].—I. Tr. Rev. Sept. 14 1916; p 515; pp 1½*; 25c.

— *Boilers Heated by Coke-Oven Gas*. [On equipment and installations for following this practice. Drawings are given with description].—I. & C. T. Rev. Sept. 8 1916; p 280; pp 1½*; 35c.

Petroleum

Smith, Warren D.—*Oil Fields of Tayabas Peninsula, Philippine Islands*. [An account of the oil possibilities in the Philippines].—Oil Age Sept. 1916; p 9; pp 2; 35c.

— *Oil Prospects in Ecuador*. [A general review of the industry in that country].—Calif. Derrick Sept. 1916; p 3; pp 1¾; 30c.

Natural Gas

Hines, Richard P.—*Natural Gas Operating Coal Mines*. [Speaks of a central gas-power station of the Consolidated Coal Co., W. Va., and the distribution of the electricity from this station to the mines].—C. Tr. Bull. Oct. 2 1916; p 34; pp 1¾; 25c.

Zanetti, J. E.; Leslie, E. H.—*The Thermopane Decomposition of the Ethane-Propane Fraction from Natural Gas Condensate*.—Jnl. Ind. & Engg. Chem. Sept. 1916; p 777; pp 2*; 60c.

III. TECHNOLOGY

MINES AND MINING

Surveying and Drafting

McCullough, Ernest.—*Practical Surveying for Surveyors' Assistants, Vocational and High Schools*. [In a practical way what a surveyor is supposed to do, methods and surveying laws are explained].—Van Nostrand Co.; book; pp 400*; \$2.

Reeves, Edward A.—*Surveying, Past and Present*. [A review of surveying instruments from ancient to present times].—Jnl. of Royal Soc. of Arts. Sept. 15 1916; p 733; pp 13*; 35c.

Shafts and Shaft Sinking

Hall, Albert E.—*Shaft Timbering Examples*. [Drawings and description of various methods of shaft timbering are given].—E. & M. J. Sept. 30 1916; p 589; pp 1¾*; 25c.

— *Carriden Coal Co.'s New Pits, England*. [Describes the formation and methods and equipment used in sinking its No. 1 and 2 shafts].—Coll'y Guard, Sept. 15 1916; p 497; pp 1½*; 35c.

Ventilation

Chambers, G.—*The Atmospheric Problem in the Deepest Mine*. [Excerpts from the superintendent's report of the Morro Velho mine of the St. John del Rey Mining Co., Brazil, dealing with the ventilation of the mine].—Mg. World Sept. 30 1916; p 575; pp 2; 10c.

Sampson, R. J.—*An Economical System of Mining*. [The system allows of complete extraction of the ground at a low cost and consists mostly of pillar drawing. A tenacious sandstone roof permits the running of wide entries].—Coal Age Sept. 23 1916; p 494; pp 2¼*; 20c.

Lighting

Bullard, E. W.—*Introduction of the Acetylene mine Lamp on the Pacific Coast*.

[An account with some details on the introduction of this lamp].—Acetylene Jnl. Oct. 1916; p 185; pp 1½; 20c.

Fay, Albert H.—*Monthly Statement of Coal Mine Fatalities in the United States*. [Contains a list of permissible explosives, lamps and motors tested prior to Aug. 31 1916].—Bur. of Mines Statement July 1916; pp 28.

— *Illumination*. [A general review of proper illumination with respect to safety on surfaces].—Anode Sept. 1916; p 1; pp 2; 20c.

Dredging

Jennings, Hennen.—*Dredging in Montana*. [From a U. S. G. S. bulletin giving costs of operation and construction of dredges used].—M. & S. P. Sept. 23 1916; p 465; pp 2½*; 20c.

Purington, C. W.; Smith, R. E.—*Winter Sluicing at the Lenskoi Gold Mines, Siberia*. [Describes the methods and plant used for handling the frozen gravel by thawing and treating at once. Mining, construction and other operating costs are given].—Mg. Mag. Sept. 1916; p 143; pp 9*; 50c.

Accidents

Fay, Albert H.—*Monthly Statement of Coal Mine Fatalities in the United States*. [Contains a list of permissible explosives, lamps and motors tested prior to Aug. 31 1916].—Bur. of Mines Statement July 1916; pp 28.

Fay, Albert H.—*Production of Explosives in the United States*. [Also contains notes on coal mine accidents due to explosives and a list of permissible explosives, lamps and motors tested before May 1 1916].—U. S. Bureau of Mines Tech. Paper 159; pp 24; 15c.

Rescue and First-Aid

Boardman, J. L.—*First Aid for Broken Bones*. [Reviews the nature of fractures and first aid methods for treating the same].—Anode Sept. 1916; p 8; pp 2*; 20c.

Sterling, J. T.—*Mine Rescue Work Developed in Alberta*. [Abst. from a paper read before the Canadian Mg. Inst., being a general description of the advances made along that line in the province].—C. Tr. Bull. Oct. 2 1916; p 34; pp 1¾; 25c.

Safety

— *Illumination*. [A general review of proper illumination with respect to safety on surface].—Anode Sept. 1916; p 1; pp 2; 20c.

Labor and Management

Bain, H. Foster.—*Labor Problems in African Mines*. [A discussion of labor, its comparative costs, with mine production, and a general description with respect to their ways and character].—Mg. Mag. Sept. 1916; p 135; pp 8*; 50c.

Evans, David.—*Nationalization of Coal Mines*. [A discussion of the subject from the point of view that this will be necessary because of the conflicts now starting between labor and capital in Great Britain].—I. & C. Tr. Rev. Sept. 8 1916; p 271; pp 2½; 35c.

Ridge, Fred H., Jr.—*Importance of the Human Factor*. [Deals with efficiency from the point of keeping the employee in a good attitude and state of mind towards his employer].—E. & M. J. Sept. 23 1916; p 543; pp 2; 25c.

Production

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*The Manganese Ores of the Lafayette District, Minas Gerais, Brazil*. [Separate description on different dis-

tricts and mines, also the nature of the ore and geology].—Bull. A. I. M. E. Oct. 1916; p 1745; pp 18*; 35c.

—British Association for the Advancement of Science. [A report of the Fuel Economy Committee, dealing with the use, consumption and conservation of coal in different industries].—Colly Guard. Sept. 15 1916; p 499; pp 4*. I. & C. Tr. Rev. Sept. 15; p 299; pp 5*; 35c.

Mining Costs

Bain, H. Foster.—*Labor Problems in African Mines*. [A discussion of labor, its comparative costs, with mine production, and a general description, with respect to their ways and character].—Mg. Mag. Sept. 1916; p 135; pp 8*; 50c.

Purington, C. W.; Smith, R. E.—*Winter Sluicing at the Lenskoi Gold Mines, Siberia*. [Describes the methods and plant used for handling the frozen gravel by thawing and treating at once. Mining construction and other operating costs are given].—Mg. Mag. Sept. 1916; p 143; pp 9*; 50c.

Scott, Herbert K.—*Manganese Ores of the Bukovina, Austria*. [A concise but complete description of the country, the ores, geology, methods of handling and preparing and costs of the same].—Iron & Steel Inst. Adv. Copy 5; pp 20*; 50c.

Mining Miscellany

Miller, Benjamin L.; Singewald, Joseph T., Jr.—*Conditions Governing Mining in South America*. [From Teniente Topics in which a general review of operations in South American countries is given and conditions controlling the same are brought out].—Mg. World Sept. 23 1916; p 541; pp 1½; 10c.

—Conversion Table for the Valuation of Ores, Minerals and Metals. [A table for converting various English money values into the corresponding U. S. currency value].—Mg. Mag. Sept. 1916; p 152; pp 4; 50c.

MILL AND MILLING

Sampling

Woodbridge, T. R.—*Ore Sampling Conditions in the West*. [Excerpts from advance proofs of Tech. Paper 86 of the U. S. Bureau of Mines. Six methods of sampling are described which are in common use in the west and the particular classes of sampling for which each is fitted is given].—Mg. World Sept. 23 1916; p 537; pp 2; 10c.

Crushing, Grinding, Etc.

Burch, H. K.—*The Inspiration Mine Plant*. [Abst. from a paper read before the A. I. M. E. Describes the equipment and methods used for handling the ore from the mine, both underground and on surface].—E. & M. J. Sept. 23 1916; p 537; pp 5½*; 25c.

Flotation

Clayton, C. Y.—*Experiments from the Flotation Laboratory*. [Considerable of the text has to do with the nature of different oils. Description of laboratory flotation machines and tests made on different ores are also given].—Mo. School of Mines Bull. Aug. 1916; pp 40*.

Elmore, A. Stanley.—*The Invention, Development and Introduction of the Flotation Process*. [A general historical account of the process carrying the method to a point where it was practically introduced].—M. & S. P. Sept. 23 1916; p 449; pp 6½; 20c.

Gahl, Rudolf.—*History of the Flotation*

Process at Inspiration, Arizona. [A paper read before the A. I. M. E., dealing in detail with the subject and equipment used].—Met. & Chem. Engg. Oct. 1 1916; p 393; pp 12½*; 35c.

Concentration: Sorting, Sizing, Washing

Scott, Herbert K.—*Manganese Ores of the Bukovina, Austria*. [A concise but complete description of the country, the ores, geology, methods of handling and preparing, and costs of the same].—Iron & Steel Inst. Adv. Copy 5; pp 20*; 50c.

Scott, W. A.—*Operations in the Tintic District, Utah*. [Describes the district and its operations in general and then gives separate descriptions of the operations and methods of some of the companies].—Mg. World Sept. 30 1916; p 583; pp 1¾; 10c.

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*Silver-Tin Mining in Bolivia*. [Old stope filling is being taken out, chloridized, leached and then concentrated for the tin residue].—E. & M. J. Sept. 23 1916; p 533; pp 3*; 25c.

Amalgamation

Allingham, John.—*Treating Amalgamation Tailings with Cyanide*.—E. & M. J. Sept. 30 1916; p 591; pp 1; 25c.

Purington, C. W.; Smith, R. E.—*Winter Sluicing at the Lenskoi Gold Mines, Siberia*. [Describes the methods and plant used for handling the frozen gravel by thawing and treating at once. Mining, construction and other operating costs are given].—Mg. Mag. Sept. 1916; p 143; pp 9*; 50c.

Cyaniding

Allingham, John.—*Treating Amalgamation Tailings with Cyanide*.—E. & M. J. Sept. 30 1916; p 591; pp 1; 25c.

Clevenger, G. H.—*Electrolytic Precipitation from Cyanide Solutions*. [A paper read before the American Electrochemical Soc.].—E. & M. J. Sept. 30 1916; p 579; pp 3½*; 25c.

Edmonds, H. R.—*Some Notes on the Effect of Lead Salts and of Varying Degree of Alkalinity on the Solvent Power of Cyanide Solution for Gold*. [Gives the results of some tests made].—Monthly Jnl. Chamber of Mines West Aust. June 30 1916; p 108; pp 4½; 35c.

Mill and Smelter Costs

Crowley, John A.—*The Gronwall-Dixon Electric Furnace*. [A paper read before the American Foundrymen's Assn. Deals with the construction of the furnace, its operation and gives drawing and detailed costs of producing steel with the same].—I. Tr. Rev. Sept. 21 1916; p 571; pp 2½*; 25c.

Scott, Herbert K.—*Manganese Ores of the Bukovina, Austria*. [A concise but complete description of the country, the ores, geology, methods of handling and preparing and costs of the same].—Iron & Steel Inst. Adv. Copy 5; pp 20*; 50c.

Mill Miscellany

—Conversion Table for the Valuation of Ores, Minerals and Metals. [A table for converting various English money values into the corresponding U. S. currency value].—Mg. Mag. Sept. 1916; p 152; pp 4; 50c.

CHEMISTRY AND ASSAYING

Chemistry

Van Name, R. G.; Hill, D. U.—*On the Rates of Solution of Metals in Ferric*

Salts and in Chromic Acid. [A discussion and description of experimental work. The nature of the different experiments and results obtained are given].—American Jnl. of Sci. Oct. 1916; p 301; pp 3½*; 60c.

Chlorination

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*Silver-Tin Mining in Bolivia*. [Old stope filling is being taken out, chloridized, leached and then concentrated for the tin residue].—E. & M. J. Sept. 23 1916; p 533; pp 3*; 25c.

METALLURGY

Electrometallurgy

Clevenger, G. H.—*Electrolytic Precipitation from Cyanide Solutions*. [A paper read before the American Electrochemical Society].—E. & M. J. Sept. 30 1916; p 579; pp 3½*; 25c.

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Stead, J. E.—*Notes on Nickel Steel Scale and on the Reduction of Solid Nickel and Copper Oxides by Solid Iron*. [Gives the method of procedure and results obtained in experimental work].—Iron & Steel Inst. Adv. Copy 7A; pp 9*; 50c.

Hydro-Metallurgy

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Metallurgy General

—British Association for the Advancement of Science. [A report of the Fuel Economy Committee dealing with the use, consumption and conservation of coal in different industries].—Colly Guard. Sept. 15 1916; p 499; pp 4*. I. C. Tr. Rev. Sept. 15; p 299; pp 5*; 35c.

POWER AND MACHINERY

Electricity

Campbell, Edward D.—*The Influence of Heat Treatment on the Thermo-Electric Properties and Specific Resistance of Carbon Steels*. [The results and nature of the tests are described and 8 curves are reproduced, showing the results of these and other tests].—Iron & Steel Inst. Adv. Copy 2; pp 18*; 50c.

Fay, Albert H.—*Monthly Statement of Coal Mine Fatalities in the United States*. [Contains a list of permissible explosives, lamps and motors tested prior to Aug. 31 1916].—Bur. of Mines Statement July 1916; pp 28.

Hines, Richard P.—*Natural Gas Operating Coal Mines*. [Speaks of a central gas-power station of the Consolidated Coal Co., W. Va., and the distribution of the electricity from this station to the mines].—C. Tr. Bull. Oct. 2 1916; p 34; pp 1¾; 25c.

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—*Russian Mines, Growth of Electrical Equipment in*. [Gives details as to the number, size, etc., of electrical plants at mines in Russia].—C. Tr. Bull. Oct. 2. 1916; p 47; pp 3½; 25c.

Combustion Engines

Garrard, A.—*Gas, Oil and Petrol Engines*. [Deals with the history of combustion engines, their construction and use and the operation of equipment used in connection with them].—Whittaker & Co., London; book; pp 221*; \$1.50.

Hines, Richard P.—*Natural Gas Operating Coal Mines*. [Speaks of a central gas-power station of the Consolidated Coal Co., W. Va., and the distribution of the electricity from this station to the mines].—C. Tr. Bull. Oct. 2 1916; p 34; pp 1¼; 25c.

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Steam and Steam Engines

Bowron, Charles E.—*Factors Governing the Efficiency of Steam Plants*. [A general discussion of the subject read before the Alabama Coal Operators' Assn.].—Coal Age Sept. 30 1916; p 539; pp 2½; 20c.

Hirshfield, C. F.—*Steam Power*. [An elementary treatise on the subject, omitting the deeper mathematics of the subject and the theory of thermodynamics].—Wiley & Sons; book; pp 420*; \$2.

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Miscellaneous Power and Machinery

Abady, Jacques.—*Soot Blowers*. [A paper read before the Nottingham Guild of the Mechanical and Electrical Engineers, giving the advantages and operating methods of mechanical soot blowers].—Pract. Eng. Oct. 1 1916; p 827; pp 4½*; 20c.

Kent, Robert Thurston.—*Power Transmission by Leather Belting*. [Tables, formulas, theory and practical information regarding the practical use of belting in power transmission are given].—Wiley & Sons; book; pp 114*; \$1.25.

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and requirements of good lubricants].—Pract. Eng. Oct. 1 1916; p 833; pp 1½; 20c.

IV. MISCELLANEOUS

Testing

Campbell, Edward D.—*The Influence of Heat Treatment on the Thermo-Electric Properties and Specific Resistance of Carbon Steels*. [The results and nature of the tests are described and 8 curves are reproduced showing the results of these and other tests].—Iron & Steel Inst. Adv. Copy 2; pp 18*; 50c.

Clayton, C. Y.—*Experiments from the Flotation Laboratory*. [Considerable of the text has to do with the nature of different oils. Description of laboratory flotation machines and tests made on different ores are also given].—Mo. School of Mines Bull. Aug. 1916; pp 40*.

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Stead, J. E.—*Influence of Some Elements on the Mechanical Properties of Steel*. [Gives the results of tests made on steels containing small amounts of other metals as copper, tin, silicon, phosphorus, sulphur, etc.].—Iron & Steel Inst. Adv. Copy; pp 91*; 50c.

Stead, J. E.—*Notes on the Effect of Blast-Furnace Gases on Wrought Iron*. [Tests of various kinds were made to determine this effect].—Iron & Steel Inst. Adv. Copy 7C; pp 7*; 50c.

Thornton, W. M.—*Influence of Pressure on the Electrical Ignition of Methane*. [A paper read before the British Assn., Sec. G, dealing with experimental work. Curves are shown].—Colly Guard. Sept. 15 1916; p 503; pp 2*; 35c.

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Brearley, A. W.—*Some Properties of Ingots*. [A metallographic review of the peculiarities of ingots made under varying conditions. Reproductions of the structure of the steel are shown].—Iron & Steel Inst. Adv. Copy 1; pp 34*; 50c.

Hayward, Carle R.—*The Effect of Sulphur on Low-Carbon Steel*. [A review of metallographic tests, giving both the structure and change in physical properties due to the presence of sulphur].—Bull. A. I. M. E. Oct. 1916; p 1841; pp 10*; 35c.

Howe, Henry M.—*Recrystallization After Plastic Deformation*. [Deals with recrystallization after the cold-working of brass].—Bull. A. I. M. E. Oct. 1916; p 1851; pp 10*; 35c.

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read before the American Inst. of Metals].—Met. & Chem. Engg. Oct. 1 1916; p 406; pp 3*; 35c.

History

Gahl, Rudolf.—*History of the Flotation Process at Inspiration, Arizona*. [A paper read before the A. I. M. E. dealing in detail with the subject and equipment used].—Met. & Chem. Engg. Oct. 1 1916; p 393; pp 12½*; 35c.

Garrard, A.—*Gas, Oil and Petrol Engines*. [Deals with the history of combustion engines, their construction and use and the operation of equipment used in connection with them].—Whittaker & Co., London; book; pp 221*; \$1.50.

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Scott, Herbert K.—*Manganese Ores of the Bukovina, Austria*. [A concise but complete description of the country, the ores, geology, methods of handling and preparing and costs of the same].—Iron & Steel Inst. Adv. Copy 5; pp 20*; 50c.

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—*American Institute Holds Successful Meeting in the Southwest*. [An account of the proceedings of the meeting held during Sept.].—Mg. World Sept. 30 1916; p 577; pp 2; 10c.

—*American Institute of Chemical Engineers*. [Proceedings of the 8th semi-annual meeting, Cleveland, June, 1916].—American Inst. of Chem. Eng. Bull. 13; pp 48; 35c.

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General Miscellany

Rickard, T. A.—*J. Parke Channing and Copper Mining*. [A bibliography of Channing's life with respect to the mining industry, principally iron and copper in this country].—M. & S. P. Sept. 30 1916; p 487; pp 12*; 20c.

Turneure, F. E.; Johnson; Bryan.—*Theory and Practice of Modern Framed Structures*. [Deals mostly with proportioning the members after the stresses are known and will be of most value to the student].—John Wiley & Sons; book; pp 486*; \$1.

Wood, George McLane.—*Reports on Mining Districts—General Suggestions*. [Abst. from a paper of a similar title written for use in the U. S. G. S. being a guide for the correct way to write reports].—M. & S. P. Sept. 30 1916; p 499; pp 4; 20c.

—*Making Mine Engineering Calculations*. [A general talk on the use of mechanical appliances of use in making computations].—Mg. World Sept. 30 1916; p 579; pp 1½*; 10c.

Ore and Metal Markets; Prices-Current

New York, Oct. 17, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London during the week ended Oct. 18 were as follows:

	New York, cents.	London, pence.
Oct. 12.....	67 1/2	32 15/16
13.....	67 1/2	32 7/16
14.....	68	32 1/2
16.....	68 1/4	32 9/16
17.....	67 3/4	30 1/2
18.....	67 3/4	30 5/16

*Holiday.

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London	
	1916	1915	Standard Oz.	1916	1915
	High.	Low.	Avg.	Avg.	Avg.
January	57 1/2	55 1/2	56.775	48.890	26.875
February	57	56 1/2	56.755	48.477	27.000
March	60 1/2	66 1/2	57.935	49.926	27.080
April	73 1/2	60 1/2	64.415	50.034	31.375
May	77 1/2	68 1/2	74.27	49.915	34.182
June	68 1/2	62 1/2	65.02	49.072	31.038
July	65	60	62.94	47.619	29.870
August	67	64	65.50	47.178	31.25
September	69 1/4	67 1/4	68.516	48.68	32.18
October				49.385	23.923
November				51.713	24.640
December				55.038	26.232

Year 49.690 23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Buying of copper since our last report has totaled about 10,000,000 lbs. Domestic consumers were in the market for some fairly large-sized blocks of the red metal for first quarter delivery, but with all the large foreign and domestic consumers protected the market lacks the inspiring features that were evident in recent weeks. Spot electrolytic sold at 29 1/4 cts., with November at 28 1/2 cts. and December at 28 1/4 cts., these prices being on sales by dealers. Producers took orders for January at 28 cts., with first quarter business done at 27 1/2 cts. and second quarter at 27 cts. Casting copper held at 27 1/2 cts. for spot, with the same price asked for November delivery. Prime lake copper on the spot and for November sold at 28 1/2 @ 28 3/4 cts.

As yet the bear movement by dealers to secure blocks of metal for the first half has not made its appearance. With buying by consumers over, the dealers usually try to uncover a weak spot in the situation and thus stock up metal at lower prices, but all of the producers are well sold up and the likelihood of a bear movement being successful is not considered bright.

Exports of copper since the first of the month total 9752 tons. The copper export situation is being aided by lower ocean freight rates and also a greater supply of shipping facilities. Two large shipments of copper have been destroyed, one on the *Stephano*, sunk by the U-53, and the other on the steamer *Milazzo*, destroyed by fire in the Azores.

The London market has pursued a steady upward course, electrolytic last week going up £1 to £143, while standard advanced £2 to £123 and futures £1 10s to £118 10s. Stocks of copper in Europe on Oct. 15 totaled 5620 tons, as against 5796 tons on Oct. 1, a decrease of 176 tons. The supply afloat was 6050, as compared with 5575 tons, an increase of 475 tons, so that the total visible supply on Oct. 15 was 11,670 tons, as contrasted with 11,371 tons on Oct. 1, showing an increase of 299 tons.

Quotations for copper per pound at New York for the week ended Oct. 18 were as follows:

(For Fourth Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
Oct. 12.....	28 1/2 @ 29	28 1/2 @ 29	27 @ 27 1/2
13.....	28 1/2 @ 29	28 1/2 @ 29	27 @ 27 1/2

14.....	28 1/2 @ 29	28 1/2 @ 29	27 @ 27 1/2
16.....	28 1/2 @ 29	28 1/2 @ 29	27 1/4 @ 27 1/2
17.....	28 1/2 @ 29	28 1/2 @ 29	27 1/4 @ 27 1/2
18.....	28 1/2 @ 29	28 1/2 @ 29	27 1/4 @ 27 1/2

Quotations for copper per ton at London for the week ended Oct. 18 were as follows:

	Standard		Electrolytic.
	Spot.	Futures.	
Oct. 12.....	£123 0 0	£118 10 0	£142 10 0
13.....	123 0 0	118 10 0	143 0 0
14.....	123 0 0	118 10 0	143 0 0
16.....	123 0 0	118 10 0	143 0 0
17.....	123 10 0	119 0 0	143 0 0
18.....	123 10 0	120 0 0	143 10 0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915.
	1916	Average.	Average.	
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	28.00	28.75	17.758
October				17.925
November				18.856
December				20.375

Year 17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	28.00	28.75	17.705
October				17.859
November				18.826
December				20.348

Year 17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	1916	Avg.	Avg.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12 1/2	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	25.50	27.00	26.40	116.10	68.560
October					72.577
November					77.400
December					80.400

Year 60.400

Tin.—The submarine scare has passed and tin prices, after showing some very sharp advances, have receded to levels more compatible with the technical position of the metal. The steamers *City of Naples* and the *Lancastrian* have arrived and the trade once more breathes easily. The upward spurt in prices served to bring many consumers into the market and sales of about 850 tons for all deliveries were made. Tin plate manufacturers were the principal buyers, covering requirements involved in new plate contracts.

Spot Straits tin sold at 43 cts. and spot Banka up to 42 1/2 cts., with business for the first 3 months' arrival done at 42 cts. Spot Straits is now holding quiet and rather easy at 41 1/4 cts..

with spot Banka at 40½ cts. For November and December arrival sellers ask 41½ cts., with January, February and March at 40¾ cts. and May and June at 40¾ cts.

Independent tin plate makers set their price for 1917 at \$6 per base box, but the American Sheet & Tin Plate Co. fixed \$5.75 as its price and pending a readjustment of the difficulty herein involved buying of tin is likely to be quiet.

London and Singapore made capital of the nervousness here, Singapore going up to £187 10s, but subsequently declining to £185. Straits tin at London advanced to £181 and now holds at £179 10s. Limits from the east were strong at 40¼@41 cts. for shipments up to March and with a large portion of the offerings accepted the sharp advances abroad were not surprising. Statistically the position of tin is very good.

Arrivals total 1180 tons, while the stock afloat aggregates only 2350 tons, of which 1750 tons is on known steamers for October arrival. The small stock afloat favors a strong bull market.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Oct. 18 were as follows:

	New York		London.	Singapore,
	Spot.	Oct.	Straits, spot.	shipments.
Oct. 12.....	.....	.....	£181 0 0	£184 0 0
13.....	41¼c	41¼c	180 15 0	185 0 0
14.....	41¼c	41¼c	180 15 0	185 0 0
16.....	41¼c	41¼c	179 10 0	185 0 0
17.....	40¾c	40¾c	178 5 0	183 15 0
18.....	40¾c	40¾c	178 10 0	183 5 0
*Holiday.				

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.886
September	39.50	38.00	39.50	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Business has been small since our last report, but at this writing signs of an improvement in the demand are beginning to appear. Last week a slight easiness in the spot situation was noted, but this week the concessions are no longer obtainable. Producers' views are very firm, owing to the good position of their order books, and the drift toward lower levels in the outside market failed to disturb them. Canadians are expected to come into the market shortly for a large block of lead, while Russia is sounding the market. Spot moved off to 7 cts. New York and 6.80 cts. St. Louis, but has since advanced \$1 a ton.

The inaction of the American Smelting & Refining Co. with respect to changing its official price has mystified the trade, but an advance is regarded as certain before the end of the month. Domestic consumers are apparently well supplied by contracts and brokers who had odd lots of spot metal to offer reported difficulty in interesting users.

As a whole the lead situation is very strong and the continuation of high prices over the rest of the year is thought certain by producers. The London market has failed to show any animation, holding at £30 10s for spot and £29 10s for futures.

Quotations for lead per pound at New York and per ton at London for the week ended Oct. 18 were as follows:

	New York		London	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
Oct. 12.....	.....	.....	£30 10 0	£29 10 0
13.....	7.00c	7.00c	30 10 0	29 10 0
14.....	7.00c	7.00c	30 10 0	29 10 0
16.....	7.00c	7.00c	30 10 0	29 10 0
17.....	7.05c	7.00c	30 10 0	29 10 0
18.....	7.05c	7.00c	30 10 0	29 10 0
*Holiday.				

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London		
	1916	1915.		1916.	1915.	
	High.	Low.	Avg.	Avg.	Avg.	
January	6.20	5.50	5.926	5.730	31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	22.010
April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	6.75	6.88	5.875	29.760	25.750
July	6.85	6.25	6.37	5.738	28.035	25.611
August	6.70	5.95	6.32	4.760	30.260	22.150
September	7.10	6.70	6.88	4.627	31.25	22.953
October .....	.....	.....	.....	4.612	.....	23.932
November .....	.....	.....	.....	5.152	.....	26.240
December .....	.....	.....	.....	5.346	.....	28.884
Year .....	.....	.....	.....	4.675	.....	23.099

Lead Ore.—Lead-ore prices in the Missouri-Kansas-Oklahoma district last week showed a similar strengthening to zinc ore, practically all sales being made at \$80 and better. Production was 1,767,170 lbs., valued at \$70,928. The year's total to date is 81,724,967 and the value \$3,381,939.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.36	63.60
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	48.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—In the Missouri-Kansas-Oklahoma district last week zinc-ore prices were considerably stronger, ranging from \$62.50 to \$70. The average price paid was \$66.25. Production for the week amounted to 12,957,120 lbs. of a value of \$417,762. The year's production to date amounts to 519,127,290 lbs. of a value of \$22,059,288.

Calamine.—The market was firm, prices averaging around \$39.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	60.00	58.75	60.25
September	65.00	45.00	55.00	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Buyers withdrew from the spelter market as suddenly as they entered and producers who had figured that the upward movement in prices would compel consumers to cover requirements found that users were well protected and in a position to ignore the higher levels. Prices receded and business has been very dull. The speculative buyers withdrew following the submarine scare and have been absent since. What induced them to buy still remains a mystery, although there have been reports that some heavy foreign buying was about to materialize.

Prime western spelter moved off to 9¾ cts. New York and 9.55 cts. St. Louis for spot, while brass special eased off to 11 cts. St. Louis for spot. Prime western for November receded to 9.55 cts. St. Louis, with December down to 9.50 cts. and first quarter to 9¾ cts. Consumers have shown no interest in the metal.

As pointed out in this report 3 weeks ago, the situation is regarded by consumers as not warranting any fear of a drastic upward turn in prices and therefore there is no need

to cover needs well into the future as they did copper. The London market has also declined, spot dropping to £54 10s and futures to £51.

Quotations for spelter per pound at New York and per ton at London for the week ended Oct. 18 were as follows:

	New York.	London	
	Spot.	Spot.	Futures.
Oct. 12.....	*.....	£56 0 0	£51 10 0
13.....	9 $\frac{1}{2}$ c	56 0 0	51 10 0
14.....	9 $\frac{3}{4}$ c	56 0 0	51 10 0
16.....	9 $\frac{3}{4}$ c	54 10 0	51 0 0
17.....	9 $\frac{3}{4}$ c	53 0 0	50 0 0
18.....	9 $\frac{3}{4}$ c	53 6 0	50 0 0

*Holiday.

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	1916	1915	1916	1915	
	High.	Low.	Avg.	Avg.	
January	19.42 $\frac{1}{2}$	17.30	18.801	6.519	89.840
February	21.17 $\frac{1}{2}$	18.67 $\frac{1}{2}$	20.094	8.866	97.840
March	20.50	16.50	18.40	10.125	100.720
April	19.37 $\frac{1}{2}$	17.75	18.76	11.48	98.103
May	17.50	13.75	15.98	15.825	89.507
June	13.62 $\frac{1}{2}$	11.25	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August	9.75	8.37 $\frac{1}{2}$	9.11 $\frac{1}{2}$	16.110	56.00
September	9.70	8.12 $\frac{1}{2}$	9.22	14.493	51.30
October				14.196	
November				16.875	
December				16.675	
Year				13.914*	66.950

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—There has been no change in the situation in the interim. Demand continues quite steady with the supply short and the price holds firmly at \$80 per flask for spot virgin metal. Foreign buyers are in the market, while domestic consumers appear to be seeking forward protection. Although there are no signs of an early change in the price, an advance would not surprise the trade in view of the scarcity.

Antimony.—On a fair amount of buying by Canadian consumers the price of antimony has advanced to 13 cts. for spot. Sellers reported that Italy was also in the market and took a fair amount for early shipment. Domestic consumers, however, are not greatly interested. As many of the domestic users are still taking antimony which they purchased last spring, at prices ranging from 45 cts. down to 30 cts., they are now inclined to wait until they actually need metal before again entering the market. The largest Chinese importer has been out of the market on spot goods, while other importers declare that supplies here are small. Most of the recent business has been for spot, but a fair amount of selling was done in November and December delivery.

Tungsten.—Business has been extremely quiet and sellers here state that it would be difficult to secure \$15 a unit from domestic consumers. Telegraphic advices from Colorado and California indicate that ore sellers in the west are asking \$20 a unit, but with eastern sellers unable to secure even \$15 the western price is out of the question. Leading consumers are importing large quantities from South America and are therefore independent of the domestic ore.

Platinum.—There has been no essential change in the situation in this metal. Refiners state that there is a fair demand, with the market steady at \$90 an ounce for soft and \$96 for hard metal.

Nickel.—Business is small in nickel with the market unchanged at 45 cts. for shot and ingots and 40 cts. for electrolytic metal. Sellers report that a few domestic orders have been obtained, but that foreign business is restricted.

Pig Iron.—Price advances in pig iron continue frequent and the upward movement is assuming a pace that is similar to that noted in steel about a year ago. Bessemer iron has sold up to \$24 valley and basic at \$20.50 valley.

Foundry grades are also securing a share of the activity, all prices being up from 50 cts. to \$1 a ton, while the cleaning of furnace banks has resulted in premiums on spot shipments.

Ferromanganese.—As yet there has been no change in ferromanganese prices, but an advance is looked for, especially with pig iron mounting to very high levels. Domestic producers are offering freely at \$166 delivered, while English alloy is obtainable at \$164 seaboard, although one sale at \$162 seaboard is noted.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06 $\frac{1}{4}$	to	.06 $\frac{1}{2}$
Nitric, 40 deg.....	.06 $\frac{1}{4}$	to	.07
Alcohol—U. S. P., gal. grain.....	2.70	to	2.72
Denatured, 188 proof, gal.....	2.68	to	2.70
Wood, 97 p. c.....	.70	to	.72
Alum—Powdered, lb.....	.04 $\frac{1}{2}$	to	.04 $\frac{1}{2}$
Lump, lb.....	.04	to	.05 $\frac{1}{2}$
Ground, lbs.....	4.10	to	4.12 $\frac{1}{2}$
Ammonia—			
Muriate, white grain, lb.....	.10 $\frac{1}{4}$	to	.11 $\frac{1}{4}$
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.05 $\frac{1}{2}$	to	.06
Red, lb.....	.62 $\frac{1}{2}$	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13 $\frac{1}{2}$	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	4.00	to	4.25
Foundry.....	3.75	to	4.00
Copperas—Spot, lb.....	1.35	to	1.50
Ferromanganese.....	165.00	to	....
Ferrosilicon, 50%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12 $\frac{1}{2}$
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
Lead—Granulated, lb.....	.14 $\frac{1}{2}$	to	.15 $\frac{1}{2}$
Brown sugar.....	.11 $\frac{1}{2}$	to	.12
White crystals.....	.13 $\frac{1}{2}$	to	.15
Broken, cakes.....	.12 $\frac{3}{4}$	to	.13 $\frac{1}{2}$
Powdered.....	.17	to	.17 $\frac{1}{2}$
Litharge, American, lb.....	.09	to	.09 $\frac{1}{2}$
Mineral Lubricants—			
Black summer.....	.13 $\frac{1}{2}$	to	.14
29 gr., 15 c. l.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37 $\frac{1}{2}$	to	.38
Wool grade, 30 gr.....	.19 $\frac{1}{2}$	to	.20
Paraffin—High viscosity.....	.29 $\frac{1}{2}$	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28 $\frac{1}{2}$
Nickel Salt, double.....	.07 $\frac{1}{2}$	to	.08 $\frac{1}{2}$
Single.....	.10 $\frac{1}{2}$	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	90.00	to	96.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.39 $\frac{1}{2}$	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.45	to	.50
Prussiate, yellow.....	.63	to	.65
Prussiate, red.....	1.85	to	2.00
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.29 $\frac{1}{2}$	to	.30
Soda—Ash, 48% (43% basis), bbl.....	3.00	to	3.65
Strontia Nitrate, casks, lb.....	.32	to	.35
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.13 $\frac{1}{2}$	to	.14
Crystals, bbls., lb.....	.28	to	.29 $\frac{1}{2}$
Oxide, lb.....	.44	to	.46
Zinc Chloride.....	.10 $\frac{1}{4}$	to	.11 $\frac{1}{4}$

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest Date	Amt.					Paid in 1916	Total to date	Latest Date	Amt.
Acacia, g.	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,915	\$1	\$.....	\$98,916	Sept. ... '01	\$0.01
Adams, e. l. c.	Colo.	80,000	10	.....	778,000	Dec. 18, '09	.04	Golden Star, g.	Ariz.	400,000	5	.....	120,000	Mar. 16, '10	.05
Adventure, c.	Mich.	100,000	25	50,000	50,000	July 20, '16	.04	Gold' Com. Fra. g.	Nev.	922,000	1	.....	92,311	Oct. 15, '09	.10
Ahmeek, c.	Mich.	200,000	25	1,500,000	5,250,000	July 10, '16	3.00	Goldfield Con.	Nev.	3,559,148	10	.....	23,999,831	Oct. 31, '16	.10
Alaska Goldfields.	Alaska	250,000	6	.....	403,250	Jan. 10, '15	.15	Good Hope, g. s.	Colo.	500	100	.....	941,250	Jan. ... '08	.25
Alaska Mexican, g.	Alaska	180,000	6	.....	3,607,381	Nov. 28, '15	.10	Good Sp. Anchor, z. s.	Nev.	550,000	1	33,000	119,765	June 15, '16	.01
Alaska Mines Sec.	U. S.	600,000	6	.....	90,000	Nov. 1, '06	.....	Grand Central, g.	Utah	600,000	1	.....	1,545,200	Dec. 23, '16	.02%
Alaska Treadwell, g.	Alaska	200,000	25	250,000	15,780,000	May 29, '16	.50	Grand Gulch. c. s.	Nev.	239,845	2.60	17,790	19,187	Sept. 6, '16	.03
Alaska United, g.	Alaska	180,200	6	54,080	2,045,270	Feb. 28, '16	.30	Granite, g.	Alaska	430,000	1	17,200	17,200	May 10, '16	.02
Alouette, c.	Mich.	100,000	25	450,000	650,000	July 15, '16	2.00	Owin, g.	Cal.	100,000	10	.....	481,500	Feb. ... '06	.25
Amalgamated, c.	Mont.	1,538,529	100	.....	103,444,983	Aug. 30, '15	3.77	Hazel, g.	Cal.	900,000	1	.....	1,114,000	Jan. 5, '16	.01
Am. Sm. & R. com.	U. S.	600,000	100	2,600,000	31,533,333	Sept. 1, '16	1.50	Hecla, s. l.	Idaho	1,000,000	0.25	1,110,000	4,855,000	Sept. 20, '16	.15
Am. Sm. & R. pf.	U. S.	500,000	100	2,625,000	67,421,386	Sept. 1, '16	1.75	Hercules,	Idaho	1,000,000	1	1,850,000	12,600,000	Sept. 15, '16	.20
Am. Sm. Sec. A. pf.	U. S.	170,000	100	765,000	11,455,000	July 1, '16	1.50	Hidden Treasure, g.	Cal.	30,000	10	.....	457,452	Sept. ... '00	.10
Am. Sm. Sec. B. pf.	U. S.	300,000	100	1,125,000	16,635,000	July 3, '16	1.25	Holy Terror, g.	S. D.	600,000	1	.....	172,000	Jan. ... '00	.01
Am. Zinc, L. & Sm.	Mo.	133,120	25	2,756,180	3,806,000	Aug. 1, '16	1.50	Homestake, g.	S. D.	251,169	100	1,462,286	37,174,994	Sept. 25, '16	.65
Anacoda, c.	Mont.	2,331,250	60	11,656,250	175,914,271	Aug. 28, '16	2.00	Hope Dev.	Cal.	600,000	1	.....	6,000	Dec. 31, '16	.01
Annie Laurie, g.	Utah	25,000	100	.....	439,561	Apr. 22, '06	.50	Horn Silver, l. s. z.	Utah	400,000	1	40,000	5,182,000	June 30, '16	.06
Argonaut, g.	Cal.	200,000	5	55,000	1,695,000	Sept. 25, '16	.07%	Imperial, c.	Ariz.	600,000	10	.....	300,000	June 24, '07	.20
Arizona, c.	Ariz.	.....	.....	521,164	20,212,164	Apr. 1, '16	.....	Inspiration Con.	Ariz.	920,687	20	3,091,233	3,091,233	July 31, '16	2.00
Atlantic, c.	Mich.	100,000	25	.....	990,000	Feb. 21, '05	.60	Inter'l Nickel, com.	U. S.	1,673,384	25	7,948,574	33,451,411	Sept. 1, '16	2.00
Bagdad-Chase, g. pf.	Cal.	84,819	6	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, pf.	U. S.	89,125	100	401,067	5,748,613	Aug. 1, '16	1.60
Bald Butte, g. s.	Mont.	250,000	1	.....	1,354,848	Nov. 1, '07	.04	Intern'l Sm. & Ref.	U. S.	100,000	100	.....	4,100,000	May 2, '14	2.00
Baltic, c.	Mich.	100,000	25	60,000	2,950,000	Dec. 31, '16	2.00	Interstate-Callahan	Idaho	444,990	10	2,092,455	4,649,900	Sept. 30, '16	1.60
Barnes-King, g.	Mont.	40,000	6	60,000	80,000	June 1, '16	.07%	Iowa, g. s. l.	Colo.	1,666,667	1	.....	270,167	Dec. 31, '16	.00%
Beck Tunnel Con.	Utah	1,000,000	0.10	.....	940,000	Nov. 16, '07	.02	Iowa Tiger, g. s. l.	Colo.	3,000	1	.....	25,179	Jan. 15, '16	.50
Big Four Expl.	Utah	400,000	1	100,300	110,000	Sept. 4, '16	.05	Iron Blossom, l. s. g.	Utah	1,000,000	1	260,000	2,750,000	July 20, '16	.10
Board of Trade, z.	Wis.	120,000	1	.....	75,000	Jan. 15, '11	.06	Iron Cap pf. d. c.	Ariz.	33,481	10	6,422	29,803	July 1, '16	.35
Bonanza Dev.	Colo.	360,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Clad, g.	Colo.	1,000,000	1	.....	60,000	Nov. ... '06	.06
Booth (Reorganized)	Nev.	998,295	6	549,949	349,949	June 26, '16	.06	Iron Silver,	Colo.	600,000	20	.....	5,050,000	Dec. 31, '16	.10
Boss, g.	Nev.	408,500	1	.....	40,850	Dec. 10, '14	.10	Isabella, g.	Colo.	2,250,000	1	.....	742,500	Mar. ... '01	.01
Boston & Colo. Sm.	Colo.	15,000	10	.....	402,350	Oct. ... '02	.75	Iste Royale, c.	Mich.	150,000	25	150,000	300,000	July 31, '16	1.00
Bost. & Mont. Con.	Mont.	100,000	25	.....	63,225,000	May 16, '11	4.00	Jamison, g.	Cal.	390,000	10	.....	378,300	Jan. ... '11	.02
Breece, l. s.	Colo.	200,000	26	.....	220,000	Dec. 15, '13	.10	Jerry Johnson, g.	Colo.	2,600,000	10	.....	187,500	Nov. 5, '14	.00%
Brunswick Con. g.	Cal.	300,000	1	.....	208,315	Sept. 15, '16	.06	Jim Butler,	Nev.	1,718,020	1	343,604	515,406	Aug. 1, '16	.10
Bullion-B & Champ	Utah	100,000	10	.....	2,768,400	July 11, '08	.10	Joplin Ore & Spelter	Mo.	400,000	6	62,000	62,000	July 22, '16	.04%
Bunker Hill Con. g.	Cal.	200,000	1	45,000	896,000	Sept. 4, '16	.02%	Jumbo Exh. g.	Nev.	1,550,000	1	194,000	694,998	June 30, '16	.05
Bunker Hill & Sull.	Idaho	77,000	10	1,315,000	18,015,000	Sept. 5, '16	.40	Kendall, g.	Mont.	600,000	5	80,000	1,555,000	Apr. 3, '16	.10
Butte Alex Scott,	Mont.	75,000	10	844,662	1,064,119	Apr. 10, '16	10.50	Kenefick Zinc,	Mo.	200,000	.....	80,000	60,000	June 30, '16	.10
Butte-Ballila, c.	Mont.	250,000	10	.....	125,000	Aug. 1, '10	.60	Keunecott, c.	Alas.	2,780,990	10	11,200,000	16,200,000	Sept. 30, '16	1.50
Butte Coalition, c.	Mont.	1,000,000	16	.....	4,700,000	Dec. 1, '11	.26	Kennedy, g.	Cal.	100,000	100	.....	1,801,001	July 2, '09	.05
Butte & Superior, z.	Mont.	272,697	10	7,676,734	13,198,765	Sept. 30, '16	6.25	King of Arizona, g.	Ariz.	200,000	1	.....	398,000	Aug. 2, '09	.12
Caledonia, l. s. c.	Idaho	2,605,000	1	703,350	1,586,091	Sept. 5, '18	.03	Klar Piquett, s.	Wis.	20,000	1	.....	167,600	Dec. 16, '12	.25
Calumet & Ariz. c.	Ariz.	641,923	10	3,849,822	26,997,847	Sept. 25, '16	2.00	Kob Hill, g.	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%
Calumet & Hecla, c.	Mich.	100,000	25	5,000,000	134,250,000	Sept. 22, '16	1.00	La Fortuna, g.	Utah	250,000	1	.....	1,200,500	Oct. ... '02	.01%
Camp Bird, g.	Colo.	1,760,000	25	113,654	10,243,564	Jan. 1, '16	.17%	Lake View,	Utah	500,000	.05	60,000	114,600	June 12, '16	.01
Cardiff, s. l.	Utah	600,000	1	375,000	600,000	Sept. 19, '16	.25	Last Dollar, g.	Colo.	1,600,000	1	.....	180,000	Feb. 23, '08	.02
Carissa, g. s. c.	Utah	600,000	25	.....	60,000	Dec. ... '06	.01	Liberty Bell, g.	Colo.	133,551	6	.....	1,762,796	Jan. 31, '16	.06
Centennial, c.	Mich.	1,000,000	1	100,000	100,000	Sept. 1, '16	1.00	Lightner, g.	Cal.	102,555	1	.....	331,179	June ... '06	.06
Centennial Eureka,	Utah	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Linden, z.	Wis.	1,020	10	.....	11,200	Dec. 31, '16	3.00
Center Creek, l. z.	Mo.	100,000	10	70,000	665,000	Sept. 1, '16	.15	Little Bell, s. l.	Utah	300,000	1	15,000	75,000	Apr. 22, '16	.05
Central Eureka, g.	Cal.	100,000	1	.....	798,159	Mar. 6, '08	.05	Little Florence,	Nev.	1,000,000	1	.....	430,000	Jan. ... '08	.03
Century, g. s. l.	Utah	1,000,000	1	44,000	392,087	Feb. 16, '16	.06	Lost Packer,	Idaho	150,000	1	.....	37,600	Oct. 23, '13	.25
Champion, c.	Mich.	100,000	25	5,640,000	15,610,000	Sept. 8, '16	6.40	Lower Mammoth,	Utah	1,000,000	1	.....	67,000	Dec. 15, '16	.01
Chiel Con.	Utah	892,960	1	132,323	438,390	Aug. 2, '16	.05	MacNamara, g. s.	Nev.	734,676	1	.....	46,800	Apr. 23, '05	12.00
Chino Copper Co.,	N. M.	869,990	6	5,002,385	11,700,377	Sept. 30, '16	2.25	Magma, c.	Ariz.	240,000	6.00	300,000	600,000	Sept. 30, '16	.60
C. K. & N. g.	Colo.	1,431,900	1	.....	171,828	Nov. ... '04	.01	Mammoth, g. s. c.	Utah	400,000	10	60,000	2,380,000	June 30, '16	.06
Cliff, g.	Alaska	100,000	1	.....	115,000	Feb. 5, '14	.05	Manhattan-Big 4, g.	Nev.	762,000	1	.....	30,248	Aug. 16, '11	.02
Cliff, s. l.	Utah	300,000	10	.....	90,000	Jan. 1, '13	.10	Mary McKinney, g.	Colo.	1,309,252	1	.....	1,169,306	July 28, '14	.02
Clinton, g. s.	Colo.	1,000	100	.....	60,000	Dec. ... '03	.30	Mary Murphy, g. s. l. z.	Colo.	370,000	6	25,067	93,106	May 1, '16	.07
Colo. O. Dredging,															

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah	500,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04	Success.....	Ida.	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03	
Pharmacist, g.	Colo.	1,600,000	1	91,600	Feb. 1, '10	.00%	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Sept. 30, '16	1.00	
Phelps, Dodge & Co	U. S.	450,000	100	57,371,627	Sept. 30, '16	8.00	Superior & Pina, c.	Ariz.	1,499,792	10	10,318,568	Dec. 21, '15	.30		
Pioneer, g.	Alaska	5,000,000	1	2,041,626	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	9,420,000	July 23, '07	4.00		
Pittsburg, I. E.	Mo.	1,000,000	1	20,000	July 16, '07	.02	Tamarack-Custer...	Idaho	2,000,000	1	108,675	Aug. 30, '16	.02		
Pittsburg-Idaho, I.	Ida.	1,000,000	1	243,104	July 16, '13	.04	Tennessee, c.	Tenn.	200,000	25	5,206,250	Apr. 15, '16	.75		
Platts Silver Peak...	Nev.	2,790,000	1	840,600	Dec. 1, '14	.02	Tightner, c.	Cal.	100	100	160,000	Jan. 3, '14	....	
Platteville, I. z.	Wis.	600	60	179,500	June 16, '07	10.00	Tomboy, g. s.	Colo.	310,000	5	3,961,555	June 30, '16	.24		
Plumas Eureka, g.	Cal.	150,625	10	2,851,294	Apr. 3, '01	.06	Tom Reed, g.	Ariz.	909,655	1	2,655,934	Sept. 5, '16	.01		
Plymouth Con.	Cal.	240,000	6	259,364	Apr. 10, '16	.24	Ton. Belmont, g.	Nev.	1,600,000	1	8,265,627	July 1, '18	.12%		
Portland, g.	Colo.	3,000,000	1	10,447,080	July 20, '16	.03	Ton. Extension, g. s.	Nev.	1,272,501	1	1,400,856	July 1, '16	.15		
Prince Con., s. l.	Nev.	1,000,000	2	175,000	300,000	Sept. 5, '16	.06	Tonopah, g. s.	Nev.	1,000,000	1	13,450,000	July 21, '16	.16	
Quartette, g. s.	Nev.	100,000	10	375,000	July 31, '07	.20	Tonopah Midway, g.	Nev.	1,000,000	1	250,000	Jan. 1, '07	.06%		
Quicksilver, pf.	Cal.	43,000	100	1,931,411	Apr. 8, '03	.50	Tremmies, c.	Cal.	200,000	2.50	234,000	Apr. 28, '15	.02		
Quip, g.	Wash.	1,600,000	1	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	1,100,000	Oct. 30, '12	.60		
Quincy, c.	Mich.	110,000	25	22,987,500	Sept. 25, '16	4.00	Tuolumne, c.	Mont.	800,000	1	495,525	Apr. 15, '13	.05		
Ray Con., c.	Ariz.	1,671,279	10	7,322,875	Sept. 30, '16	.75	Ucle Sam Con. s.	Utah	500,000	1	470,000	Sept. 20, '11	.05		
Red Metal, c.	Mont.	100,000	10	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	167,070	Nov. 16, '15	.10		
Red Top, g.	Nev.	1,000,000	1	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	50,000	100	1,500,000	Apr. 15, '07	3.30		
Republic, g.	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	6,125,000	Aug. 3, '07	1.75		
Richmond, g. s. l.	Nev.	54,000	1	4,463,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	26	211,627	Oct. 15, '07	.60		
Rocco Home, I. s.	Nev.	300,000	1	152,500	Dec. 22, '06	.02	United Copper, c. s.	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01		
Rochester Ld. & L.	Mo.	4,900	100	130,946	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1	440,435	Jan. 1, '10	.04		
Round Mountain, g.	Nev.	889,018	1	353,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	3,749,000	Sept. 30, '16	.00		
Sacramento, g.	Utah	1,409,466	10	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	50,000	100	11,000,000	Sept. 23, '10	6.00		
St. Joseph, I.	Mo.	1,409,466	10	1,161,330	Sept. 20, '16	.75	United Verde, c.	Ariz.	300,000	10	2,925,000	Sept. 9, '16	1.60		
St. Mary's M. L.	Mich.	160,000	25	2,403,000	Sept. 13, '16	2.00	United Verde Ext.	Ariz.	1,000,000	50	500,000	Aug. 1, '16	.50		
Schoenbr-Wal'n. z. i	Mo.	10,000	10	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo.	59,188	100	414,078	Oct. 9, '03	1.00		
Scratch Gravel.	Cal.	1,000,000	1	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,458	100	1,775,936	Oct. 1, '07	1.50		
Seven Tro. Co., g. s.	Nev.	1,443,077	1	252,532	Apr. 1, '16	.02%	U. S. S. R. & M. com	USMx	351,116	60	965,566	July 15, '16	1.00		
Shannon, c.	Ariz.	300,000	10	750,000	Jan. 30, '13	.50	U. S. S. R. & M. pf.	USMx	486,350	60	1,288,668	July 15, '16	.87%		
Shattuck-Ariz., c.	Ariz.	350,000	10	4,200,000	July 20, '16	1.25	Utah, c.	Utah	1,624,490	10	13,808,165	Sept. 30, '16	3.00		
Silver Hill, g. s.	Nev.	108,000	1	88,200	June 24, '07	.05	Utah Apex, s. l.	Utah	528,200	5	396,154	Sept. 30, '16	.25		
*Silver King Coal'n	Utah	1,250,000	6	14,147,485	July 1, '16	.15	Utah Con., c.	Utah	300,000	5	9,825,000	Sept. 26, '16	.75		
Silver King Con.	Utah	637,582	1	942,373	July 22, '15	.10	Utah M. & T. f.	Utah	750,000	1	1,285,493	Aug. 15, '16	.50		
Silver Mines Expl.	N. Y.	10,000	100	250,000	June 16, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	May 29, '16	1.00		
Stoux Cons. I. & c.	Utah	746,389	1	872,105	July 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	207,500	Apr. 23, '10	.04		
Skidco, g.	Cal.	1,000,000	6	365,000	Oct. 2, '14	.01	Vindicator Con., g.	Colo.	1,600,000	1	3,937,500	July 25, '16	.03		
Smuggler, s. l. z.	Idaho	1,000,000	1	2,235,000	Nov. 22, '06	.08	Wasp No. 2, g.	S. D.	500,000	1	648,466	May 15, '16	.02%		
Snowstorm, c.	Idaho	1,000,000	1	1,168,610	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,000,000	1	1,050,000	July 1, '16	.02		
Socorro, c.	N. M.	377,342	6	136,070	Aug. 1, '16	.05	West End Con.	Nev.	1,788,456	1	638,545	Jan. 15, '16	.05		
South Eureka, g.	Cal.	299,381	1	1,409,754	Aug. 15, '16	.07	West Hill, c.	Wis.	20,000	1	40,000	June 29, '16	.20		
South Hecla, c.	Ida.	500,000	1	39,450	Aug. 10, '16	.16	White Knob, g. pf.	Cal.	200,000	10	190,000	Aug. 25, '16	.10		
So. Swansea, g. s. l.	Utah	300,000	1	287,600	Apr. 3, '04	.01%	Wilbert, c.	Ida.	1,000,000	1	30,000	Aug. 15, '16	.01		
Spearfish, g.	S. D.	1,600,000	1	165,500	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	8,760,000	Apr. 1, '16	6.00		
Standard Con., g. s.	Cal.	178,394	10	5,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,674	15	53,403	....	.25
Standard, c.	Ariz.	425,000	1	69,600	Sept. 8, '05	.50%	Wark, g.	Colo.	1,500,000	1	1,597,955	Apr. 31, '12	.02		
Stewart, I. z.	Idaho	1,238,362	1	2,043,297	Dec. 31, '16	.05	Yak.	Colo.	1,000,000	1	2,127,655	June 30, '16	.07		
Stratton's Crip. Ck.	Colo.	2,000,000	1	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	167,500	Feb. 1, '13	.01		
Stratton's Ind.	Colo.	1,000,000	5	6,028,568	Dec. 23, '06	0.12	Yellow Aster, g.	Cal.	100,000	10	1,131,759	Sept. 1, '16	.02		
Str'n's Ind. (new) g.	Colo.	1,000,000	.30	691,250	Jan. 31, '16	.16	Yellow Pine, z. l. e.	Nev.	1,000,000	1	1,593,000	Sept. 15, '16	.10		
Strong, g.	Colo.	1,000,000	1	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	102,583	July 15, '14	.10		

Corrected to October 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				
					Paid in 1916	Total to Date	Latest								Paid in 1916	Total to Date	Latest		
							Date	Amt.									Date	Amt.		Date	Amt.
Ajuchitlan,	Mex...	50,000	\$ 5	\$.....	\$237,600	July 1, '13	\$0.25		Las Cebillras,	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00			
Amistad y Concordia g.s	Mex...	9,600	60		429,358	July 16, '08	1.28		Le Roi No. 2, g.	B. C.	120,000	25		1,627,320	Dec. 15, '15	\$0.24			
Amparo, s. g.	Mex...	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.05		Lucky Tiger,	Mex...	715,337	10		379,129	3,812,520	Sept. 20, '16	.05		
Barlo de Medina Mill	Mex...	2,000	25		103,691	Aug. 1, '07	.50		McKinley-Darragh-Sev.	Ont.	2,247,892	1		202,293	4,810,061	July 1, '16	.03		
Batopilas, s.	Mex...	446,268	20		55,870	Dec. 31, '07	.12%		Mexican, I. pf.	Mex...	12,500	100		1,018,750	May 1, '12	3.50			
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03		Mexico Con.	Mex...	240,000	10		660,000	Mar. 10, '08	.25			
Boleo, g.	Mex...	120,000	20		721,871	May 8, '11	6.00		Mexico Mines of El Oro	Mex...	180,000	6		1,478,500	June 26, '14	.96			
British Columbia, c.	B. C.	691,709	6		615,399	Jan. 6, '13	.16		Minas Pedrazzini, c.	Mex...	1,000,000	1		497,600	Jan. 23, '11	.06%			
Buena Tierra, c.	Mex...	330,000	6		160,350	Jan. 30, '15	.24		Mines Co. of Am.	Mex...	900,000	10		4,953,800	July 25, '13	.12%			
Buffalo, Ont.	Ont.	1,000,000	1		2,787,600	July 1, '14	.05		Mining Corp. of Canada.	Can.	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%			
Canadian Goldfields...	Can.	600,000	0.10		237,099	July 15, '14	.01%		Montezuma, I. pf.	Mex...	5,000	100		402,500	Nov. 15, '13	3.50			
Cananea Central, c.	Mex...	600,000	10		360,000	Mar. 1, '12	.05		Montezuma M. & Sm.	Mex...	500,000	1		100,000	July 20, '09	.04			
Cariboo-Cobalt, c.	Ont.	1,000,000	1		295,000	Sept. 1, '15	.09		Mother Lode,	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11			
Cariboo-McKinney, g.	B. C.	1,250,000	1		66,250	Dec. 1, '09	.00%		Nalca, s. l.	Mex...	100	300		3,190,000	Oct. 11, '09	\$23			
City of Cobalt,	Ont.	500,000	1		138,375	May 15, '09	.01		N. Y. & Hond. Rosario.	C. A.	200,000	10	220,000	3,970,000	July 23, '16	.05			
Cobalt Central, s.	Ont.	4,761,500	1		192,845	Aug. 24, '09	.01		Nipissing, s.	Ont.	1,200,000	6	900,000	4,340,000	July 20, '16	.25			
Cobalt Lake, s.	Ont.	3,000,000	1		465,000	May 23, '14	.02%		North Star, s. l.	B. C.	1,300,000	1		533,000	Feb. 1, '10	.02			
Cobalt Silver Queen...	Ont.	1,600,000	1		316,000	Dec. 1, '08	.03		Paloma, g.	Mex...	3,000	....		99,600	Dec. 1, '12	.50		
Cobalt Townsite, s.	Ont.	199,282	5		1,042,259	Aug. 20, '14	.24		Panuco, c.	Mex...	10,000	....		7,465,000	Nov. 4, '09	5.00		
Coolagras, s.	Ont.	800,000	6	400,000	8,240,000	Aug. 6, '16	.25		Peneoles, s. g.	Mex...	120,000	20		6,451,687	Sept. 30, '13	1.25			
Con. Mg. & Sm., g. s. c.	B. C.	63,050	100	490,517	2,740,654	July 1, '16	2.60		Peregrina, pf.	Mex...	10,000	100		328,656	Sept. 1, '10	3.50			
Crown Reserve, s.	Ont.	1,999,957	1		6,102,408	July 15, '15	.03		Peterson Lake,	Ont.	2,401,820	1	84,064	340,287	July 1, '16	.01%			
Dolores,	Mex...	400,000	6		1,374,865	July 24, '11	.22%		Pinguico, pf.	Mex...	20,000	100		790,000	Apr. 15, '13	3.00			
Dome Mines, s.	Ont.	400,000	10	600,000	1,000,000	Sept. 1, '16	.50		Porcupine Crown, ..	Ont.	2,000,000	1	180,000	600,000	July 2, '16	.03			
Do Estrellas, (El Oro)	Mex...	300,000	0.50		15,405,000	Sept. 30, '13	1.60		Providencia, (S. J.)	Mex...	6,000	15		963,360	Apr. 1, '08	1.00			
El Favor,	Mex...	3,600,000	1		210,000	Apr. 30, '14	.01		Rambler-Cariboo, ..	B. C.	17,500	100	70,000	490,000	Aug. 15, '16	.01			
El Oro, g. s.	Mex...	1,147,500	5		9,136,842	July 11, '13	.24		Rea Mines, Leasing	Ont.	200,000	1		12,750	Feb. 20, '15	.06%			
El Rayo, g. s.	Mex...	280,020	2		140,410	Apr. 24, '11	.16		Real of Way,	Ont.	1,685,500	1	16,855	660,614	June 15, '16	.00%			
El Triunfo, c.	Mex...	2,000,000	1		30,000	Aug. 28, '11	.01		Rio Plata,	Mex...	374,618	6		345,744	Feb. 1, '13	.05			
Esperanza, s. g.	Mex...	450,000	10		12,521,250	Dec. 31, '15	1.0		San Francisco Mill	Mex...	2,000	25		444,086	Oct. 15, '08	1.00			
Oranby Con. c. g.	B. C.	149,985	100		8,550,313	Aug. 1, '16	2.00		San Rafael,	Mex...	2,400	25		6,798,260	Jan. 11, '12	2.00			
Oreene-Cananea, c.	Mex...	474,411	100	2,431,405	6,666,850	Aug. 28, '16	2.00		San Toy, s.	Mex...	6,000,000	1.00		540,000	July 24, '13	.01			
Oreene Con., c.	Mex...	1,000,000	10	2,600,000	12,544,000	July 25, '16	1.00		Santa Gertrudis, Hdgo.	Mex...	1,500,000	6	364,500	2,819,772	June 16, '16	.24			
Greene Gold-Silver, pf.	Mex...	300,000	10		194,871	Mar. 28, '07	.40		Sta. Gert'y Guadalupe, g. s.	Mex...	60,000			3,960,000	Mar. 27, '09	1.00			
Ouanajuato Con., c.	Mex...	540,000	5		600,000	Oct. 8, '06	.07%		Sta. Maria del Paz, ..	Mex...	9,600	12%		5,606,000	Jan. 2, '13	2.50			
Ouanajuato Dev., pf.	Mex...	10,000	100		274,356	Jan. 1, '11	.30		Seneca-Superior, ..	Ont.	478,844	1	766,214	1,687,420	Sept. 15, '16	.30			
Guggenheim Explor.	Mex...	833,732	25	10,713,456	34,032,786	Apr. 3, '16	11.85		Soledad, s. l.	Mex...	960	20		4,439,840	Oct. 17, '11	8.00			
Haleybury, s.	Ont.	60,000	1		50,000	Apr. 6, '11	.50		Sorresra, g. s.	Mex...	19,200	20		3,979,240	Jan. 6, '11	34.00			
Hedley,	B. C.	120,000	10	180,000	2,003,620	Sept. 30, '16	.60		Standard, s. l.	B. C.	2,000,000	1	450,000	2,250,000	Sept. 10, '16	.02%			
Hinds Con., g. s. l.	Mex...	5,000,000	1		88,000	Feb. 27, '08	.02		Temiscam'g & Hud. Bay	Ont.	7,761	1		1,940,250	Nov. 10, '13	3.50			
Hollinger,	Ont.	4,000,000	1	1,440,000	6,610,000	Sept. 8, '16	.05		Temiskaming, s.	Mex...	2,600,000	3	75,000	1,834,150	July 22, '16	.03			
Himulco, c.	Mex...	10,000	100		975,000	Feb. 27, '11	.10		Tolman,	Mex...	1,000	100		1,855,000	Jan. 1, '09	1.50			
Kerr Lake, s.	Ont.	600,000	5	450,000	6,670,000	Sept. 15, '16	.26		Tough-Oake,	Ont.	531,600	6	199,311	265,750	July 3, '16	.12%			
La Blanca,	Mex...	140,000	20		2,776,700	Mar. 31, '13	.90		Tretheway, s.	Ont.	1,000,000	1		1,061,988	July 15, '14	.05			
La Republica, s.	Mex...	400,000	5		110,000	Aug. 15, '11	.06		Wettlauffer-Lorrain, s.	Ont.	1,416,690	1		656,386	Oct. 20, '13	.05			
La Rose Con., s.	Ont.	1,498,627	5	224,793	6,811,913	July 20, '16	.05		Yukon, r.	Y. T.	3,500,000	5	787,500	8,870,610	Sept. 30, '16	.07			

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CHICAGO

October 28, 1916.

Continuous Counter Current Agitation and Decantation

C. F. SPAULDING.

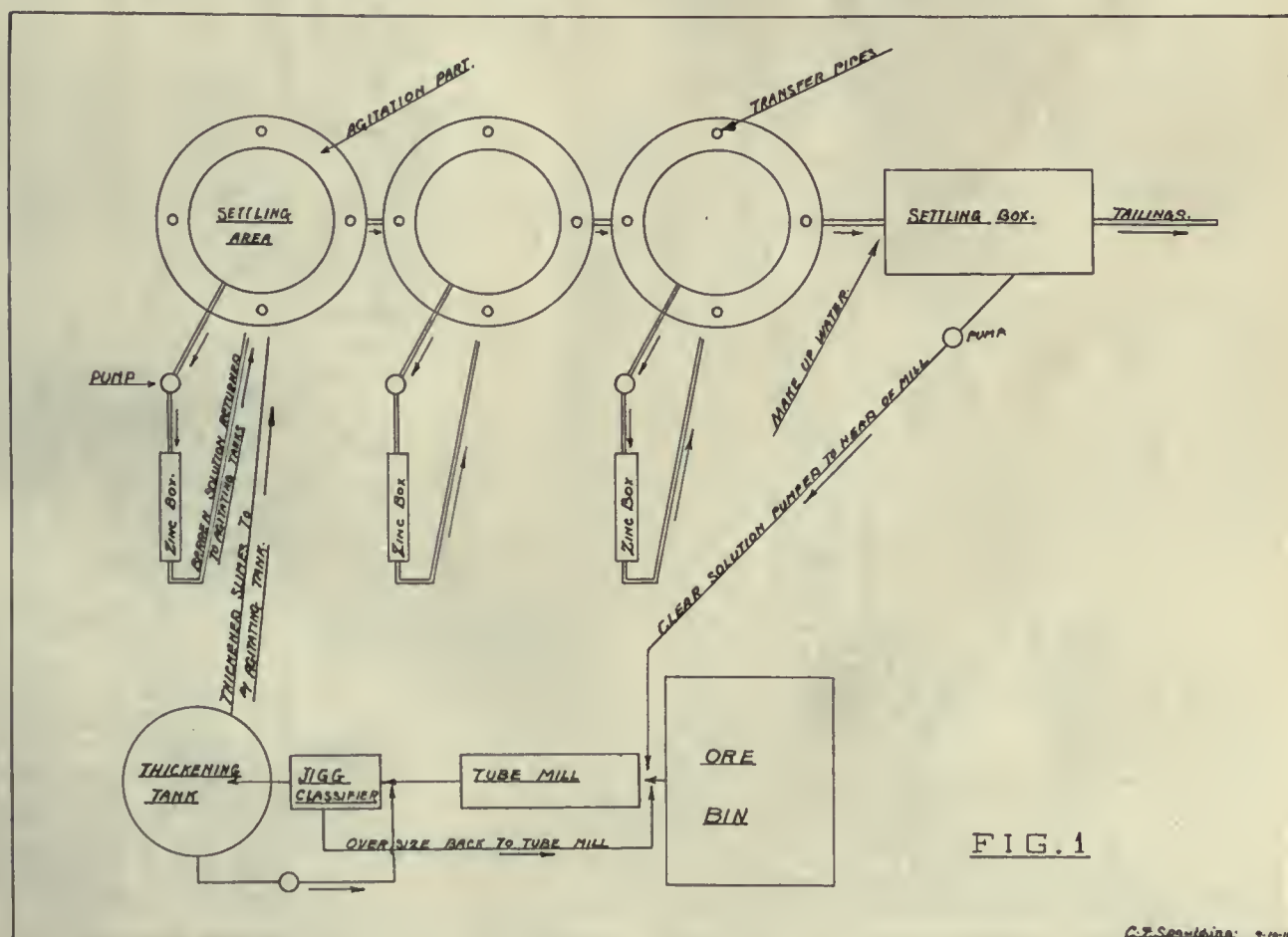
There is a very interesting article on "Counter Migration of Pulp and Solution in Cyanidation and Acid Leaching" by Bernard McDonald in the July 1st issue of the Mining and Engineering World.

Several years ago I built a small cyanide plant along those lines. There were three agitation tanks 20 by 20 ft., each tank being equipped with an inner annular ring, or tank, without top or bottom, and extending down 8 ft. from the top of the agitation tank. Each tank was equipped with four transfer pipes, substantially as described by Mr. McDonald.

The flow sheet of the mill is shown in Fig. 1. The ore as it came from the mine passed through a crusher to the ore bin, thence to a 5 by 22 ft. tube mill. The

discharge of the tube mill going to a 3-compartment jig classifier; the oversize returning to the tube mill and the slimes going to a thickening tank; the thickened pulp from the thickening tank going to No. 1 agitating tank, and the clear overflow being returned to the jig classifier.

In the agitating tanks the solids were settled out of the pulp in the inner ring; the clear solution (which usually stood 16 to 18 ins. above the surface of the pulp in the outer ring), was decanted off, and pumped by centrifugal pumps, to the zinc room at the top of the mill, some 40 ft. elevation above the agitating tanks. The pregnant solution passing through the zinc boxes, and the barren solution returning to the



agitating tanks, where it was forced into the bottom of the transfer pipes by gravity, assisting very materially with the agitation.

In 1910 at the Veta Colorado Mining & Smelting Co.'s cyanide plant at Parral, Mex., working with a base silver ore, I found by using barren cyanide solution for agitation instead of air agitation, that the time of agitation was cut from 72 hours to 48 hours, with an increased extraction of 15 to 20 grams silver.

The agitating tanks Nos. 2 and 3 were piped up similar to No. 1 tank, each tank having its own system of pumps and zinc boxes, etc.

The pulp as it passed out of the agitating tanks went to a V-bottomed settling box, the overflow solution being pumped to the head of the mill, and the settled tailings being discharged to waste. The make-up water for the mill was introduced at the head of the settling box.

In operating this mill I found that the area allowed for settling purposes was too small. To get around this difficulty I filled the inner settling space with clarifying filter leaves. The leaves were made with wooden frames filled with vertical wood slats and were covered with unbleached muslin. The muslin instead of being stitched through was held in place and kept from bulging by wood strips, spaced 12 ins. apart and held by carriage bolts. This construction worked out quite satisfactorily, and was considerably cheaper to install than regulation filter leaves with coco matting and canvas would have been.

The leaves were submerged in the thinned pulp and were connected to a manifold. At that time I was unable to secure a three-way valve that could be rigged up to work automatically, so I arranged the valves to be operated by hand, as it took 2 to 3 hours to form a cake, this was a minor item. The valves were arranged to cut off the vacuum pump and then allow the kick-off solution to enter the manifold and leaves under a low pressure; 10 lbs. pressure was used. This kicked-off the cake formed and allowed it to drop to the bottom of the agitating tank. The cakes being formed at a low vacuum and not being air dried or lifted from the pulp, were loose and flocculent and dissolved easily when they dropped to the bottom of the tank.

The introduction of the filter leaves solved the restricted settling area and also gave a clarified solution for precipitation, which was a good thing. I have been trying to settle solutions for precipitation purposes for a number of years, sometimes with good results and sometimes not so good. It seems that no matter how clear a decanted solution appears to be, it will foul zinc boxes much more rapidly than the same solution will after being passed through a clarifying filter. In decantation work one is usually crowding things to the limit, and unless watched very closely he can hardly avoid having a rush of slimes come over once in a while. I have stood on top of the Dorr thickening tanks at the Veta Colorado mill and have seen the slimes raise in the tanks until they began to run over the overflow lips; this condition would hold for a few minutes to half an hour, then things would go back to normal again. A certain proportion of this overflow solution was sent to the zinc house, where it was impoverished; this was done to keep the mill solutions from building up in silver; the muddy solution coming from the Dorr thickeners fouled the zinc boxes so badly that it forced the installation of clarifying filters.

McDonald's scheme is all right; the main points are to have sufficient settling area; or to install clar-

ifying filter leaves in the settling area; or, better yet, do both. All available data that I have been able to get, experimental and otherwise, show that 1 sq. ft. of settling surface will clarify 1 to 4 tons of solution per 24 hours. In the Dorr Cyanide Machinery Co.'s 1914 Bulletin, page 27, there is given some data on areas necessary to settle pulp:

Veta Colorado Co., Parral, Mex.

5 sq. ft. to settle 1 ton ore. Pulp 11 to 1.
5 sq. ft. to settle 11 tons solution.
1 sq. ft. to settle 2 1/5 tons solution.

At the Veta Colorado there were three 36 by 12 ft. Dorr thickening tanks; several times I had occasion to run all the pulp from the mill to one of these tanks; this meant settling some 3800 tons of pulp daily, or a duty of 3.3 tons of clear solution per square foot of tank area.

Noxia Scotia, Sonora, Mex.

5.4 sq. ft. to settle 1 ton of ore. Pulp 6 to 1.
5.4 sq. ft. to settle 6 tons of solution.
1 sq. ft. to settle 1.1 tons of solution.

Broken Hill Proprietary, Australia.

1356 sq. ft. to settle 5000 tons solution.
1 sq. ft. to settle 3.7 tons solution.

Another thing to figure on is to have some mechanical means of moving the settled solids towards the transfer pipes. I found that the circulation of the pulp in the outer ring did not assist in cutting down the cone formed in the center. When I estimated the size of the tanks I figured on a cone forming in the center of the tanks, with a slope of 45°. It formed all right, but the slope was nearer 90 than 45°. The sides would slide off and clog the transfer pipes. Some ores might not need this mechanical transference of the settled solids, but one experience without it is enough, and my next plant will have drag arms to move the settled solids, and will be designed along the lines of the flow sheet shown herewith.

In the mill I will change the agitating part from the outer ring to the inner ring, arranging the tanks similar to an elongated Dorr thickening tank, making the shaft driving the drag arms of 16 or 18 ins. extra heavy pipe, and utilizing this pipe as a transfer column. The settling action then is the same as it is in a standard Dorr thickening tank.

The solids, as they settle down, are dragged to the center of the tank. A certain proportion of the thickened pulp, equal to the tonnage coming into the tanks, is drawn off through the center draw-off plug, and passed to the next tank below. The balance of the thickened pulp is picked up by the agitating medium, either air or the solution coming up from the tank below, or both, and goes up through the transfer pipes to the top of the tank, where the solids begin to settle out, going through the same process again until they pass to the next tank, and finally out of the system.

The solution agitation may be assisted or not as desired by air agitation. Adding a little air along with the solution used for agitating accelerates the circulation of the pulp through the transfer pipes and also supplies the necessary oxygen. I have found that ordinarily the solutions will pick up enough oxygen from the surface contact with the air on top of the tanks and during the drop of a few inches from the top of the transfer pipes.

One tank at the Veta Colorado, using barren solution for agitation without any air, gave an increased extraction of 20 grams silver and cut the time for agitation from 72 hours to 40 hours. With air agitation,

as the solution becomes pregnant, the particles of gold and silver are surrounded with pregnant solution and the more gold and silver this solution carries the less its dissolving power. With solution agitation, as fast as the solution surrounding a particle of gold or silver becomes saturated, it is washed away or diluted with barren solution and stays in its most active form. It is a well-known fact that the old-fashioned agitation and decantation process, where the tanks were agitated, settled and decanted off, then more barren solution added and the tanks again agitated, settled and decanted, gave better extraction than the more modern processes of continuous agitation, either in series or separate charges followed by filter pressing in which the ore particles in the pulp stick pretty close to its own drop of solution.

Some 14 or 15 years ago I saw some interesting work done by the Holderman Filter Tank Co. of Salt Lake, with mechanical agitation. They used a horizontal shaft equipped with beater arms or paddles, the whole thing submerged in the pulp in a rectangular tank. This combination of mechanical beating with the air absorbed by the violently agitated mass gave an excellent and very rapid extraction. As I remember it seldom took over 30 minutes to put into solution all the soluble gold. They experimented with a number of ores from different parts of this country and Mexico.

An idea has occurred to me on which I am now working, and that is to enlarge the top of the transfer pipe in either a Pachuca or Parral tank, install therein a mechanical beater similar to that in a mechanically-driven flotation cell. Experiments on my tailings from a concentration and flotation plant, handling a complex lead-zinc-copper-silver ore, and to which are running too high in silver to suit, seem to indicate that mechanical beating in the top of the transfer pipes, combined with solution agitation, will cut the time of agitation 50 to 60% under what it would take with air agitation alone, and also give a higher recovery of the silver values.

An Original and Effective Mine Signal System.

The A. Hanna Coal Co., operating mines in northern Michigan, has equipped its shafts with a signaling system as effective as it is novel. Confronted with a signaling problem in connection with their cage operations, the mine officials co-operated with the Western Electric Co. in the design of a special system as indicated above.

The system and its operation are simple, being essentially as follows: At each of the various mine levels loud ringing extension bells are installed in pairs, each pair consisting of one 6-in. and one 8-in. weatherproof type loud-ringing gong. In connection with these bells, special switches are installed at each level. They consist of a telephone switch hook housed in a weatherproof cast iron casing. Attached to the switch hook and hanging from the casing is a long leather strap similar to the well-known street car strap. Pulling this strap makes contact and rings the 6-in. bells on every level, and one in the engineer's room. When a man has loaded a car and wants it hoisted, he pulls the leather straps a number of times—the number corresponding to a pre-arranged signal that corresponds to the operation desired. The bells ringing on each level in connection with the engineer's bell serves as a warning to the men on the various

levels. The 6-in. bells are on one circuit and the 8-in. bells on another—the latter being rung by the engineer when he is ready to hoist, or as a summons.

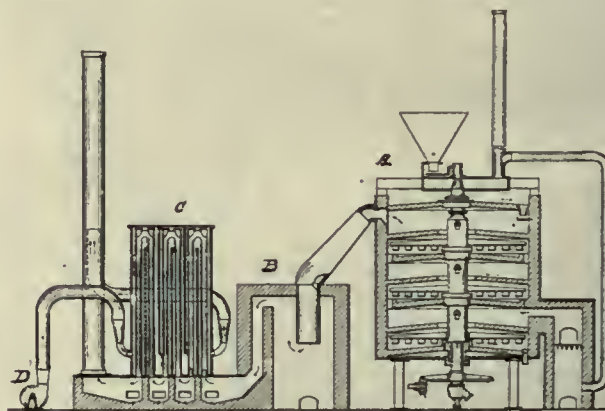
The wires of the signaling circuit are used for a telephone system, with a telephone set in the engineer's room, and a set on every level. The system is simply a magneto party line circuit, and is used as a means of communication in connection with the signaling system between the various levels and the levels and the engineer.

The company has placed great reliance in its new signal system and has taken great precaution to keep it in operation. A supplementary circuit has been wired so that if the ringing current in connection with the system should fail, warning bells will ring, summoning a repair man.

Recovering Quicksilver from Ores.

William H. Landers, of Almanden, Calif., has patented special apparatus for the recovery of quicksilver and assigned one-half interest to the Pacific Foundry Co., of San Francisco. The sectional view herewith illustrates the sequence of operations by which the quicksilver vapor is distilled off and the metal recovered without mingling with dust.

The ore in crushed condition, say from $\frac{3}{4}$ -in. mesh down, is roasted in the multiple hearth furnace. (A) The gases driven off, together with dust from the furnace, pass over into the dust settler. (B) In this settler the gases will remain hot enough to prevent the



LANDERS' METHOD OF RECOVERING QUICKSILVER.

precipitation or condensation of any quicksilver, and the settler has a form and is of such dimensions as to reduce the velocity of the gases and provide a quietness conducive to the settling out of the dust. The gases which now contain only a small amount of dust, if any, pass into through the condenser. (C) The quicksilver settles in the collecting boxes or trays of the condenser.

The condensation is due to the current air from the fan (D), passing through the baffle spaces of the condenser. The air quickly cools the pipes, and when it is liberated, it is in a heated condition and is discharged into the stack, increasing the draft and creating effective suction throughout the whole apparatus.

An important advance has been made within the past 2 years in the field of electrometallurgy in the development to a practical stage of an electrolytic process for the manufacture of iron.

Flotation at the Mt. Morgan Mine, Queensland

W. SHELLSHEAR.*

The Mount Morgan ore is a mixture of iron pyrites, copper pyrites, and gold in a quartzose gangue. There are two types of ore broken in the underground workings—smelting ore containing 40 to 50% silica, and ore too siliceous for economical smelting. This latter type of ore was treated by flotation, an approximate analysis being:

Copper	2.0%	Alumina	1.5%
Iron	10.0%	Calcium carbonate, al-	
Gold	5½ dwt.	kalis, etc.	3.5%
Silica	73.0%	Sulphur	10.0%

or, dividing the ore approximately into component minerals: Copper pyrites, 6%; iron pyrites, 16%; quartz calcite, etc., 78%. This analysis is only typical, and does not represent the average assay of the class of ore.

In order to carry on experiments on a large scale, a 6-box standard 24-in. Minerals Separation machine was installed. For 3 months occasional tests were made with the machine. It was then decided to convert the plant into a large-scale experimental unit treating 100 tons a day, in order that the value of concentrates produced would, to a large extent, defray experimental costs.

Following is a description of the plant, which, to the writer's knowledge, is the only dry-crushing plant used on a large scale for flotation treatment. The same ball mills, coarse crusher, and bins being used as were in use in the West Works before it closed down.

The ore from the shaft bins, approximately 6 ins. in size, was hauled in trucks and tipped into a bin of 400 tons capacity. From thence it was fed into a 24 by 16-in. Blake-Marsden crusher. The tonnage put through the machine was 10 to 15 tons per hour, and the horsepower was 20 to 26. The crushed product, varying in size from 1½ to 2 ins., was conveyed along one of the old West Works drier conveyors, and was elevated into bins above the ball mills by bucket elevators. Eight No. 5 ball mills were put into commission, of which six were constantly in use, traveling at 20 rpm. These were driven by pinion and spur-gearing off one main shaft, and each mill was capable of being thrown out of commission by means of clutch-gearing. Six-inch steel balls were added regularly with the feed so as to keep the normal weight of 1 ton of balls in each mill. Screens of 50-mesh were used (not I.M.M. standard screens), the average size of the crushed product being 10 to 15% + 60 mesh (I.M.M.).

Each mill took 15 hp. when crushing at its full capacity, which was approximately 0.9 to 1 ton per hour. The product from the ball mills passed into two fine-feed bins, each capable of holding 150 tons. To prevent escape of fine dust, each bin was lined with sheet iron. From these latter bins the ore was fed into the Minerals Separation plant by two Challenge feeders delivering into launders, with water pipes so arranged as to wet the ore with minimum escape of dust. The feeders were very accurate, and could control any required tonnage.

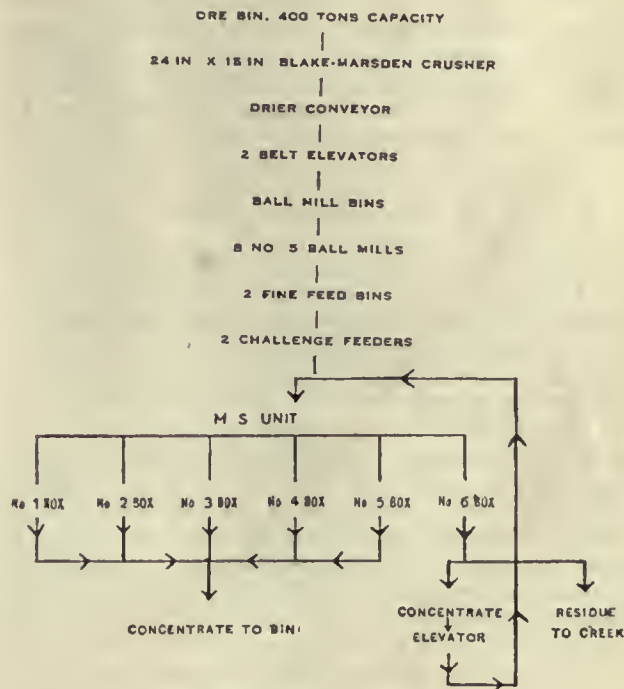
The arrangement for feeding the oil was similar to that at the Kyloe copper plant. The oil was supplied from a tank kept at a constant head by means of a ball valve which actuated a valve in the bottom of a

feed tank higher up. The speed of each agitator of the Minerals Separation machine was 205 revolutions, and the whole machine took from 55 to 60 hp., depending on the rate of feed.

The first one to five boxes were run for concentrates, and No. 6 box was returned to the feed by means of an elevator.

The concentrate was at first run into round vats, about 20 ft. in diameter and 10 ft. deep, with filter bottoms. These, however, were unsatisfactory, owing to the fact that the wet slime always kept to the outside of the vat and did not thoroughly drain. The difficulty was overcome by running the concentrate into a series of rectangular vats, 9 ft. 10 ins. by 10 ft. 9 ins., about 3 ft. deep, with cocoanut matting resting on a sand filter bed.

The concentrate was run through these in series, three or four always being in operation, and each vat



FLOW SHEET OF MOUNT MORGAN FLOTATION PLANT.

was filled with concentrate. No trouble, however, was experienced with this system. The drained water was perfectly clear, and the concentrate drained readily in 48 hours to 7 to 8% moisture. The residue was run into the creek.

Flotation Experiments.

As a general rule, acid is not used in the flotation of this type of ore, and this particular case was no exception. As typical of one of the many trial tests made on this plant before its conversion into a large-scale unit, the following results were obtained from a special quantitative test on a certain slope of the mine:

Data of Test.—Rate of feed, 15 tons per hour; dilution of pulp, 3.5 to 1; duration of run, 3 hours; ore (actual), 1 lb. per ton, eucalyptus being used; oil

*Excerpts from paper read before Australian Institute Mining Engineers.

was added—two-thirds to No. 1 mixer, one-third to No. 3 mixer.

Each flotation-box assayed separately gave the following results:

	Gold. dwt.	Copper. %	Iron. %	Silica. %
No. 1 box concentrate.....	55.52	16.28	34.49	10.10
No. 2 box concentrate.....	44.90	14.36	34.49	12.20
No. 3 box concentrate.....	40.00	12.54	32.72	17.33
No. 4 box concentrate.....	41.43	14.38	32.07	16.80
No. 5 box concentrate.....	25.30	8.10	27.03	32.81
No. 6 box concentrate.....	18.77	5.31	20.23	50.37

The theoretical recovery of gold in bulk on this test is about 76%, and, as seen from the sizing tests, it is much higher in the —120 grade than in any of the coarser grades. The relatively low recovery of gold as compared with that of copper led to a number of tests being carried out to try and find out the exact occurrence of the former.

Occurrence of Gold in Various Flotation Products.

Tests on Concentration of Ore by Tabling before Flotation.—Vanning tests, conducted in a dish in the laboratory on various stopes of the mine, indicated that a recovery of 40 to 50% of the gold could be obtained, but only about 30% of the copper, unless the crude ore vanned was very high in copper. On conducting flotation tests on the vanned residue more gold and copper were recovered. In the ore a high percentage of copper nearly always indicated a high gold content. The vanning concentrates, however, although much lower in copper than the flotation concentrates, were, as a general rule, higher in gold values.

Laboratory tests indicated strongly that, although the gold in bulk was associated with the copper, on fine crushing it certainly was not so associated. Tests were then conducted on a Wilfley table, sectional samples being taken every 9 ins. along the table to ascertain how the gold followed the various table products. Feed to table was crushed through 50-mesh screens on ball mills of main plant. Feed was sent direct to table without classification.

Table Details.—Speed, 260; stroke, $\frac{5}{8}$ -in.; fall, $\frac{1}{2}$ -in. per ft.; rate of feed, $1\frac{1}{4}$ tons per hour. A vanning test was conducted in a dish on a crude sample of sulphide ore assaying 25.14 dwt. of gold. After careful concentration a trace of very fine free gold could be seen on the edge of the dish. Concentrates produced were tested for tellurium, because, on rare occasions, telluride minerals have been found in this mine, but no trace was discovered.

Tests on Occurrence of Gold in Residue after Flotation.—A sample of residue from a large scale flotation test assayed 2.44 dwt. gold, 0.23% copper. The magnetite was removed carefully under water with a hand magnet, a fairly clean magnetite being obtained. This assayed 3.42 dwt. gold, proving that a certain proportion of the gold is with the gangue. The proportion of magnetite in the residue only represented a very small percentage of the total iron remaining there. The test indicated clearly that gold is not associated with copper.

Use of Sonstadt Solution.—A sample of flotation residue from a large-scale flotation test was taken assaying 4.40 dwt. gold, 0.55% copper. Sample was screened through an 80-mesh sieve. The —80 product was then screened through 120-mesh. The sand that remained on the 120-mesh sieve was used for the test. It assayed 5.13 dwt. gold and 0.74% copper.

Sonstadt solution was prepared by taking a saturated solution of potassium iodide in water and adding mercuric iodide till required specific gravity of

solution was obtained. In this case 150 grm. of the sand from the product sieved between —80 and +120-mesh was added to the Sonstadt solution and stirred well. The Sonstadt solution had to be kept warm to prevent it solidifying. The quartz product floated on top of the solution, and was skimmed off, filtered free of solution, and dried.

Assays of products obtained were—

	Gold. dwt.	Copper. %	Iron. %	Silica. %
Original product	5.13	0.74	.....	.....
Quartz product	3.91	0.05	1.45	95.50
Mineral product	9.79	1.85	34.95	18.40

As the mineral product contained 9.79 dwt. of gold, the copper and the iron in the quartz product certainly did not account for the total gold present. Therefore, the test proved that a certain percentage of the gold was associated with the quartz. In order to obtain still more information on this matter, the original sample of residue was screened through 120-mesh. The —120-mesh product was then screened through 180-mesh. The sand that remained on the 180-mesh screen was used for the second experiment. The test was conducted similarly to the first experiment, the quartz product being floated off the top of the Sonstadt solution. Assays of the quartz product were: Gold, 1.30 dwt.; copper, *nil*; iron, 0.79%. This test is of interest, as it clearly indicates that there was less gold associated with the quartz in the finer product. Hence, it seemed reasonable to assume that a certain amount of the gold associated with the quartz was liberated by finer crushing.

Tabling of Residue after Flotation.—Numerous tests were conducted on Wilfley tables in the experimental plant. The following are results of a typical test:

Table Details: Sectional Analysis.—Speed, 260; stroke, $\frac{5}{8}$ -in.; fall, $\frac{1}{2}$ -in. to ft.; feed, $\frac{3}{4}$ ton per hour. Feed crushed through 50-mesh screens and sent unclassified to table.

Average Extra Recovery of Gold by Tabling after Flotation.—Large-scale tabling tests proved that this varied considerably according to the stopes from which the ore was obtained, the recovery in some cases being practically *nil*, in others 10% on original feed. The following are the assay values on a typical table concentrate: 6.85 dwt. gold, 0.66% copper, 38.3% iron, 16.8% silica.

Examination of Flotation Concentrates.—Flotation concentrates were tested for tellurium, but no trace was found. A sample, being the —80 product of the first flotation-box concentrates and assaying 47.2 dwt., were vanned to see if any free gold was present. After long and careful vanning very fine free gold could be seen in the dish. This test proved conclusively that fine free gold floats, and that a certain proportion of it, at any rate, was free in the concentrates. It seemed reasonable to assume that the gold in the siliceous ore was free and in a very fine state of subdivision.

Flotation of the Iron.

As seen in figures of the flotation test, the recovery of iron was low. Results from many runs averaged 45 to 60%, the residue assaying 4 to 8% of iron. The percentage of iron varied considerably, according to the nature of the ore. The test indicated that gold was in a fine free state distributed through all the table products.

Recoveries of gold and copper during tests extending over a week at the experimental plant were

63.9 and 80.7% respectively. The results proved that some of the iron in the crude had no tendency to float even when crushed through 120-mesh. This was confirmed by numerous laboratory tests on ore crushed through 120-mesh. The average iron in flotation residue was 4 to 5%.

A sample of flotation residue from large-scale treatment was crushed through 120-mesh and was re-floated, giving the following results:

Product.	Gold. dwt.	Copper. %	Iron. %	Silica. %
Original residue	2.93	0.44	5.77	.....
Concentrate	13.71	5.53	21.1	46.14
Residue after refloating.....	1.63	0.20	4.98	.....
Recoveries on original residue	50.4	56.7	18.1	.....

The light color and general appearance of the iron in the residue indicated that it was marcasite which was identified in this class of ore by Messrs. Newman and Campbell Brown.¹ The concentrates from tabling after flotation were found to oxidize very rapidly—usually in about 24 hours—while flotation concentrates did not oxidize, even after standing for days. This proved that the iron pyrite in the flotation residue was either a different mineral from the iron pyrite in the flotation concentrate or else the oil or some other agent formed a protective coating over the mineral floated. In any case, the proof was sufficient to indicate that most of the iron in the residue had been unaffected by flotation treatment.

Effect of Thickness of Pulp.

The results of laboratory tests indicated that, with a dilution of 1 to 1, bad recoveries would be obtained, with thinner dilutions up to 7 to 1, recoveries would be normal.

Rapid Method of Determining Dilution of Feed on Large Scale.—A number of 50 cc. cylinders were filled up to graduated mark with weighed quantities of water and ore, the latter being average crushed feed from experimental plant.

The pulp in the cylinders was then agitated and allowed to settle for 5 minutes, and the relative number of cubic centimeters of settled feed and of clear water were read off. The results obtained were used as standards for subsequent work.

Tests on the large scale, checking the method against the ordinary one of weighing, showed that it gave good results, the method of taking the dilution being to fill a 100 c. cylinder with pulp out of one of the agitators. A number of large-scale tests proved that the results were not affected by having dilutions ranging from 2 to 1 and 5 to 1, providing the feed was not heavy.

With a feed of over 20 tons per hour it was found advisable to work with a dilution under 3 to 1, owing to the work being adversely affected if the rate of flow of pulp through the machine was too great. Dish vaning tests showed that the quantity of elutriated slime in feed varied from 15 to 20%.

Nature of Water Used.

The following are average analyses of waters that were used for large-scale experiments. One sample was taken while flowing into the Minerals Separation plant, a second sample from the residue pulp after treatment. Analyses were made on clear solutions after filtering:

	Before treat- ment. Gr. per gal.	After treat- ment. Gr. per gal.
Total solids	35.14	78.26
Loss on ignition.....	13.21	23.91
Calcium oxide	4.27	16.87
Magnesium oxide	10.81	9.25
Sulphur trioxide	3.41	27.75
Copper	nil	nil
Iron	nil	nil
Acidity	neutral	neutral

Analyses indicate that CaSO_4 is dissolved from the ore during treatment.

The following method of testing whether a particular sample of water was suitable for flotation or not may be of interest. A sample of crushed ore was treated in the laboratory machine with the water to be tested by passing it dry into the machine and obtaining the recoveries. A sample of the same ore was then thoroughly wetted with the sample of water and allowed to stand in it for some definite period. The sample was then treated by flotation, and recoveries so obtained were compared with recoveries from the first test.

The following comparative assays of residues from the same crude ore were obtained from a sample of water which was unsuitable, and which was applied in two different ways. The same conditions of treatment were used in both cases:

(a) Sample treated immediately in water. Residue assayed 2.60 dwt. gold, 0.30% copper.

(b) Sample allowed to remain under water for 6 hours and then treated by flotation. Residue assayed 3.09 dwt. gold, 0.67% copper.

Water was found to be neutral, and after agitation with ore still neutral.

Effect of Fine Crushing.

No opportunities were available for finer crushing on the large-scale experimental plant, as tests showed that a screen finer than 50-mesh could not be economically used. Sizing tests on flotation residue produced from ore crushed to 10% on +60-mesh (I. M. M.) indicated that the better the crushing the better would be the recoveries. The crude ore assayed 5.05 dwt. gold, 2.02% copper, and was treated direct by flotation, 134 lbs. per ton of eucalyptus being used.

This test showed a marked improvement in recoveries as compared with the best results obtained on this particular class of ore crushed through 50-mesh either in the laboratory or in large-scale plant. The best recoveries with the coarser crushing were 70% gold, 86% copper.

Rand Gold Output.

The Rand gold output in September was 771,000 fine ounces, comparing as follows:

	1916.	1915.	1914.	1913.
January	787,000	714,984	651,000	789,390
February	753,000	476,000	626,000	734,122
March	796,000	753,000	686,000	790,000
April	754,000	744,000	684,000	784,000
May	777,000	763,000	720,000	794,000
June	761,000	755,000	717,000	547,000
July	761,000	770,000	732,000	655,000
August	781,000	778,000	711,000	728,000
September	771,000	776,000	702,000	706,000
October	797,000	733,000	733,000	718,000
November	781,000	715,000	715,000	673,000
December	781,000	672,000	672,000	776,400
Total	8,888,984	8,599,000	8,599,000	9,124,912

Copper exports from Atlantic ports for week ending Oct. 5 were 3221 tons; since Oct. 1, 1990 tons, against 4627 a year ago.

¹See paper No. 201 of Australasian Institute of Mining Engineers.

Efficiency of Air Compressors.

H. E. MacCamy, designer of the MacCamy condensing intercooler, Dooly building, Salt Lake, some time ago prepared a thesis on air-compressor efficiency, from which the following is taken:

There is only one condition under which a compressor can be operated whereby it can furnish the number of cubic feet of air which it was designed to produce, and this condition is the elimination of the moisture from the air.

Kent and other authorities tell us that every cubic foot of saturated air at 82° temperature contains 0.001667 lbs. of water vapor. This means that for every 1000 cu. ft. of air entering the low-pressure cylinder of the compressor, we have 1.667 lbs. of water, and as there are 28 cu. ins. in 1 lb. of water, we have $1.667 \times 28 = 46.67$ cu. ins. of water to be evaporated into steam gas by the heat due to the compression of 25 lbs. gauge, or 40 lbs. absolute pressure attained in the low-pressure cylinder. Any steam table will tell us that 1 cu. in. of water when raised to the temperature of 267° F., which is the temperature due to 25 lbs. gauge, or 40 lbs. absolute pressure, has an expansion of 642 times its volume. Then we must have $642 \times 46.67 = 29,962$ cu. ins., or 17 cu. ft. of steam gas entering the intercooler for every 1000 cu. ft. of air entering the low-pressure cylinder; and unless this steam gas is condensed to water and removed from contact with the air before the air leaves the intercooler and enters the high-pressure cylinder of the compressor, it will cause trouble and expense, as it not only increases the power required to compress the air, but is the cause of carbonizing the oils used to lubricate the cylinders, and continues to follow to the end of the air line, materially reducing the efficiency of the power at the tool or machine where it is used, as water is a poor agent for operating air tools or engines.

The usual way of removing the water or moisture from the air is to establish auxiliary receivers near the end of the line in which to condense and precipitate the water; but the water should have been removed from the air before it entered the high-pressure cylinder, or at least 90% of it. The power wasted compressing steam gas in the high-pressure cylinder would be saved, and the oil used to lubricate the high-pressure cylinder would do its work instead of being carbonized. This carbon sediment finds its way through the receiver and pipe lines into the tools, requiring user to soak them in kerosene or naphtha.

Investigation shows that all trouble with air compressors and air equipment is due to moisture in the air. Even the back pressure, so often found in the low-pressure cylinder, causing the low-pressure side of the compressor to give more trouble than the high-pressure side, is attributable to this cause. The reason for this is that the ratio of the cylinders is such that the high-pressure cylinder cannot receive the expanded air from the low-pressure cylinder when the intercooler fails to reduce the temperature of the air coming from the low-pressure to 60° or lower; for it must be remembered that the temperature of the air from the low-pressure cylinder is about 300°, which will cause an increased expansion, due entirely to moisture in the air raised to that temperature, of 37% in volume, and unless the intercooler reduces this temperature to 60° the moisture cannot be removed from the air. With the ordinary intercooler, when compressor has been working at its maximum for 1 or 2 hours, the temperature of the air entering the high-

pressure cylinder will be about 125°, and the gauge will show from 25 to 30 lbs. pressure; but if the temperature could be lowered to 60°, and maintained at that, the gauge will show a pressure of 3 to 5 lbs. less. This difference in pressure is caused by the inability of the high-pressure cylinder to receive the expanded air, this being wholly due to the steam gas generated from the moisture in the air, which has not been removed by the intercooler.

The increased volume of workable or useful air we would receive from the compressor, if all the water vapor could be removed from the air before it enters the high-pressure cylinder, would be the volume of steam gas generated from the 46.67 cu. ins. of water contained in 1000 cu. ft. of saturated air, figured at the point of condensation. The power in foot-pounds wasted in compressing the steam gas in the high-pressure cylinder would be determined by multiplying the cubic inches of steam gas allowed to enter the high-pressure cylinder by 62.5 lbs. per sq. in., as this is the mean pressure between the 25 lbs. pressure at which the piston begins its stroke and the 100 lbs. pressure at the end of the stroke. It is apparent that the efficiency of a multiple-stage compressor can only be calculated by the amount of water removed from the air in its passage through the intercooler.

Another thing to be remembered is that air is a mechanical mixture, and lowering the temperature alone to the condensing point will not remove the water, for the reason that as soon as the water is removed the dry air will absorb the water if it comes in contact with it again before reaching the high-pressure cylinder. Therefore, the intercooler must be constructed to cool the air to the lowest point attainable with the cooling water available, and make a purely mechanical separation of the air and water.

New Hydro Plant for Sweden.

Arrangements are being made for the utilization of 50,000 hp. through the exploitation of the Folla in Norway. This stream comes from the Troldeheimen mountains, and after a course of about 25 miles joins the Surna, which terminates in the Surendal Fjord. The Folla has no natural regulating basin, not passing through any lake of a size to serve as a reservoir, though it has abundance of water, the catchment area being 347 sq. kilometers. A valley, which is of no special value to anyone, is therefore being flooded to create a lake, having an area of 8 sq. kilometers, by building a wall 30.5 meters high and 648 long. There will be a fall of 300 metres, and at the turbines the power will be 40,000 to 50,000 hp. In addition there are two other falls in the Folla, below the regulating dam, of respectively 7200 and 10,000 hp. The large power station will be situated at the bottom of the Folla valley; a tunnel over 2 miles long and 12 sq. metres section, will lead from the intake to the distributing basin. The energy will be transmitted over 8 miles to Surendalsören, in the vicinity of which the promoter of the scheme controls large lime deposits, which can supply necessary raw material. The manufacture is likely to comprise carbide and cyanamide, an annual production of 25,000 to 30,000 tons being expected. The aggregate cost is calculated at nearly £800,000, of which nearly £350,000 is allocated to the power station, etc., and nearly £75,000 to the electrical plant.

White arsenic is produced in the United States from smelter-flue or bag-house dusts.

Mount Baker Mining District, Washington

MORRIS McCARTY.

The Mt. Baker mining district, situated in the extreme northwestern part of Washington, was first discovered in 1897, or the same year the riches of the Klondike became known to the outside world. The first location of importance known as the Post-Lambert, which was later equipped with a 15-stamp mill, and after producing \$275,000, burned down.

The district, although situated not far away from tide water, is not favorable for the installation of machinery, as it lacks good wagon roads. This defect can and will doubtless be overcome when mines are further developed.

The Cascade range of mountains receive their maximum development at the 49th parallel, which is the international boundary, and Mt. Baker, after which the district is named, is situated in the midst of the district, only 10 miles south of it.

The topography is rough and wild beyond description, and up to an elevation of about 5000 ft., is covered with a dense growth of timber and well carpeted with moss, making prospecting difficult.

The northern portion of the Sierra Nevada mountains of California have not yielded treasures compared with the central California sections of this well-known range, and this is true of the Cascade mountains in Oregon and Washington. Mining engineers have a "cold shoulder" for this area, and not without good cause, as few properties have been developed meriting the name of mine. No really great mines, so far as the writer is aware of, are running from Yreka, Cal., to the international boundary line at the present time.

The prospects in the extreme northwest section of the country are therefore of considerable interest outside of their local importance, and the question as to what, if any influence the maximum development of the range has to do with these ores, is also of some interest.

Having, years ago, prospected close to the international boundary in northeastern Washington and southeastern British Columbia, I familiarized myself more or less with the discoveries made from time to time near the 49th parallel, and have arrived at the conclusion that there is an east-west mineral zone which can be traced from the Atlantic seaboard in the vicinity of Newfoundland to the Pacific ocean. The ores found in this great zone or belt include all of the prominent members of the mineral family, such as iron, copper, nickel, silver and gold.

Numerous individual mines could be cited to support the theory of a cross continental zone and it is barely possible that this fact is closely related to the maximum development of the Cascade mountains near the 49th parallel.

About one year ago, George Wingfield, president of the Goldfield Con., which company it will be remembered made us "millionaire prospectors" a trifle jealous several years ago by paying in one year more than \$7,500,000 in dividends, closed a deal for a controlling interest in the Boundary Red Mountain mine, in the Mt. Baker district, which was already equipped with a Marathon mill. He installed, at great expense, 10 gravity stamps, developed a water power and commenced operations about March 15 of the present year. The mill treats from 50 to 60 tons daily and makes a

saving of upwards of 90% by plain amalgamation, demonstrating the remarkably free nature of the ore. A crosscut tunnel is being driven to tap the ore 500 ft. below the deepest workings, and if the results are as favorable at that depth as at present levels, the intention is to erect a large mill. While no definite figures are given out, the ores are said to average from \$15 to \$20 per ton. The ore body has been proven 800 ft. long with drift continuing in ore.

The Post-Lambert is being equipped with a Lane slow-speed mill, and will soon be ready to run. The ore resembles the property purchased by Mr. Wingfield. Several more properties have power developed and are doing active development.

At the Hammond, which is situated some 15 miles southward from the free milling section of the Mt. Baker district was erected some years ago a 20-stamp mill with auxiliary mills—one a Huntington and the other a Bryan—also, later a cyanide plant was erected but only ran but few days. The property produced, it is said, about \$100,000 and was closed down because the values in the ore could not be saved closely. The ore is a silver-sulphide.

The company has been reorganized with new capital, with the result that George Crerar, M. E., who was connected with the demonstrating plant of the Inspiration Copper Co. at Miami, Ariz., has been chosen to manage the metallurgical end. Mr. Crerar is installing the flotation process and the capacity of the mill will be increased by installing a tube mill. The mine contains large ore bodies and the outlook for making a success of this property is excellent with the flotation process. The ore contains silver-gold, the former predominating.

Stone and Webster own a power plant near the mine where the Nooksack river falls 105 feet. The mine, however, possesses its own power plant, and because of the numerous water powers and timber facilities, the conditions for doing cheap mining are most excellent.

The Mt. Baker district, except for heavy machinery (some sections are accessible to it), is easy of access from Bellingham, which is the county seat of Whatcom county, situated on one of the really great harbors of the world. The county enjoys the distinction of being the most northwesterly county in the United States and the richest in natural resources on the Pacific coast.

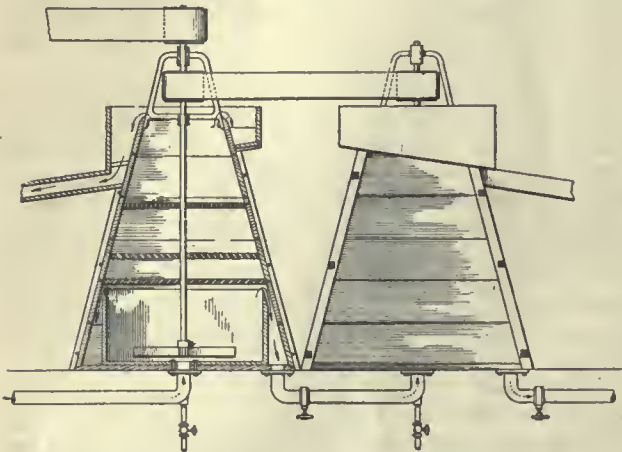
Calcium Chloride Production.—Calcium chloride is made from natural brines in the Saginaw valley in Michigan, in the Ohio valley in Ohio and West Virginia, and in the Kanawha valley, W. Va. Thus practically every constituent in these brines is saved and turned into profit. Calcium chloride is manufactured at Mount Pleasant and Saginaw, Mich.; Pomeroy, Ohio; and Mason, Hartford, and Malden, W. Va. Statistics of production of calcium chloride from natural brines have been collected by the Geological Survey since 1909. Large quantities of calcium chloride formerly wasted in the manufacture of soda, the source of which is different from that considered in this report, are now being used in part, and it is to be hoped that new uses for what is still wasted may soon be found.

Large Capacity Flotation in Small Space.

In concentrating mills there is frequently little space allowed for the machines, and it is desirable to have as great efficiency per unit as possible. Among the recent improvements in concentrators of the flotation type is one which embodies this feature. It also possesses another advantage, in that the ore particles which cling to the countless air bubbles are removed so quickly after reaching the top of the tank that they are hardly exposed to the free air, which would cause the bubbles to break and the concentrates to sink. The units, of which two are shown in the drawing, are designed to operate in series.

Referring to the drawing: Each tank is first filled with water. Power is applied by means of a driving belt and pulley to the vertical shaft, and the dasher in the cylindrical tub in the bottom of the tank is revolved. The pulp or equivalent ore material is fed in at the bottom through a pipe, while air is supplied continuously through another pipe as shown.

The ore, upon arriving in the tub, is agitated by the dasher and the air is broken up into very fine par-



FLOTATION CONCENTRATOR WITH LARGE CAPACITY.

ticles which permeate the ore mass. In this way, any fine particles of ore which have a tendency to float, adhere to the air bubbles and are carried upward by them. The particles of ore thus floated are the concentrates. The gangue, being unable to float, and yet being agitated continuously by the dasher, is carried over the sharp upper edge of the tub and floats or creeps downward around the tub and out through a pipe, through which it is introduced to the next successive tank.

The particles of ore, floated as above described, by the minute air bubbles, are carried up through various baffle floors and reach the top of the tank. They are carried over the sharp upper edge of the wall, arrive in the drain boxes and are carried off through the discharge spout. The baffle floors, being immovable, serve to render the liquid comparatively quiescent, or, in other words, they prevent further disturbance of the ore particles after they are properly floated. In order to render this action effective, more than one floor is provided.

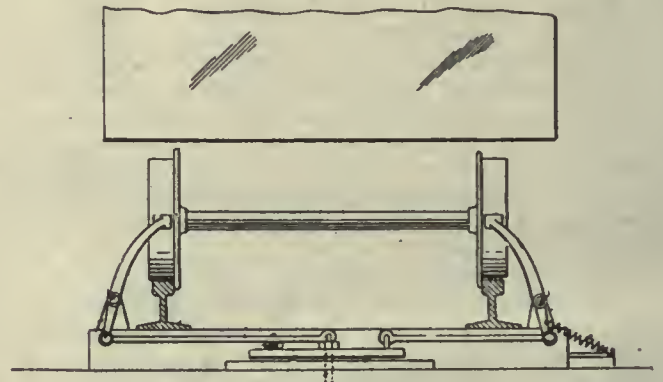
The concentrates, which carry with them more or less gangue or crude material, next pass through another machine of the type just described, and in this way still further refinement may be effected.

Automatic Handling of Cars to Tipple.

More or less trouble and expense are incurred in running mine cars onto the tippie or dump. Manual labor is employed in many mines for this purpose, the loaded cars being pushed onto the tippie and the empties gotten away to the cross-over in the same manner, with many delays. Archibald Ferguson of Roscoe, Pa., in a patent (No. 1,187,825) recently granted, seeks to overcome the lost motion and effort by a combination of a gravity system and a series of car stops operated automatically by the movement of the tippie as it dumps each car.

The track to the tippie is arranged on a down-grade. The tippie track is level and there is a section of track beyond the tippie which is slightly up-grade. After dumping, the empties are run out onto this farther section through a spring point switch and then back by a cross-over to the return track, which is down-grade. The empty cars are therefore carried back past the tippie by gravity to a point where they can be removed by a locomotive.

The novel feature lies in the car stops, one being shown by the sketch herewith. Several of these stops are located at points on the down-grade approach to the tippie. Normally, when in the upright position, the



AUTOMATIC CAR STOP.

stop holds the car stationary. When the car on the tippie is dumped, the tippie in falling back into place operates a series of levers and throws the stops all down. The car nearest the tippie runs onto the tippie, and the stops are returned to normal. But in the meantime the cars back along the line have all moved up one stop. In this manner, a whole train of cars can be backed onto the down-grade portion and left to themselves, feeding onto the tippie automatically as fast as it dumps and removes the empty cars.

China to Have Tin-Smelting Plant.—A tin-concentrating and smelting plant for the An-Yuan mines in Hunan Province, southern China, is shortly to be placed in commission by the Wah Chang Mining & Smelting Co., Ltd., which will offer this product for sale in the United States. The company has offices in the Woolworth building, New York, and agencies in Europe. These mines are in the Ichanghsien district and contain both oxide and sulphide ores in chimneys in limestone, marmorized by granite and intruded by a later granite dike along the course of which the ore chimneys are found.

The most refractory clays are those containing an excess of alumina.

Making Motor Trucks Pay.

Whether the haul be long or short, the use of motor trucks can be made to pay just as good returns

stronger in this field, a new type of body is being widely used, as is also a special kind of loader. Both are designed to save practically all of the time and manual labor at each end of the trip; in other words,



TWO-WAY DUMP BODIES ON MOTOR TRUCK AND TRAILER.

in the transportation of ore as in that of any other raw material. After all, time is the great element. In these days of rapid-moving trucks and trailers of large capacity, and ability to negotiate almost any

to give the truck an opportunity to be actually earning money every hour that it is on the job.

The Lee two-way dump body is mounted on any type of truck or trailer in the manner illustrated. It



LEE LOADER AT WORK.

hills or kinds of going, the horse is in no sense better equipped to compete with trucks in the mine country than he was with Pershing's trucks in Mexico.

To make the position of the motor truck even

dumps to either side, clear of the wheels. It is particularly adapted for loading direct onto the car from a raised platform, having inclines so that the truck can climb up to a level with the top of the cars. The

dump body rolls outward and over at the same time so that the load can be distributed over the car bottom.

These bodies can be operated without the use of mechanical power, and they discharge their load in less than half a minute. One man easily attends to this operation, without the use of cranks, handwheels or winches, the hang of the body being such that the weight of the load furnishes the principal power for dumping.

A combination unit has also been designed for hauling cement in bags or barrels, lumber, timbers and other materials used about the mine.

At the loading end, the Lee loader can be used to advantage. It travels on low wheels from point to point along the ore storage bins. It consists of a hopper-like arrangement mounted on a tower just high enough to clear the truck body. This hopper is loaded while the truck is away with a load. When the truck draws up beside the loader the hopper is rolled outward and over as shown, loading the truck with scarcely a moment's delay.

Obviously, the shorter the haul and the more frequent the trips of the truck, as in cases where the mine is near the railroad or mill, the greater the economical advantage of the loader, as in that case the loading time is a greater factor.

Gold Mining in the Boise Basin, Idaho.

The Boise Basin of western Idaho has always been primarily a gold placer region, and for a decade after the discovery of gold there, late in 1862, it is credited with an annual placer production of one to five million dollars. In later years the yield has fluctuated greatly, but in 1912, 1913, and 1914 it still amounted to approximately half a million dollars annually. Many of the veins from which the placers derived their gold were located in the early days, and in recent years they have received increasing attention. To meet the many demands for information concerning these lodes, the U. S. Geological Survey has just published a reconnaissance report on the region as Bulletin 640-E.

According to this report the depression known as the Boise Basin has resulted from the sinking of a fault block 15 miles long and 12 miles wide. The region lies within a great area of granite that extends over more than 20,000 sq. miles, the surface of a mass known as the Idaho batholith, which is believed to be of late Cretaceous or early Tertiary age. Porphyritic dike rocks in considerable variety were intruded into the granite and afterward the metalliferous veins were formed. The veins occupy zones of close-spaced fracturing in granite, and as the maximum depth to which mining has extended is not great most of the ores now mined are somewhat oxidized.

The principal primary ore minerals are native gold, pyrite, galena, sphalerite, chalcopryrite, stibnite, and tetrahydrite. The secondary minerals are cerussite, chalcocite, malachite, and native copper. Only the precious metals are now recovered from these ores, but as the mines go deeper the ores become increasingly base, and in the near future lead, copper, and possibly zinc will doubtless be saved. Probably less than 50% of the gold can now be saved by amalgamation.

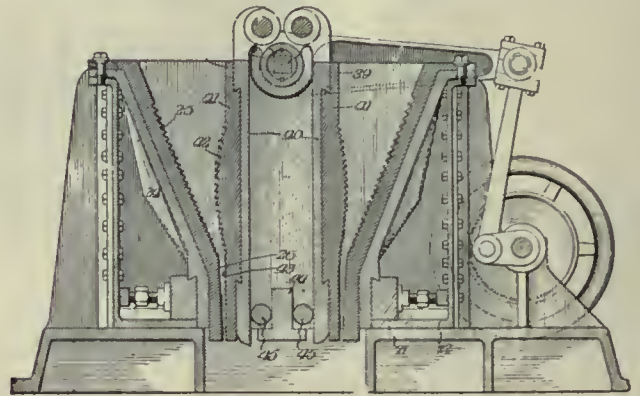
It is of interest to note the widespread occurrence in the placer gravels of the Boise Basin of monazite, which is extensively used in the manufacture of gas

mantles. This source of supply, however, is not now utilized. An unidentified radium-bearing mineral also occurs sparingly in the gravels at one locality.

Opposed Plate Crusher.

A combined compressive and rubbing action between massive sets of plates, one stationary and one reciprocal, is brought about in the ore crusher shown in the accompanying sectional and elevation views. It is the invention of James W. Boileau of Chicago, Ill.

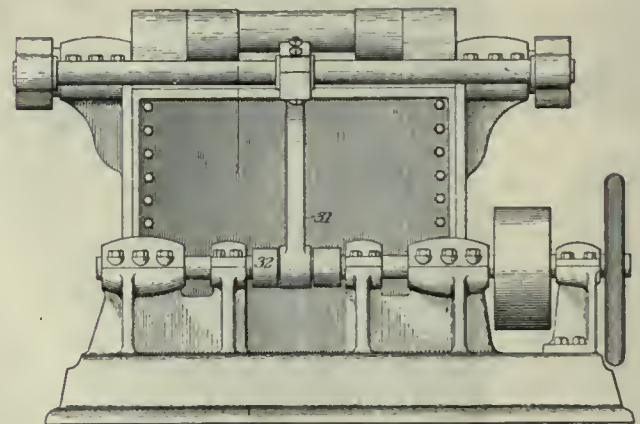
It will be seen that the interior sides of the crusher consist of slanting face plates, with corrugated sur-



OPPOSED PLATE CRUSHER—CROSS-SECTION.

faces and means at the bottom for slight adjustment of the angle. Two sectional corrugated plates are set up in the middle of the machine, in such manner that they are given an up-and-down movement when the driving pulley is turned. This motion is imparted by a walking beam and rock shaft shown in both drawings.

Not only is this motion of the central plates a reciprocal one, but, through the agency of knuckles



OPPOSED PLATE CRUSHER—SIDE ELEVATION.

on the upper shaft, the upper ends of the plates move in a curved path, while the lower ends are moving in practically a vertical plane. In this way both a compressive and a rubbing action are secured. The corrugations get finer and finer toward the bottom of the plates, as the ore is more and more finely ground. The ore finally falls through the narrow openings at the bottom of the plates.

What the Mining Companies are Doing

Kerr Lake Mining Co., Ontario.

The annual report of the company for the year ending Aug. 31, 1916, shows the gross production from all ores to have been 2,433,893 ozs. of silver, at a mining cost of 889-100 cts. per ounce; 58,850 tons of rock was hoisted at a cost of \$3.68 per ton. Total costs per ounce were 25¼ cts.

Cost of production and development expenses are given as follows:

Stoping	\$ 18,909.87
Development	46,443.75
Power, light and heat.....	24,092.18
Ore sorting and jigging.....	14,426.42
Tramming	21,655.54
Hoisting	8,691.90
Timbering	18,912.62
Pumping	3,416.44
Drills and steel.....	8,345.99
Mine expense	11,557.36
Repairs to plant and buildings.....	1,403.76
Stable expense	4,250.81
Office expense	5,092.90
Surface maintenance	8,549.04
General expense	2,314.57
Taxes	17,553.57
Boarding house	901.85

Total\$216,548.57

Other expenses—

Shipment, treatment and other charges.....	\$ 203,627.27
Administration and general expense.....	13,672.20
Amount written off cost of property.....	24,589.35
Exploration outside properties.....	14,070.48

Total\$ 472,507.87

Balance transferred to profit and loss account..... 813,701.90

\$1,286,209.77

Colorado Fuel & Iron Co.

The 24th annual report of the company, covering the year ended June 30, 1916, has just been issued. A brief summary is here given:

Income Account—

Gross earnings from operation.....	\$25,626,605.54
Operation and management	21,280,519.74

\$ 4,346,085.80

Net earnings from operation.....	492,006.83
Income from securities and interest....	132,984.05

\$4,971,076.68

Deduct: Bond interest and taxes.....	\$ 2,011,958.73
Taxes	348,888.92

2,360,847.65

Surplus over fixed charges, as above	\$2,610,299.03
Less: Provision for sinking funds, etc..\$	184,088.51
Insurance and personal injury.....	58,000.00
Crystal River R. R. Co. traffic contract guaranty	15,000.00
Prospecting	6,969.63
Equipment renewal	145,000.00

409,058.14

Surplus after deducting sinking funds, etc....	\$2,201,170.89
Out of which was declared a dividend of 30% on preferred stock	600,000.00

Surplus after deducting sinking funds, preferred stock dividend, etc., carried to the credit of profit and loss.....	\$1,601,170.89
General profit and loss account—	

By balance at credit June 30, 1915.....\$3,376,280.86

By surplus for year ended June 30, 1916.....1,601,170.89

To customers' accounts charged off.....\$ 22,110.20

To bond premium

To depreciation on equipment charged off 19,755.00

To various adjustments during the year 12,895.12

By various adjustments during the year 3,258.85

To balance4,922,127.28

\$4,980,710.60

\$4,980,710.60

By balance to credit of profit and loss June 30, 1916, as per balance sheet \$4,922,127.28

Round Mountain Co., Nev.

Placer operations of the Round Mountain Mining Co. during the period from July 13, 1915, to July 1, 1916, resulted as follows:

Period.	Value recovered.	Cost.	Realization.
July 13, 1915, to Nov. 1, 1915....	\$36,413.70	\$11,058.18	\$25,355.52
Nov. 1, 1915, to March 1, 1916..	9,203.62	5,397.32	3,806.30
March 1, 1916, to July, 1916....	48,176.53	27,897.58	20,278.95

Alaska Treadwell Co.

Returns for the month of August are reported by the Alaska Treadwell Gold Mining Co., as follows:

Tons ore crushed.....	24,696
Tons concentrate saved.....	784.53
Estimated gross value of free gold.....	\$11,825.34
Estimated gross value of concentrate.....	63,582.83
Estimated gross value of base bullion.....	2,787.46

Estimated gross total production.....\$78,195.63

Estimated gross total realizable value.....\$77,413.68

Operating expenses

Estimated operating profit.....\$32,997.02

Construction expenses, etc.....17,585.37

Estimated net profit.....\$15,411.65

Other income

Yield per ton of ore milled.....\$3.16

Tonopah Mining Co.

The combined income and surplus account of the Tonopah Mining Co. and the Desert Power & Mill Co. for the quarter ending Aug. 31, 1916, shows as follows:

Gross value of ore milled.....	\$ 336,287.37
Metal losses in milling and refining.....	26,257.10

Gross value of mill products.....\$ 310,030.27

Mining, milling, marketing and general expenses.. 212,982.32

Net earnings for quarter.....\$ 97,047.95

Miscellaneous income

Exploration expense

Net income for quarter.....\$ 122,712.93

Quick Assets—

Cash on hand Aug. 31, 1916.....\$ 36,172.24

Bonds purchased

Certificate of deposit.....

Silver bullion stored at 50 cts. per oz.....

Deduct dividend payable Oct. 21, 1916.....

\$1,362,014.44

Calumet & Hecla Outputs.

The September and 9 months' outputs of the Calumet & Hecla and subsidiary companies compare as follows (in pounds of copper):

	1916.		9 months.	
	September.	August.	1916.	1915.
Ahmeek	2,309,955	2,173,439	17,685,686	15,000,000
Allouez	896,184	870,768	7,649,473	7,000,000
Cal. & Hecla..	6,257,447	6,603,418	57,191,355	52,000,000
Centennial ..	160,800	207,486	1,828,245	1,700,000
Isle Royale ..	1,010,723	1,199,162	9,226,225	6,700,000
La Salle	119,269	109,032	93,580	954,489
Osceola	1,700,522	1,625,498	14,935,700	14,000,000
Superior	220,582	192,463	183,020	2,300,000
Tamarack	512,665	513,441	4,949,184	.....
White Pine ..	385,577	426,152	2,77,941	3,280,142
Total	13,573,725	13,920,849	120,055,029	.....

Franklin Mining Co.

The Franklin Mining Co. has been able to reduce its operating costs from 21 cts. per pound of copper last January to a present cost of 15½ cts.

On present price of copper and a monthly output of about 270,000 lbs. of copper, profits now average over \$30,000 monthly, which is accumulating for working capital. The last of the company's notes was paid recently and its books now stand clear of floating indebtedness.

The output by months thus far this year follows:

	Lbs. refined copper.		Lbs. refined copper.
January	200,000	May	235,000
February	233,000	June	265,000
March	266,000	July	275,000
April	194,000	August	265,000

Production for first 8 months exceeds by 665,031 lbs. that for the entire 1915 calendar year. Output for the present year

has been sold for better than 25 cts. a pound, which compares with average price of 19.33 cts. in 1915.

Tonopah Belmont Co.

The combined condensed statement of operations of the Tonopah Belmont Development Co. and the Belmont Milling Co. for the quarter ending Aug. 31, 1916, shows as follows:

Received and receivable for ore, bullion, etc.....	\$ 634,923.49
Mining, milling and administration expenses.....	327,789.79
Net earnings for quarter.....	\$ 307,133.70
Miscellaneous income.....	7,278.01
Total net income for 3 mos. ended Aug. 31, 1916.	\$ 314,411.71
Available resources, August 31, 1916—	
Due from smelters and silver stored at 50 cts. per oz.	\$ 618,355.81
Due from others.....	12,630.43
Loans on collateral.....	250,000.00
Cash in banks.....	507,147.34
	\$1,388,133.58

Miscellaneous Company Reports.

The Nipissing Mines Co., Ltd., as of Oct. 2, 1916, had cash in bank, \$1,280,957; value of bullion and ore in transit and at smelters, \$487,730; value of ore on hand and in process and bullion ready for shipment, \$459,752; total, \$2,228,440.

Mohawk Mining Co.'s earnings for the last 6 months of 1916 will be in excess of \$1,000,000. In September the yield was 19.67 lbs. of copper per ton treated. Copper production was 1,145,762 lbs., as compared with 1,049,460 lbs. in August.

The operating companies of the La Rose Con. Mines Co. as of Sept. 30, 1916, had cash surplus \$806,717; ore in transit and at smelters, and ore sacked at mine ready for shipment, \$69,421; less current liabilities, \$38,071; leaving balance of current assets, \$838,068.

Bingham Coalition Mines Co. has filed notice with the Utah secretary of state that the capital of the concern has been raised from \$1,000,000 to \$1,500,000. The company is incorporated under the laws of Maine, but Utah laws require foreign concerns to conform to laws of that state.

Profits of the Arizona Commercial Co. for the first 8 months of this year have averaged \$47,000 monthly, or at the rate of \$564,000, or \$2.10 per share, per annum. With an increase in output early next year dividends of 50 cts. quarterly would seem a natural expectation as the company has a comfortable working capital of about \$600,000 and no large construction expenses ahead.

Work on new mill of the Butte-Detroit Mining Co. is completed and workmen laid off. Orders have been placed for machinery and equipment of a flotation plant patterned after that at mill of the Butte & Superior. As soon as this is installed sinking at the Ophir mine will be resumed. Work at mine was suspended until mill was completed. Ophir mill is now in shape to handle zinc ores.

The Atlantic Mines Co., which 3 years ago took over La France Copper Co. property, has been dissolved and all the property with exception of cash on hand will be offered for sale at public auction in Butte Nov. 1, following which a dividend in liquidation will be distributed. The Anaconda Co. has offered a price for the property which will return Atlantic Mines Co. stockholders the \$250,000 cash originally in company's treasury when operations started, and a sum equal to the par value of the stock—\$10—together with 8% interest per annum, a total of about \$12.50 per share.

Present earnings of the Shannon Copper Co. are the largest in the history of the company, with profits amounting to around \$100,000 monthly, or at the rate of \$4 per share. For the first 9 months of this year profits were \$625,000, which is more than sufficient to meet the full year's dividend requirements at present regular rate with extra. The treasury is now in a strong position with about \$1,200,000 net quick assets so that practically all earnings can now be declared in dividends. At the present time there remains in the hands of the public only \$169,000 Shannon Arizona Railway bonds out of an original issue of \$600,000. Production is sold well ahead, a portion into next April at approximately 27 cts. per pound, which assures a continuance of present large profits

for 6 months at least. The highest price yet received by the company was 29¼ cts. a pound for 625,000 lbs. sold last May for August delivery which was a "special" transaction.

Stanley Dexter, referee in bankruptcy, has been enjoined from confirming the sale of the Ohio Copper property to the bondholders' committee. Sale actually took place 6 weeks ago, but a stay was granted at the request of the North American Liquidation Co. in order that plans might be prepared giving stockholders opportunity to rehabilitate the company. Further decisions regarding the sale by the referee were held up by the Federal Court, on application of a second group of stockholders, in which the Heinzes have an interest. Their contention was that referee had no right to offer at auction the "right of redemption," which sold for \$40,000.

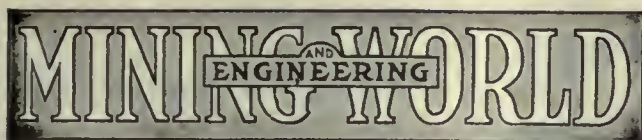
Sales of 1,500,000 lbs. of copper have been made recently by the Mass Con. Mining Co. at prices ranging from 27 to 28½ cts. a pound, according to delivery. With this sale the company is sold fairly well ahead into next year with some copper still available for nearby delivery. Operations for the past 4 months show a profit in excess of \$200,000 over and above all construction and improvement expenses, a sum sufficient to pay 6 months' dividends at the rate of \$4 per annum. Production for the past 9 months exceed the output for the entire 1915 calendar year, which amounted to 4,638,452 lbs. refined copper, a 5,000,000-lb. production being estimated for the present year.

At the present time Chino Copper Co. is producing at the rate of close to 80,000,000 lbs. of copper per annum. With copper at 27 cts. profits should be close to \$14,000,000, or \$16 a share on 870,000 shares. Selling at \$55 per share, the company may be said to be earning 30% on the market price of its stock. So long as the dividend rate remains as at present, \$9 per share, the purchaser of stock at 55 has an income return of 16%. What action the directors will take at the December meeting as to the size of the regular quarterly dividend is problematical, but it is positive that a declaration of the regular \$1.25 per share will be added to the same as in September when an extra of \$1 was paid.

While Hancock Con. is not yet out of debt and has no accumulated treasury balance, production is profitable, and as rapidly as more men can be added to the present working force of 400, production will show a substantial increase. The rock coming from No. 7 Quincy is all of a standard grade of excellence and this month the tonnage will be over 8000. All this goes to the Quincy mill and the Quincy smelter for treatment. From No. 2, 16,000 tons of rock will be treated this month and this is handled in the Point Mills head of the Hancock Co. and smelted at the Calumet & Hecla plant at Hubbell. In both workings the physical condition is decidedly better than at any time since the present work was undertaken.

The American Zinc, Lead & Smelting Co. has increased its retort capacity by the addition of another "block" to the Granby Mining & Smelting Co.'s equipment. This would add about 800 retorts and, assuming an average yield of 3½ tons of spelter per retort per annum, swelling the company's total production by about 2800 tons of spelter a year. The absorption of the Granby property added materially to the strength of the American Zinc, Lead & Smelting Co.'s position among the zinc producers of the country. This is particularly true because of the fact that the American Zinc Co. can now enter the market as a seller of any and all grades of zinc, from ordinary prime western up to the intermediates and high grades.

Earnings of the U. S. Smelting Co. for September are estimated to have been close to 100% ahead of July and August, or at the rate of between \$800,000 and \$900,000, as compared with a low-water mark of close to \$400,000 for the two summer months. The improvement in earnings is due mainly to the advanced prices as compared with 60 and 90 days ago of silver, lead, copper and spelter. As U. S. Smelting is more than 50% a custom smelting proposition it benefits very substantially by a rising metal market. Although no inclusion is being made of profits from Mexican properties it is expected that the final quarter will show reasonable returns from across the border, though it is any one's guess when conditions there will approach the normal.



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*Illustrated.

Subscription Notice.

Owing to the extraordinary increase in the cost of paper (more than double) used in printing the domestic edition of Mining and Engineering World as well as the increased cost in every department of printing it has been found necessary to increase the subscription price to \$5.00 per annum.

United States to Output Two Billion Pounds of Copper in 1916.

There is every reason to believe that the output of copper in the United States this year will exceed the 2,000,000,000-lb. mark for the first time, and it is expected that domestic consumption will take care of more than half of this. Estimates, however, indicate that exports will not reach the previous record of 840,000,000 lbs. in 1913. This would indicate domestic needs rather than export demand is the principal factor in keeping copper metal prices in the vicinity of 28 cts.

The United States refinery output for a series of years follows:

	Output, lbs.	Inc., lbs.	Increase, per cent.
1916 (est.)	2,000,000,000	453,000,000	28
1915	1,647,000,000	112,219,000	7.4
1914	1,533,781,000	*88,669,829	*5.4
1913	1,622,450,829	40,530,542	2.6
1912	1,581,920,287	149,981,949	10.4
1911	1,431,938,338	*20,183,782	*1.4
1910	1,452,122,120	46,719,064	3.3

*Decrease.

It is of interest to compare in tabular form the United States consumption and exports of copper for a series of years:

	U. S. con- sumption, lbs.	Exports, lbs.
1916 (est.)	1,220,000,000	750,000,000
1915	580,000,000	596,000,000
1914	653,000,000	795,000,000
1913	767,000,000	840,000,000
1912	819,000,000	725,000,000

Reinforced Concrete in Mining Operations.

There is no doubt that the ordinary mining engineer, while more or less familiar with his own particular subject, is considerably behind his colleagues in other fields in regard to general engineering applications and developments. This is undoubtedly due to the isolation of the average mining engineer, principally on account of location. This condition of affairs results in a general lag in the application of many modern developments to mining operations.

On the other hand, when such developments are

brought to the attention of the mining world, there is no class of people more eager to adopt any and all improvements of merit, and none more open to a clear appreciation of the situation.

This applies with particular force to concrete and reinforced concrete in their utilization in mining developments. The production of concrete has increased many fold within the last decade, and not only has the quality become superior, but methods and ease of installation are also improved and the cost has diminished almost in the same measure. Owing to these developments, concrete has been substituted in many cases where timber and brick and iron and steel were formerly used, and with gratifying results both from an operating and first cost point of view.

Can We Look Into the Rock?

The rocks of the universe are like a sealed book, but will disclose the contents when the key is once possessed, and this can only be acquired by the active, conscientious and carefully guided mind, keenly observant, always alert to deduce from his observations the minutest law of nature, even though it might seem to others insignificant. Deductions carefully made from nature's consistent showings, refined by well applied comparisons and all brought together into a comprehensive completeness, will bring into vision the key—the possession of which will unfold the intricacies of nature's composite work, whereby we may study and realize the beauties and profit which she spreads before all.

The acquisition is not reserved for any one man, even though he be a Humboldt, or one of the many bright minds who have and are following him, but each who possesses the patience, perception, and method, may share in the honor which is the reward for conscientious work among the rocks, one of the greatest gifts of mankind from nature's bequest.

Cheap Mining and Dividend Payers.

There probably does not exist a mine manager or superintendent who is not desirous of attaining low-cost mine operations. It is a laudable desire and one that proves that he has other than merely a salary compensation in view.

In order that cheap mining may be accomplished, it is necessary that physical and economic conditions should be such that work can actually be done for little money. While some mine superintendents do work as cheaply as it can be done under existing conditions, yet it is not accomplished at a figure that attracts attention. It may be cheap, however, as compared with the cost of similar work being done elsewhere.

Another superintendent may get his costs so low as to seem almost impossible of accomplishment, but yet his mine is paying no profits for the reason that the ore is too low grade. It will generally be found that the good dividend paying property is the one that

accords the mine manager the greatest opportunity for praise.

Fluctuations in silver have some peculiar effects upon trade of China, according to Consul Sammons of Shanghai. At low silver prices the Chinese export trade is not flourishing, as then the Chinese importer and foreign exporter do not seem able to agree upon fair price of goods. It is an excellent opportunity for the importer to buy goods when gold value of silver is low, and resell on a gold basis to foreign consumer. But Chinese dealers are well posted through their system of guilds which flourish all over the country and distribute information somewhat similar to our commercial organizations. They, therefore, learn the true value of their goods at low silver prices and offer the goods at just about the amount of silver the foreign importer ought to give and have a fair profit. When gold value of silver begins to rise, the foreign importer is more anxious to close before silver value becomes so high as to leave him little profit, while the Chinese exporter wants to sell before the silver value becomes so high that amount of silver actually received by him shrinks more and more. Under these conditions transactions are concluded with more diligence, turnovers are larger and exports materially increase.

Wherever possible the railroads have granted a special rate covering the period of the convention of the American Mining Congress, to be held at Chicago, Nov. 13 to 17. In Western Passenger Association territory where the rates approximate 2 cts. a mile, no further concessions are made to any gatherings. From California and Pacific Coast common points the information is given out that the 9-months tourist rate of one and one-third fares to Chicago and return applies for the period of the sessions of the American Mining Congress. The Central Passenger Association which covers common points in Illinois, Indiana, Ohio, Pennsylvania, West Virginia, Michigan, Eastern Missouri, Western New York, has made a 2 ct. rate each way. These tickets will be sold Nov. 11, 12 and 13, and have a return limit to Nov. 20. Holders must reach original starting point before midnight of Nov. 20.

England has been increasing her zinc smelting capacity during the past year and when construction now under way is completed, that country will be in a position to produce spelter amounting to about 85,000 tons annually. While the large zinc mines of Australia are controlled in England, the ore has been smelted in German-owned smelters. With the breaking out of the war this ceased and the major portion of the Australian zinc output has been coming to the United States, while some has been sent to Japan. A zinc smelting industry has also been building up in France.

The Lake Superior copper district is not the only mining section in the country that is suffering from lack of men, as the same condition exists in nearly all the larger camps in this country. Agents from various districts visit the Lake copper country nearly every month in search of men and many of the camps of the western hemisphere have recruited their working forces in times past from the Michigan mines.

PERSONAL.

R. B. Brinsmade is at Pueblo, Mex.

B. M. Sparke of Spokane, Wash., was in Helena, Mont., recently.

Carl H. Beal has joined the Bureau of Mines in the petroleum division.

B. L. Thane, manager of the Alaska Gold Mines Co., is in New York city.

Samuel L. Boyer is inspecting mining properties at Drummond, Mont.

George E. Bailey, mining engineer, Republic, Wash., is at Trail, B. C., on professional work.

J. V. Pohlman recently inspected mining properties in the Coeur d'Alene district, Idaho.

V. E. Lednicky has been appointed chief geologist of the Philippine Bureau of Science.

A. J. Devlin will act as temporary manager of the Empire Copper Co., in Custer county, Idaho.

Dorchester Mapes of Chicago has assumed the management of the Rambler mine near Laramie, Wyo.

D. Foster Hewitt of the U. S. Geological Survey has completed an examination of vanadium properties in Peru.

George P. Mims, a mine operator in the Republic section, Washington, has been appointed postmaster at Medford, Ore.

J. Cleveland Haas, mining engineer, Spokane, Wash., has been in Duluth, Minn., recently in the interest of British Columbia properties.

Frank W. Hopkins, vice-president of the Traylor Engineering & Mfg. Co., Allentown, Pa., has returned from a western business trip.

Kirby Thomas, mining engineer, New York city, has been engaged in an investigation of zinc and other mineral resources of the south.

D. D. Fraser, who has been at Butte, Mont., has joined the engineering staff of the Highland Valley Mining & Development Co. at Ashcroft, B. C.

Charles C. Newton, manager of the Consolidated Interstate-Callahan Mining Co.'s properties at Wallace, Idaho, was in Boise on business last week.

B. F. Tibby, who has been in mining engineering work several years, with offices in Salt Lake City, has taken a position with the Bureau of Mines, Washington, D. C.

Oscar G. Engelder, recently general manager of the Miniera di Rosas at Rosas, Sardinia, who has been spending a few weeks at Houghton, Mich., has gone to Jerome, Ariz.

Preston Locke has been appointed northwest manager for the American Smelting & Refining Co., with headquarters in Spokane. He was formerly in the New York office of the company.

Prof. F. W. Sperr, head of the mining department of the Michigan College of Mines, read a paper on "Metal Mine Accidents and Their Prevention," before the National Safety Council at Detroit.

R. C. Allen of Ann Arbor, state geologist for Michigan, spent a few days at Houghton to furnish information for the State Tax Commission in a disputed case of valuation between two townships.

R. L. Agassiz, president of the Calumet & Hecla Co., who, with General Manager Jas. MacNaughton, was hunting with Wm. E. Corey in Montana, has been at Calumet, Mich., on official business for a few days.

Will L. Clark, manager of the United Verde Copper Co., Jerome, Ariz., has resigned and has been succeeded by Robert E. Tally, who has for 8 years been superintendent of mines for the company. Mr. Clark was connected with Senator Clark's property since 1889, and since 1904 as manager. It is understood he will give his attention to properties in which he is interested. He is a member of the American Institute of Mining Engineers, the Metallurgical Society of America, American Mining Congress, Archaeological Society of Arizona, American Historical Society and National Geographic Society. At the present time he is a director of the State Taxpayers' League of Arizona. He has been president and treasurer of the Verde Tunnel and Smelter Railroad Co., Clarkdale Improvement Co., Upper Verde Public Utilities Co., Mogollon Lumber and Timber Co., and Jerome Power Co., all United Verde subsidiaries.

OBITUARY.

Thomas M. Brennan, manager of the Gold Hunter Mining & Smelting Co., passed away at Mullan, Idaho, Oct. 15 at the age of 39 years, from an attack of pneumonia. He was one of the most promising and popular young engineers in the northwest and his death is sincerely mourned.

Lewis M. Jones, of Pittsburgh, Pa., mining engineer and expert rescuer of the bureau, was killed Oct. 20 while directing the rescue work at a mine explosion at the mine of the Jamison Coal & Coke Co., Barrackville, W. Va., a few miles from Fairmont. Mr. Jones was born in Cleveland, Ohio, and took up his residence in Pittsburgh after he entered the employ of the Bureau of Mines, Feb. 15, 1909. He was a graduate of the Columbia School of Mines, New York city, and was an honor man in his studies. He leaves a wife and one child.

"The death of Mr. Jones is a heavy blow to the Bureau of Mines," said Van. H. Manning. "He was a mining engineer of exceptional ability and was perhaps the best man we had in directing rescue work at disasters. Under the chief mining engineer of the bureau, Mr. Jones had charge of the experimental mine of the bureau at Bruceton, Pa., a few miles outside of Pittsburgh and in this capacity developed many safeguards that are not only saving life in the coal mines today but will be instrumental in the saving of thousands of lives in the future."

SCHOOLS AND SOCIETIES.

Colorado Scientific Society.—At its recent meeting in Denver the abolition of the apex law and extralateral rights were discussed. The speakers included Geo. E. Collins, E. C. Stimson, Henry May and George Manley, all but the latter favoring abolition.

The Institute of Metals.—The officers elected for the coming year at the annual meeting of the American Institute of Metals in Cleveland are as follows: President, Jessie L. Jones, Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.; secretary, W. M. Corse, Titanium Alloy Mfg. Co., Buffalo, N. Y.; senior vice-president, George C. Stone, New Jersey Zinc Co., New York; vice-presidents, R. S. B. Wallace, National Cash Register Co., Dayton, Ohio; William B. Price, Scovill Manufacturing Co., Waterbury, Conn.; George K. Burgess, Bureau of Standards, Washington, D. C.; deCourcy Browne, Goldschmidt Thermit Co., New York city; Harold J. Roast, the James Robertson Co., Ltd., Montreal, Que.; J. P. Salter, Ohio Brass Co., Mansfield, Ohio; F. H. Schutz, H. Mueller Manufacturing Co., Decatur, Ill.; W. A. Cowan, National Lead Co., New York; H. S. Gulick, More-Jones Brass & Metal Co., St. Louis, Mo.

TRADE PUBLICATIONS.

Drill Steel. A. Milne & Co., Chicago. Catalog A-1915; pp. 16.

This catalog gives weights, dimensions, prices per pound, etc., for different kinds and grades of steel for drill bits. The information is all in tabulated form and is accompanied with a leaflet showing sectional views of the company's FJAB steels.

Oil and Gasoline Storage. Wayne Oil Tank & Pump Co., Fort Wayne, Ind. Booklet; pp. 24; illustrated.

An account is often desired of the oil being drawn from tanks at the mine or plant, more accurate than can be obtained by the common method of drawing from a faucet into a measure. The device here described is for drawing the oil from the tank by a pump device arranged so that each stroke will bring a specified and known quantity.

Barometric Steam Condensers. Mesta Machine Co., Pittsburgh, Pa. Bulletin R; pp. 8; illustrated.

Though the major points in the operation and construction of this company's condenser are brought out the text is more particularly devoted to the practice of installing and using steam condensers. There is considerable discussion, bringing out the saving possible to be obtained by running condensing rather than non-condensing. A curve is reproduced showing the saving to be had per 1000 engine horsepower operating 300 days per year and 24 hours per day, with coals varying from \$1 to \$3 per ton.

Wire and Manila Rope and Fixtures. Waterbury Co. Three catalogs; pp. 99, 23 and 31; illustrated.

A separate card is included giving the approximate strength and weight of different grades and sizes of manila rope, with prices for the same included. In the first mentioned catalog an attempt has been made to discuss the different structures of wire rope. Illustrations showing this are given and the uses, properties, etc., of the different kinds are considered. The other two catalogs are somewhat similar but views from the field are shown bringing out the practical application of different kinds of rope. The latter catalogs are confined to considering a smaller line of ropes and deal more with the application of the same.

INDUSTRIAL AND TRADE NOTES.

S. V. Trent, who controls the Trent Engineering & Machinery Co., Salt Lake, Utah, has opened offices in Dooly building, that city.

George A. Muir has been placed at the head of the mining machinery department of the Mine and Smelter Supply Co., Denver, Colo.

Burt B. Brewster, who formerly represented the Sullivan Machinery Co. in Alaska, is now district manager for that company at Salt Lake, Utah.

The Stimpson Equipment Co., Salt Lake, has established a testing plant at 18 Fourth South street, that city, to make demonstrations of efficiency and results with Janney flotation machines. The plant is in charge of Frank A. Bird, a metallurgist who has had much experience in flotation work.

The Nordberg Mfg. Co., of Milwaukee, Wis., announce the appointment of H. W. Dow as sales manager. He succeeds F. W. O'Neil, who has resigned to occupy an important executive position with the Ingersoll-Rand Co., New York. Mr. Dow has been associated with the company in the engineering and sales departments for 12 years.

The McFarlane-Eggers Machinery Co. has been formed to take over and operate the business of the Peter McFarlane & Sons Iron Works of Denver. Henry Eggers is president of the new company and F. McFarlane, secretary and treas-

urer. Mr. Eggers is well known throughout the west through his connection with the Mine and Smelter Supply Co. of Denver. The company will manufacture mining and milling machinery, which will include the development of a number of specialties.

NEW PUBLICATIONS.

Preliminary Report on the Tolovana District, Alaska. By Alfred H. Brooks. Washington, D. C., U. S. Geological Survey. Bulletin 642-G; pp. 9; illustrated.

The district is located in the east central part of Alaska, west of Fairbanks. Though gold was discovered in the district in 1892 it was not until the middle of 1914 that placer discoveries came to make the present importance of the district. Gold placer operations, geology, topography and commercial conditions are briefly reviewed.

Geology and Oil Prospects of Cuyama Valley, California.

By Walter A. English. Washington, D. C., U. S. Geological Survey. Bulletin 621-M; pp. 25; illustrated.

This area is situated between the Santa Maria and Sunset and Midway fields, which have been large producers for many years. The formation of these producing fields underlies the Cuyama field. This with many other designations of oil has attracted the attention of oil men to the field for many years, but development has been retarded by remoteness from transportation. Little drilling has been done and the description of the geology of the area as here given is based almost entirely on surface indications and phenomena.

Natural Gas Resources of Parts of North Texas. By Eugene W. Shaw, George C. Matson and C. H. Wegemann. Washington, D. C., U. S. Geological Survey. Bulletin 629; pp. 129; illustrated.

Because of the fact that Dallas and Fort Worth are so dependent on the gas and oil from the surrounding country, it was at their request that the investigation included in this bulletin was made. Besides the detailed study of the two well-known fields in the district, as regarded geologic structure, possibilities and resources, fields were investigated where there were surface showings of oil and gas or where the structure of the formation indicated that there would possibly be oil or gas.

Geology and Coal Resources of Castle Valley in Carbon, Emery and Sevier Counties, Utah. By Charles T. Lupton.

Washington, D. C., U. S. Geological Survey. Bulletin 628; pp. 88; illustrated.

The causes which led to the investigation from which this bulletin is written were first to obtain more specific data regarding the coal field of which little was known and second to prove the area to be mineral land and thus open it for location to which the greater part of it is now closed. The area is located south by a few degrees east of Salt Lake City. Known coal mines and seams are given separate descriptions and in other respects the book is confined to a general geographic description of the country and more detailed description of the geologic formation.

Mines and Mineral Resources of California by Counties. By

W. B. Tucker, Walter C. Bradley, G. Chester Brown, F. L. Lowell and R. P. McLaughlin. San Francisco, Cal., State Mining Bureau. State Mineralogist's Report, 1913 to 1914; 5 volumes; illustrated.

The report treats each county separately and the information for each county is of a similar nature aside from the fact that the minerals found in the county and considered, are taken up with different degrees of completeness according to their importance. The text is all of an economic geological nature. The localities in which the different belts of minerals are found are given; in the more important instances the nature of the mineral and its occurrence is described and in considering the most important minerals descriptions of some of the properties are given.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Valdez.

The mill at the Granite Gold mine has resumed operations, following a several weeks' shut-down, during which extensive development of the property was done. Col. B. F. Millard, president of the company, states high-grade ore has been encountered in the extension of the hoist level, while a good grade also has been opened in the 210 level and the 350 level. In the upper tunnel a 2-ft. vein, carrying more than \$200 a ton, has been crosscut, and another vein, joining the main vein at this point, about the same width and carrying equally good values, has been encountered. On the 210 level the vein has been cut at about 500 ft. vertical depth, a number of assays of the deposit showing average values of \$160 the ton. An 80-ft. crosscut from the 350 level has picked up the main vein, which at this depth is about 2 ft. wide and carries the same high values as in the upper workings, and in the Granite end of the group development has revealed a 3-ft. vein of good milling ore. Millard is confident that there is enough ore in sight now to assure operating the mill for an indefinite period, and that further development will open additional reserves. In fact, he seems to think that the physical condition of the property is better than ever before, and that a steady improvement in the extent and value of the ore bodies may be anticipated.

ARIZONA.

Prescott.

Reduction of ores from the First Home mine in the Big Bug district will start next week. The mill on the Oriental property was recently purchased by the First Home management for that purpose, and has been repaired and modernized—including an oil-flotation unit. The First Home was taken over recently by local and Los Angeles mining people. Since then the old workings have been cleaned out, the shaft re-timbered to a depth of 300 ft., and the ore bodies developed to warrant the mining and milling of ore. The ore is silver and lead, and prevail generally throughout the mine workings. Ed Block, of Prescott, owner of the property for more than a decade, retains an interest with the present operators. W. H. Worthington is in charge of the mine.

The recent closing of a deal for the Monica mine in the Kirkland country has quickened mining activity and stimulated the demand for mining properties there. Among the more recent transfers is the Stein copper group to the Lucky Strike Co. The McMahon mine is again in the productive class and will send out 2 carloads of ore the latter part of this month. The old Vesuvius mine is once more being operated and is responding satisfactorily to the development plan in force. In fact, the entire mining country adjacent to Kirkland is, like the remainder of Yavapai county, experiencing an hitherto unprecedented mining revival.

The Harqua Hala Bonanza mine started September by shipping a bar of gold bullion worth \$6500 to the Bank of Arizona, of Prescott. The bullion represents a run on about 900 tons of oxidized ore mined in the upper levels in the vicinity of the old "Castle Garden" stopes, from which approximately \$2,000,000 worth of gold-bearing ore was extracted in former years. The property was taken by the Yuma-Warrior Mining Co. about 3 years ago, and since that time has been developed more with a view to opening and blocking out ore in the sulphide areas than to maintaining a regular production from the oxidized areas. A tonnage suf-

ficient to meet a portion of the expense attaching to exploration work in the lower levels is, however, mined and billed with monthly regularity. The property is located about 8 miles from Salome, a railway station on the Santa Fe, Prescott & Phoenix railroad, and is being operated under the joint management of J. B. Martin and H. William Stevens. A body of sulphide ore of promising extent and copper values has been opened on the 7th and 8th levels. Prescott and Chicago mining and business men dominate the affairs of the Yuma-Warrior Mining Co. and have to date supplied the funds necessary for exploration work in the sulphide ore zone—that is, funds other than those derived from the sale of the Harqua Hala Bonanza bullion.

Oatman.

Development of a body of high-grade ore in the Crown City group, control of which is owned by the Tom Reed Co., extends the proven district of Oatman $1\frac{1}{2}$ miles to the northwest, from its former limit at the United Eastern. For several months the company has known of the existence of \$10 to \$20 ore there at 60 ft., but now at 75 ft. it has values ranging from \$80 to several hundred dollars.

In the Bald Eagle shaft, near the south end of its holdings, the Tom Reed has made another strike of the greatest importance. The shaft is a few hundred yards northwest of the Aztec shaft, where a recent strike brought life back to Oatman after a quiet summer. Its situation proves that the Big Jim and main Tom Reed veins are distinct. Values are from \$20 to \$50, similar to those of the Aztec.

In the Martin tunnel the Times mine has opened a breast of 8 ft. of solid ore assaying \$12.81.

A high-grade vein drifted upon several months ago in the Pioneer mine has been reopened by Supt. George F. Moser upon his again having charge of the property. It carries values of \$100 a ton and in places is 10 ins. wide. It appears in a south drift from an east crosscut on the 400 level, in the direction of the Arizona-Tom Reed, Paramount, Gold Dust, Boundary, Cone and Lexington-Arizona, the Golconda being on the west of the Pioneer group.

The Orion Co. has finished sampling the Oversight shaft and other workings, obtaining values from \$12 to \$20.

The Boundary Cone continues to drift in its two shoots of milling ore at the 550 and 750 levels. Values show no signs of diminishing.

The Nellie is trenching at the spot where it made its recent surface strike and pinnings, and assays indicate values from \$2 to \$19 a ton. At the same time it is crosscutting the ledge at a depth of 350 ft. Values as the foot wall is approached are improving and as they stand will pay hereafter to mill.

Chloride.

The Keystone mine has opened up on the 300 level, 8 ft. of ore assaying 226 ozs. silver and 14.10 ozs. gold. The Keystone and Silver Keystone are sinking a joint three-compartment shaft midway between the properties. It will be utilized by both companies when hoisting ore for the new mill which is now being constructed.

The Black Jack has let a contract for a new road from the mouth of Alum Wash to the property. When completed the ore will be hauled down on auto trucks. At the present time a large number of burros are being used in packing down the first shipment, which will be in the neighborhood of 250 tons.

The Copper Age is to build a mill immediately. A reservoir is now being built, preliminary to the mill work.

The old Silver Hill mine is again in operation after being closed down for a number of years. The 600-ft. tunnel is being cleaned out so that the ledge can be sampled. It is said that bad management is chiefly responsible for the

failures made in operating this property in the past. It also has historic value, being the oldest property in the district. One of the old shafts was the death trap of three of the early-day miners, who were stoned to death by Indians.

Julius Kruschnitt last week sampled the Golden Hammer, the Brunswick and the Holmes properties at Hackberry. He took his samples to El Paso for assay.

The Tennessee Extension has a force of men employed and a contract has been let for an extension of the tunnel.

The Towne mine has ordered a new compressor, hoist and head frame. When these are installed a new shaft will be commenced, the old shaft being in such bad condition that it cannot be used. This is one of the old properties of Chloride. It was recently unwatered and sampled, with good results.

The new power line will be in operation in Chloride in about 3 weeks. Much electrical machinery will be installed.

Eight hundred and seventy-three cars of ore were shipped from Chloride during 9 months ending June 30, according to the Santa Fe records.

Miami.

Development is to be started at the Miami Mother Lode Co.'s property. The property is traversed by several well-defined ledges on which there has been some development, and ore has been encountered in all of the shallow openings. Preparatory to sinking the Cracker Jim shaft to 500 ft. and drifting on the vein at several levels, the equipment is being overhauled and added to. A compressor, purchased in San Francisco, is expected to arrive, and a storage tank for fuel oil is being constructed. As soon as the compressor is installed, three shifts will be put on in the shaft. Several months ago exploratory work at depth on the vein disclosed high-grade sulphide. This is to be drifted on and the vein crosscut.

Globe.

The Miami Con. has recently been formed and capitalized at \$2,500,000. The company owns 1200 acres and is the consolidation of 19 different groups. The ground owned by the company has been worked for many years and hundreds of tons were shipped before the depression in the price of copper. At points where the ground has been opened the formation is shown to be identical with that at the Live Oak and Keystone mines of the Inspiration Con., which lies directly northwest of Miami Con. There is every indication that the body runs southwest from the Keystone and Live Oak, which the new company adjoins, directly through Miami Con. Further indication of this is seen in the fact that 400-ft. drill holes show the same formation at the same levels that have been encountered on the Live Oak and Keystone. Miami Con. is confident that it will encounter the same body of sulphide that was found by the Inspiration at 700 ft. in the Live Oak property.

CALIFORNIA.

Harrison Gulch.

The Victor Power & Development Co. has ordered a large Diesel engine for the power plant of the Midas mine, and expects to have it in position by Nov. 15. It will consume California crude oil and will displace the wood-burning engine now at the mine. President J. H. Sharpe states a yearly saving of \$15,000 in fuel bills will be effected. Unwatering of the Midas shaft to the 1300 point is to be carried on immediately, and from the bottom levels drifts will be thrown out to seek extensions of the Midas, Gold Hill and other veins.

Crescent City.

Frank Edwards has given a bond and option on his French Hill copper property to a group of California capitalists, according to reports. The mine contains a good tonnage of excellent ore, with the deposits showing a persistent character.

Callahan.

James McKeeney, managing owner of the McKeen mine, has decided to add flotation equipment to the 50-ton mill in the early spring. A large tonnage of good-grade ore has

been blocked out and the mill is effecting a good gold recovery, but the sulphides are causing some trouble. Tests with flotation indicate the sulphides will yield readily to the process. A new tunnel is being driven to open the ledge at further depth.

Goldstone.

Ore assaying \$100 to \$150 in gold per ton was encountered last week on the Gold Ring claim of the United Goldstone group. The strike was made by George Franch and associates and work is proceeding to determine its extent. Lessees are actively prospecting adjoining territory.

The Pacific Mines Corporation is developing good ore on the 300 level of the Bagdad-Chase mine, southeast of Goldstone; 100 tons are shipped daily to the United Verde smelter, at Clarksdale, Ariz., and the management expects to be sending out 150 to 200 tons per day in the near future. The product is reported to net around \$4 per ton.

Sinking of the main shaft of the Goldstone Mining Co. started last week. Ore is being followed and the shaft will be sent to the 700-ft. point. Extensive lateral work is planned and the company expects to start a heavy output early in the spring.

Kennett.

The Friday-Lowden tunnel is in 3400 ft. and is expected to intersect the main Mammoth ore channel within 700 ft. at a point fully 600 ft. below the main workings. The Sutro tunnel is in 700 ft. and will be extended a total length of 3000 ft. Both tunnels are exploring wide areas of virgin and highly-promising territory. Grading for the zinc plant is proceeding rapidly and structural work will soon begin.

Jackson.

The strike situation along the Amador section of the Mother Lode is fairly quiet, but the past week has witnessed several scenes of violence. Attempts to resume at the South Eureka were defeated by 400 armed strikers, and owners of other properties have made no effort to reopen their mines. Several operators state they will resume as soon as a sufficient number of men manifest a disposition to return to work.

John P. McLaughlin, State Labor Commissioner, has reported the situation as serious, and expresses his belief that violence can be averted only by a speedy settlement. The Kennedy Co. is installing two new boilers in the power house and completing the impounding dam. The Argonaut, Bunker Hill and Central Eureka Co. are repairing underground workings and surface plants, preparatory to resumption of activity on brief notice.

Pine Grove.

The Pine Grove Mining Co. has placed its mill in operation and expects to keep the stamps dropping steadily. Good ore is exposed in the upper workings, and work is proceeding to open the ledges at further depth. This is a new producer and has yielded some very rich ore.

In the Reward mine a 28-ft. ore body has been uncovered by R. Robinson. Of this 8 ft. carries ore of excellent grade. preparations are being made for a steady output.

Rich ore has been opened in the Kerkoff mine, near Defender, and the operators are expectant of opening a good tonnage. The shoot shows some specimen ore, and the entire face carries quartz of milling grade. A promising gold deposit was opened recently on the old Stirnaman property.

Forbestown.

A small flotation plant has been erected at the Southern Cross and experiments are being made on ores of various grades. A large tonnage of good ore is blocked out and preliminary tests indicate flotation can be successfully applied. Fully \$50,000 has been expended in developing the property.

It is reported a deal is pending for sale of the Forbestown Con. group. This is a consolidation of several of the largest mines in the field, including the noted Gold Bank. Satisfactory flotation tests have been made on Gold Bank ores and a plant will probably be installed next summer.

Local people have taken over a group of 12 claims, lying northwest of the Gold Bank, and are planning to drive a long tunnel from the south fork of Feather river. The Beik mine has been purchased by Hall and associates of Los

Angeles, who are pushing extensive work. The United States Exploration Co., of New York, is unwatering the Carlisle property, and otherwise preparing for extensive work. The Salano Wonder is active, and engineers are examining the Denver.

Placerville.

The Badger Hill Mining Co. has been formed to operate the Badger Hill mine in the Camino district. It is composed of John L. Woods, Charles F. Bryant and Otto G. Koch. The mine has yielded much rich ore and is said to contain a good tonnage of profitable material. It is owned by County Assessor George Rieber.

The south drift from the 500 level of the Pyramid has broken into a vein assaying \$50. The shaft is being sunk to a depth of 700 ft. and drifts will be run to open the new vein at further depth; 24 men are employed.

Jamestown.

Extensive work continues to be carried on in the lower levels of the famous Harvard, for years one of the premier gold producers of Tuolumne county. The 60-stamp mill is running at top capacity and the quartz continues to carry profitable values. Much new ground has been added lately to the productive belt.

The Boitano mine at Groveland has been taken under bond by J. L. Whitney, manager of the Atlas property in the Tuttletown district. Extensive developments will be started within a few weeks. The Boitano has produced much good ore and considerable ore remains in the workings.

Oroville.

The United States Exploration Co. is shipping supplies to its Robinson mine at Granite Bas'n, northeast of Oroville, and preparing to continue operations throughout the winter months, despite deep snow. The shaft will be deepened to 400 ft., and if ore conditions continue satisfactory, a hydro-electric plant and 100-ton flotation mill will be installed next summer. The company is controlled by New York capitalists. E. N. Miller is superintendent.

Poker Flat.

A new hoist has been installed in the Carey winze of the Herkimer gravel mine, and production of rich material is going on day and night; 25 men are at work and a large yardage of gravel is washed daily. With the new hoist the management expects to take out 100 to 150 cars of gravel per day. Careful prospecting indicates each car will average close to \$11 in gold. Four drifts have been extended from the Carey winze.

COLORADO.

Good Springs.

The Bullion Co. as yet has not opened its ground extensively, but shipments of concentrates and crude zinc ore are being made. In regard to a recent shipment, Joseph J. Daynes, Jr., president, says that the shipment comprised 18 tons. Assays were 14.6 ozs. silver and 64.5% lead. The settlement represents \$74.68 net per ton and the total approximates \$1200. Good results from development is being obtained. The ore found at the greatest depth is richer than that on the upper levels. There is some first-class ore mixed through the mill product, but at the greatest depth the ore is all of a direct shipping grade. The development to new depths is being hurried along. A lead ore was encountered in the crosscut from the 145 level. This crosscut is developing the Daynes vein and there is a good portion of the ore exposed that is of a direct shipping grade. It is expected that within the next 25 ft. the deposit will prove to be a large one and the ore should be of a shipping grade.

Silverton.

B. B. Allen and Celeste Fattor have secured a lease on the Tom Turner property. This property was worked many years. The lessees are making arrangements for immediate work and have been installing necessary machinery, etc. A few men are now employed.

The North Star mill has been started, treating ore from the North Star mine. The mill has been overhauled. The

mine has undergone considerable development in the past 4 months. The work was carefully planned and before the starting of the mill the mine was given the necessary attention.

Clay Johnson has the contract for sinking the shaft at the Dora mine. During the first part of last week he started his men. Three shifts are employed and he expects to complete his task in a short time.

A strike is reported to have been made in the Mayflower, which is now being worked under bond and lease by Slattery, Mears and associates. The value of the body opened is given at \$25,000. The Mayflower is owned by G. H. Malchus of this city.

Georgetown.

A strike has been made on the Hanson-Walthers lease in the Capitol mine. No. 15 raise and a mill run of 4 tons shows 200 ozs. gold per ton. The streak is looking good and the lessees intend to take out at least 12 tons before making another shipment. With this they will ship the tailings they now have, either to the mill at Victor, where the Cresson ore is treated, or direct to the smelter. The other lessees in the Capital are raising and crosscutting for what is now believed to be the gold zone on the hanging wall above the lateral barren plane in the big, continuous copper and lead ore shoot of the Aetna lode. No. 15 raise was the first to go above this barren plane, and from present indications there is no reason that the gold zone should not extend the full length of the mine, as has the copper and lead ore.

Leadville.

The work of draining the ground of the Down Town Mines Co. has been completed and permanent pumping equipment has been placed. Work is now being directed to opening the ore bodies. The lessees who have been operating at the Wolcott and Hibsche shafts in the Down Town section have experienced some difficulty. The first undertaking to operate through the Wolcott resulted in failure because of the water, which prevented the lessees from getting into the old workings, drainage being blocked in some way that could not be remedied without the installation of pumping machinery in the shaft. The expense of such a plant was considered too great. It was decided to move the surface plant to the Hibsche shaft, which was known to be drained. Following the moving of equipment, everything progressed favorably until work had been continued below the old water level in the shaft. Here a large cave in the shaft barred further progress and considerable time has been spent removing the cave and retimbering the shaft. This work is now nearing completion and development in the territory will be under way during this month.

In the past considerable exploratory work has been done by the Fidelity Gold Mining Co. The ore now uncovered appears in the lower tunnel, which cut the vein after driving 1200 ft. Here 4 ft. of smelting ore averaging \$200 has been opened. The ore is iron sulphide carrying 10 ozs. gold and showing high values in silver and copper. It is stated that 200 sacks of the ore have been extracted and will be shipped as soon as trains can be secured to move the ore. Previous work on the Fidelity uncovered a vein of low-grade ore assaying around \$10 to the ton and reported free milling. This shoot, which is stated to be 25 ft. wide and has been traced through the property for 100 ft. Plans for the erection of a mill are now being completed and construction work will be started in the spring. The site of the mill will probably be in Four-Mile Park, near the foot of Bull hill. The present development will be continued till December, when work will be suspended until spring. Should the discovery prove as large and rich as reported, steps will be taken early next year to equip the property for extensive development.

Telluride.

King & Farrell are operating the Gertrude group with a fair sized force. They have put in air drills, are drifting on the Modena vein and will work all winter.

At the Black Bear mine they have a shaft 450 ft. deep and have taken out enough ore to keep 20 stamps at the Smuggler mill going full capacity. The company desires to increase the output, and have commenced widening the shaft

and will install an electric skip. This will double their hoisting capacity. While the shaft is being enlarged a part of the miners will be laid off.

IDAHO.

Wallace.

Although plans for the plant have been prepared, the Consolidated Interstate-Callahan Mining Co. will not build its proposed new mill at Enaville for several months. In fact, no definite time for beginning construction has been decided upon, according to President John A. Percival of New York, who spent several days at the properties. Even when the new concentrator is built the present plant will be maintained in service until the ore reserves on the Nine-Mile side of the mountain are exhausted. "We have at least 4 years' supply of ore in the workings tributary to the present plant, and there would be no economy in diverting this to a mill at Enaville, as the product would have to be sent down into the Amazon-Manhattan workings, and thence by aerial tram to the new railway now being built up Beaver Creek," said Percival. "Eventually, however, I feel sure that the proposed mill will be built, but how long before we will begin construction I cannot say. Production is being maintained at the maximum, and the output in September was 6600 tons of lead-silver-zinc concentrates, as compared with 7200 tons in August, but we do not know what the net earnings for the month were, as settlements have not been received. August was the banner month in the history of our company, so far as production is concerned, but we soon will have it increased, as we are installing a new flotation recovery system to work over the tailings that have been impounded near the mill. For the first few weeks after the plant began operating these tailings got away from us, but since then they have been conserved and there is a several years' supply for the retreatment department, which will produce about 800 tons of high-grade concentrates monthly. The additional recovery system will cost about \$50,000, but this amount will be repaid soon after it is in service, probably about Jan. 1. The company will pay the regular quarterly dividend of \$1.50 a share, or \$697,485, on the specified date of disbursement, but I am not inclined to believe that any extra payments will be made this year, as we are building up a surplus fund commensurate with the magnitude of our operations, and excess earnings are being diverted to this account. Excellent progress is being made constructing the new O. W. R. & N. branch line up Beaver creek. Work already is under way with a large crew, and grading is well advanced. Track laying will begin soon, and I was told that about a mile of rails would be laid by Nov. 1."

Hailey.

The \$40,000-option on the Smoky Bullion group of gold-silver-lead claims, 35 miles west of Hailey, held by the United Mines Co., a Spokane corporation, is to be exercised soon, according to E. A. Worswick of Lovelock, Nev., owner of the properties. "The holdings comprise three patented and three unpatented claims and a patented mill-site," said Mr. Worswick. "Better than \$75,000 have been expended in development and a considerable tonnage of ore has been exposed. One vein has been opened by surface cuts for 2000 ft., showing the ledge to be one of 4 ft. wide and carrying average values of about \$40. Another shoot has a width of 4 to 30 ft., in which there are three streaks of solid ore 6 to 8 ins. wide, and at one point there is a streak of solid lead ore 16 ins. wide that is in shape for shipment at once. The higher grade material assays 65% lead, 45 ozs. in silver and a few dollars in gold to the ton. The new company, of which Thomas S. Griffith is president, Charles Uhden treasurer, and George P. Larsen, secretary, contemplates beginning operations in about 30 days. There is more activity in the Wood river district than for many years, the entrance into the field of eastern capital having given mining a much-needed impetus. The Federal Mining & Smelting Co. already has invaded the field, having taken over the North Star-Triumph group, which it will have on a producing basis as soon as the new 200-ton mill now being constructed is operating; a New York syndicate has acquired another dormant property

there for \$100,000, and the Stewart Mining Co. is investigating several claims with a view to purchasing them."

The Nay Aug Mines Co. mine, in the Wood river district of southern Idaho, has been purchased by Raymond Guyer, of Spokane, general manager of the Rex Con. Mining Co. It is said that an eastern syndicate is identified with the corporation that is being organized to take over the property, which has been worked intermittently for the last 30 years, and is credited with production estimated at approximately \$750,000, gross. The property probably will be transferred to the Idaho Exploration Co., capitalized for \$100,000, which is being formed to engage in development of Wood river holdings. If development work warrants the company will install a modern mill of sufficient capacity to treat the output. These improvements will represent an expenditure of about \$75,000. There are two shoots of ore, running about 40 to 49% zinc, remaining untouched in the 500 and 700 levels, the former operators having removed only the lead-zinc product, and it is estimated that there are not less than 40,000 tons available for immediate extraction in these bodies. It is intended to sink 300 ft. from a point near the face of the No. 7 tunnel, now in 2200 ft. Adjoining ground has been acquired by the Silver-Lead Mining Co. with which Darwin Utter, former surveyor general of Idaho; M. Miller of Kansas City, and Raymond Guyer have the chief interests. The ground is virgin, but engineers say it is as promising as the Nay Aug and has a continuation of its vein. A tunnel has been driven 450 ft. and lacks 150 ft. of the body, which is 1 to 6 ft. wide, contains lead and silver, and in these and other particulars is characteristic of the Wood river country. These properties are 12 miles northeast of Hailey.

Burke.

The capitalization of the Laclede Mining Co., which owns and is developing the Laclede mine, near the Hercules holdings, was increased from 1,000,000 to 1,500,000 shares at \$1 each, at a recent meeting of the stockholders in Wallace. The company intends to dispose of stock to defray expenses of equipping and further developing the property. Present development consists of 1600 ft. of tunnels, 1200 ft. of drifts and 300 ft. of shafts, opening four different levels, but in none has commercial ore been encountered. Operations have been suspended until February or March, when more extensive development plans will be inaugurated.

Development of the West Hecla group of lead-silver claims is now being confined to drifting on what is believed to be the extension of the main vein of the Hecla mine, adjoining, and two shifts of miners are employed, according to J. V. Pohlman, of Spokane, secretary-treasurer-manager of the West Hecla Co. The drift starts from a point 1800 ft. in from the portal of the crosscut, and the vein now has been followed for more than 100 ft., promising mineralization being shown the entire distance. The vein, which has the same dip and strike of the Hecla vein, is soft and easily worked, and the general formation is almost identical with that exposed in the Hecla workings. "There are 2000 ft. of this vein in West Hecla ground, which is near the Hecla Co.'s principal holdings, only the Galena fraction intervening," said Pohlman. "The Hecla vein has been opened to within 290 ft. of the east end line of the Ophir claim of the West Hecla group, and the indications are that this ore body extends into our territory. Our property is adjoined on the west by the Standard-Mammoth group, and to date we have run 2200 ft. of crosscuts and drifts, opening the mine to 700 ft. vertical depth. Our property comprises three patented claims, the Bamboo Chief, Ophir and Ruby, lying in the center of three of the heaviest producers of the Burke district, the Hecla, Standard-Mammoth and Tiger-Poorman, both of the latter being owned by the Federal. The Sherman Development Co., operating the Union and Hidden Treasure claims, lying immediately north, has opened a very important ore showing, and the indications are that this corporation will become one of the big producers of the district. This deposit bears no relation to the West Hecla bodies, but it demonstrates the extensive mineralization of the region. Between 700 and 800 ft. additional depth can be obtained by running a lower tunnel, enabling us to begin production very quickly in the event that we encounter commercial ore. The West Hecla company is officered as follows: Morton Webster, Wallace, is president; R. H. Bailey, Spokane, vice-

president, and J. V. Bohlman, secretary-treasurer. These, with Dr. Thomas A. Russell and Arthur A. Boothe, of Spokane, complete the directorate."

LAKE SUPERIOR.

COPPER.

Houghton.

Hancock produced in September 341,195 lbs. of copper from 22,588 tons of rock, making the yield 15.5 lbs. a ton. This is an increase of thirty-four one-hundredths of a pound in the yield. Both No. 2 shaft and Quincy No. 7 are giving a better yield, the latter running about 19 lbs. At the Centennial-Allouez the mine is sending about all the rock that can be handled there for the present—about 650 tons, but can send a vast amount more than it is sending to the Quincy mill, which is milling the rock hoisted through its own shaft, where it will bring up between 8000 to 9000 tons this month, as compared with about 7000 for September. More stopes are being opened as men are coming in more freely.

Wyandot is now running into excellent grades of the metal on the 10th level, where it has begun again to extend its drifts which had only covered a distance of about 25 ft. in each direction. The two stopes that have been opened for 3 or 4 months back, and which are getting pretty well up to the 8th level, are also in good ground. From both of these sources a stockpile is being accumulated that will be large enough to be milled at the Winona mill sometime before the holidays. The indications are that the returns in mineral will equal if not exceed those of the first mill test which were 28 lbs.

Victoria is gradually getting into condition so that the tonnage can be greatly increased; the new hoist is working very steadily; the track on the new skipway is laid except between the two lowest levels; and the waste rock has been all hoisted out of the way. The output for last month was 105 tons; and the production of refined copper will be increased about 25% this month, principally because more ground was available and a better selection could be made, though there was some increase in the tonnage. The 23d level east and the bottom level, the 26th, are exposing some high-grade rock. The former has a mass that has been uncovered for 8 ft. without any sign of its end being in sight. Sinking will be started again shortly. Geo. Hooper is superintendent.

Keweenaw began stamping the first of its rock from the Ashbed lode the 14th, working about 6 hours. For a few days the old Phoenix mill where the rock is being treated will run only on the day shift until the machinery is running smoothly. The old Ball stamp has been put on a firm base and is operating very efficiently. This beginning is both a mill test and the commencement of the mine's production which will be carried on indefinitely.

New Baltic has its shaft pit down about 25 ft. without any indication of the ledge, which will be run into at the depth of from 40 to 50 ft. The timber is about all ready to be set up as soon as the ledge is reached. President R. H. Shields is very anxious to get to sinking as soon as possible to make up for the unavoidable delay in securing the shaft site.

New Arcadian is now cutting out its loading station at the 1500 level as it sinks the shaft, and will soon begin to cut out its crosscuts to the New Arcadian lode, and to the lode encountered on every level back of the shaft about 15 ft., and also for quite a distance beginning with the 1400 level in the shaft with paying grades of copper. It will drift on the latter lode enough to get an estimate of its average. Some good copper is being met with in the two drifts at No. 2 shaft which is on the lode supposed to be the Old Arcadian on the 150 level.

Isle Royale's output has declined slightly to about 2825 tons daily from about 3000, which has been maintained for 3 months or so on account of the want of men.

Wakulla, which comprises 480 acres located about 5 miles west of the Norwich or Copper Crown, was recently examined by Henry Hillegas of Houghton for the owner, W. J. Lan-

don, a banker of Winona, Minn. Hillegas had the assistance of a geologist of this district and found some promising lodes; he also made estimates as to the cost of reopening, etc., and embodied findings in a report which the Mr. Landon now has under consideration. It is rather likely that the latter may decide to explore the property.

Michigan, since finding the mass copper on the Ogimah lode, has been in a very good quality of stamp rock, and is now crosscutting to the fissure vein which parallels the amygdaloid, and which was very good when it was passed through by the main crosscut. The width of the mineralization the second time it was passed through was about the same as when first opened—6 to 7 ft. The main crosscut is now 180 ft. from the Ogimah, and is not meeting with anything of importance. Nearly 2 tons of mass was taken out of the Butler lode last week. The west drift has met with considerable copper, but at the present time is passing through a fault of trap. The east will be soon connected by a stope with the 5th level, and for the past few days has disclosed only a little copper, and that was stamp grades.

Flint Steel under the direction of Supt. Samuel Brady of the Michigan, has men cleaning up the surface and examining the three old shafts on the Butler formation, which they report to be very promising. It is now being decided from the data obtained just where to begin, and this question will soon be settled and the work of pumping out the water will be started at once.

Calumet & Hecla's new smelter, which will have a capacity of 2,000,000 lbs. a month, located at Dollar Bay, will be in commission in a few days. This is an additional smelter which is required by the increasing amount of mineral and mass that is coming from the mines whose smelting is done here—the Osceola, Tamarack, Ahmeek, Isle Royale and Centennial. The capacity of the smelter, outside of the new smelter, is about 5,000,000 lbs. monthly. The plant is exceedingly well situated, as it is on Portage Lake, which is a part of the waterway crossing the Keweenaw peninsula used by all of the shipping coming to the Copper Country, and on which are Hancock and Houghton. It is about 5 miles south of the Calumet & Hecla smelter at Hubbell.

Houghton Copper is still in the good ground encountered on the 4th level of the Superior lode recently opened by a crosscut from the shaft, a distance of 250 ft. The north drift at the distance of over 130 ft. from the winze on the bottom, the 12th level, for the first time since the drift was started, is in a somewhat lean but short stretch. The West vein is disclosing but little copper, but the stoping on the 6th level is still meeting with good grades.

Cherokee, which is now down about 110 ft., at the depth of about 90 ft. passed through a horse of trap and below it ran into the mineralization again richer than before, which has continued to the bottom.

IRON.

Iron Mountain.

The Peninsular Power Co. will soon supply the Indiana mine with electric power and it is the intention to commence the construction of the transmission line at an early date. The initial installation will supply the crusher and pumping plants. In the spring an electrical haulage will be installed and a number of individual motors for other purposes erected. The company will soon commence the erection of machine and blacksmith shops, and the building will be 60 by 40 ft. Dwelling houses will be erected this fall. Supt. Richards complains of a labor shortage and says he could employ a considerable larger force, if the men were available. The ore is smelted in the furnaces of the Thomas Iron Co., Milwaukee. The pig is shipped to New Orleans and from that port to Italy, at present.

Wakefield.

Considerable activity is being noted on the part of the Gogebic range. The Hanousek pit was not completely stripped before steam shovels were placed to start production. With the closing of the shipping season soon the stripping of overburden will be completed. M. A. Hanna Co. is to start another big pit near its Wakefield mine. Seventy feet of overburden covers the deposit and the waste will be removed by hydraulic. About 600,000 cu. yds. in all will be

stripped. The course of a small creek will have to be changed. The company has made the necessary arrangements with adjoining land owners to carry out this work. At the outset the ore will be taken from the pit to surface on an inclined track, but later it will be milled and pulled to surface through "B" shaft. The new mine will be known as "C" pit.

The Castile will install two 500-gal. electric pumps that have been ordered from Fred M. Prescott, Menominee. These are to care for the additional water that is expected to be encountered in opening up the 19th level. The plat and pump station is being cut on the 19th, the shaft having been completed from the 17th to 19th recently. The pumps will be installed and running by the spring of 1917, when the 19th level will be developed.

The Sunday Lake mine is installing a Greene economizer and equipping their boilers with automatic stokers. They will wash away the ashes with a stream of water running in front of the boilers as at the Castile. They have extended the boiler house 30 ft. west. The mine has shipped about 40,000 tons to lower lake ports, the analysis being 37 to 40% iron.

Ramsay.

At the Eureka 16 new company houses are to be built and bids have been called for. Further it is to soon purchase a first-motion steam hoist for the No. 2 shaft. The shaft is timber and will have to be repaired before hoisting can be done through it. It will be used to mine a pocket of ore found in the western portion of the mine, near the boundary line between this and the Anvil mine, which, however, is not considered an extension of the Anvil ore body. A diamond drill hole from surface to a depth of 1100 ft. with the idea of locating the extension of the Anvil ore body is to be sunk. This hole will be put down 500 ft. east of the Eureka-Anvil line.

MISSOURI-KANSAS.

Joplin, Mo.

For 6 consecutive weeks shipments of zinc ores have been heavy, and in every instance have been greater than the production. Naturally this has resulted in a heavy depletion of ore stocks. From a total of 26,566 tons in stock at that time, there have been shipped sufficient to reduce it to 12,000 tons this week. This, too, is in the face of a slightly increased output. These new conditions place the district in a much better position statistically than it has been for many weeks, and relieves the operators greatly, for there was a period during the spring and summer months when it appeared that every week marked an increased output and a decreased demand for the Joplin product. As a result stocks assumed huge proportions, and at one time exceeded 30,000 tons, the largest figure ever known in the field. Rapidly decreasing ore prices, together with the accumulated stocks, forced the closing of many mines, but with a renewed buying activity there is again a tendency to resume operations in so far as local conditions will permit. The low waters of Spring and White rivers, which are the sources of power for the plants which supply the Joplin district with electric power, have been so low that the maximum power is not available, and many patrons of the plant have been forced to wait till the fall rains raise the rivers, or turn their plants into steam-driven ones. The gas engine plants are also experiencing trouble, in that they cannot get sufficient gas for regular power, and this last week has been one full of difficulties for all those having either electric or gas-engine driven mills. Every winter season sees difficulties for the gas engine plants, but this has been the first year when there was an actual shortage of electric power. Even supplemented with steam turbine plants, the electric power company has been unable to meet their patrons' requirements.

Southwest of Joplin the Adams-Hicks Zinc & Lead Corporation, owning a lease of the Mattes Bros. land, has been opening up a good deposit of ore. This is being mined and milled by the company itself, but in addition to this the company has sublet a portion of its lease to small operators,

who have been prospecting the shallow levels, and they have opened up some remarkably good ore. J. H. Handsford of Joplin is one of the principal owners.

With excellent fall weather prevailing there has been a great deal of prospecting and development work under way all over the district, and at no place has the prospecting been more general than in the Joplin camp. In the old Chitwood camp the Coffeyville Mining Co. has opened up a prospect of merit. It has two drifts now running 10 to 20% zinc blende and in each case the deposit seems to be widening out. The face is 12 ft. high and carries both lead and zinc. The company is now planning on the early erection of a milling plant. John West of Joplin is the local manager.

In the Leadville Hollow camp John T. Phipps and Chas. W. Edwards of Joplin have been doing some prospect drilling that has shown some very good results. One of the last holes put down encountered 11 ft. of ore at the 50 to 61 levels that assayed 20% zinc. Nine drill holes have been put down so far, and only one hole failed to show ore. Some of the deeper holes showed a 28-ft. face of ore. The company has a 16-acre lease immediately in the heart of the old camp, and the work of development will be hastened before the severe winter weather sets in.

In the southeast part of the Joplin camp there is a number of new prospects and much of the old ground known for years as shallow producing territory is being re-prospecting, and in many cases with good results. On the Robb land the Old Friends Mining Co. has recently uncovered a deposit of ore at the 80 level which is considered very good. The ore is in soft ground, and with further development the owners expect to keep a 150-ton mill running steadily.

Johnson and Tatum have just struck what appears to be a good zinc prospect on a lease of the Missouri Lead & Zinc Co. land. The ore is found at a shallow level, and is said to run nearly 25% lead and zinc. The owners are this week installing hoisting equipment and will be better able to open up the prospect hereafter. Another prospect on an adjoining lease is the Honey Bee Mining Co. shaft, where at a depth of 150 ft. a good run of ore has been developed by drilling and a shaft is being put down to that level.

After milling tailings for many months the Grandtower Mining Co., west of Joplin, has opened up a good prospect by drilling its lease beneath the old tailings pile, and finds that a considerable portion of its ground has ore at the 65 to 105 levels. Some of the ore ran as high as 10% and was found in a disseminated formation of spar and flint. A shaft will be sunk to open up this new discovery, while company will continue its milling of the old tailings pile. Those interested in the property are J. M. Evans, J. C. Finke, L. R. Parker of Joplin, and L. L. Hutchmaker of Grandtower, Ill.

On the Thompson land southeast of Joplin two leases are being developed, one by the E. & N. Mining Co. and the other by Smith, Moore & Co. Both companies are engaged in sinking shafts upon recently drilled ground where drill holes showed the existence of ore at a depth of 130 to 206 ft. The shafts have been put down to 115 ft., but here the water has been found to be so strong as to seriously interfere with further sinking. A concerted effort is being made to overcome the head of water and heavier pumps will be installed.

Galena, Kan.

Frank B. Wilcox and W. S. Watson of Joplin have just taken over a lease in the heart of the Galena camp with the intention of erecting a mill at once. The property has been known as the Lone Elm mine, and it has been producing well over hand jigs and a custom mill. The ore has milled out as high as 9% zinc, while the concentrates have run up to 63% zinc. The new owners will rename the property the Premium Mining Co. The company has a 10-acre lease of, practically virgin ground in the very heart of the old mining camp.

In the Cave Springs camp, near Galena, Mustain Bros. have taken hold of a 40-acre lease and have been successful in bringing it to the production point. The company now has three shafts producing from the 103 level. Besides the Mustains activities there are several lessees. The company expects to put up a concentrating plant for cleaning its own ores and will also handle the ores of its sub-lessees.

MONTANA.

Butte.

There were 48,809 tons of ore treated under the oil flotation process at the plant of the Butte & Superior during September, and 12,694 tons of concentrates were recovered, according to report submitted by the mining company officials to the federal court. Of the amount of ore treated in its oil flotation plant, 48,809.7816 tons; of the amount of concentrates recovered in its oil flotation plant, 12,694.2915 tons; of the analysis and assay returns of heads in its oil flotation plant, 14.8415% zn., .9494% pb., .1534% cu., 2.5475% fe., 1.7308% mn., 66.8589% insol., 6.1882% oz. ag., .0058% oz. au.; of the analysis and assay returns of concentrates recovered in its oil flotation plant, 53.659% zn., 3.167% pb., .509% cu., 3.010% fe., .303% mn., 8.672% insol., 21.720% oz. ag., .0322% oz. au.; of the cost of flotation per ton of concentrates recovered in its oil flotation plant, \$3.1725; of the value per ton of concentrates recovered in its oil flotation plant, \$48.69. The figures set forth under the foregoing six paragraphs are, as noted, approximate estimates, for the reason that at the date of the filing of this statement no exact information has been acquired by the Butte & Superior Mining Co., so that accurate figures can be given. As to the analysis and assay returns of tails from the oil flotation plant, the following figures are accurate and not estimates, 1.0900% zn., .0600% pb., .0800% cu., .8000% fe., 2.0000% mn., 88.4000% insol., .7900% oz. ag., .0020% oz. au.

The north crosscut on the 160 level of the Butte & London apparently is approaching a ledge, one of the series of large fissures cut in the property of the Rainbow Lode Development Co., adjoining the Butte & London. A number of stringers were intersected and for a time it was believed that the vein had been entered, but as the breast was driven ahead it was shown that the fissure had not been reached. The fissures where cut on the 1500 level at the Rainbow are large and strong and show a good state of mineralization, carrying copper, silver and zinc values. One of the largest of the Rainbow fissures is that of the Third Sphinx, a fissure showing an outcrop with a width of about 40 ft., and striking directly for the northern part of the Butte & London.

Great Falls.

The new zinc plant is far more than meeting the most enthusiastic expectations of the company and work is in progress in laying the foundations for a "bag house" which will cost more than \$100,000, the same to be completed about Jan. 1, is the important feature of the news given out by C. F. Kelley, managing director of the Anaconda Copper Mining Co., while here this week. With Mr. Kelley were C. W. Goodale, manager of the company; John Gillie, superintendent of mines; Frederick Laist, chief metallurgical engineer; William Tanner, chief engineer, and one or two other officials of the company. "With but two units of the zinc plant complete, we have already found it is going to be a most gratifying success, from every standpoint," said Mr. Kelley. "There was an output of 60 tons of zinc at the plant in one day, while the theoretical capacity of the two units was but 50 tons, so it will be seen that it exceeds capacity expectations by 20%. The plant is working satisfactorily in every particular."

Mr. Laist talked about the "bag house" which is now being constructed. He said that it would be 50 by 150 ft., ground dimensions, and about 50 ft. in height. In the building there will be 1440 bags, which will be used to get the lead from the fumes that come from the reverberatory furnace. The bags will be arranged with the mouth at the floor and the fumes will pass into them and all except the lead will escape through the bag. "This new building will be erected with our own forces," said Laist. "The work of putting down the foundation is now under way and there is expected to be no trouble in getting the bag house completed by Jan. 1. It will enable us to save the lead that, without the device, is not being saved here."

Concerning the zinc plant, Laist said that there had been an unexpected delay in getting certain of the heavy electric machinery, but that the manufacturing company had prom-

ised to hurry the remaining portions as rapidly as possible and some hope was entertained of having all five units of the plant operating by Jan. 1. "There seems to be pretty good ground for believing we will have four units ready about the first of the year and we might be fortunate enough to have all five. The third unit can be installed as soon as certain machinery now in transit has been received. The first two units have given the fullest satisfaction. As. Mr. Kelley has said, the plant is turning out 20% more than the theoretical capacity and is doing it in excellent manner. Because of that fact, we are anxious to get the other units going as soon as possible, but we cannot hurry the manufacturers of the heavy electric machinery and it appears we may even consider ourselves fortunate to have gotten our plant as nearly equipped as we have."

Saltese.

The Tarbox Mining Co. will inaugurate shipments about Jan. 1, according to Manager Richard Daxon. "The shaft now is down nearly to the 600 level, where a station will be cut, pumping equipment installed and a crosscut driven 180 ft. south to intersect the vein," said Daxon. "Drifts then will be run both ways on the ledge, to make accessible for extraction of ore. Power drills and the compressor plant recently installed are working smoothly, and much better progress is being made in sinking the shaft. A sawmill with a daily capacity of 25,000 ft. is being installed to supply lumber and mining timbers. A boarding and bunk house and office buildings are to be built at once."

Superior.

The Intermountain Mining Co., which owns and is operating the Intermountain mine, formerly the Amador, now is netting about \$17,000 monthly, and probably will be able to continue to earn at this rate for some time, as arrangements have been made to secure electric current for power during the winter from the La Casse Bros.' dredging plant, nearby, according to Frank Walker, of Jackson & Walker, Spokane brokers, who returned recently from a visit to the property. "A car of concentrates is being taken every fifth day from the jigs and tables, and an equal amount in the same period from the flotation system," said Mr. Walker. "In addition 1 to 2 cars monthly are being secured from the grizzlies, making the output about 14 cars a month. The product from the jigs and tables runs about 15% copper, and from the flotation system, 18%. This makes the net smelter returns about \$1800 to \$2000 the car, or an average of \$23,000 monthly. Operating expenses are approximately \$6000 monthly, leaving the net earnings \$17,000, or more than twice dividend requirements at the present rate of disbursement, a half cent the share. A new shoot has been found at depth on a side of the gulch opposite that in which the shaft was sunk and two on the No. 2 level. The shoot across the gulch will have 500 ft. of backs at the point of its intersection. A stope on the No. 2 level has a width of 17 to 20 ft. This body has a copper content of 2½%, but streaks having a width of 1 to 2 ft. contain 10 to 11%."

NEVADA.

Goldfield.

The main shaft has penetrated the alaskite-shale zone in the Silver Pick, at a depth of about 1050 ft., and a crosscut is being driven to the west to intersect the shoots of rich ore located by the core drill. It is calculated the ore bodies will be tapped within 500 ft. Arrangements have also been made to develop the shoots indicated in the contact of latite and shale. The work is followed with pronounced interest, as it may open a new ore zone to the west of the Columbia Mountain fault.

The Grandma Con. Co. has doubled its acreage by the acquisition of adjacent ground along the strike of the Grandma-Spearhead ledge. Sinking of the shaft is going ahead rapidly and it is believed the ledge will be intersected within 200 to 250 ft.

Returns from the first carload of ore shipped from the new shoot on the 300 level of the Great Bend were \$83 per ton, according to the management. A winze is to be sunk on the shoot. A raise was recently started and has entered

low-grade material, apparently establishing the upper limits of the rich deposit. Development of the main vein continues.

The shaft of the Spearhead is down 945 ft. and is expected to enter the contact zone at the 990 point. Important lateral work is being pushed from several points.

National.

The new mill erected by the Hatch Mining Co. to treat ore from its lease on the Buckskin National mine is operating satisfactorily. The winze from the 300 level has attained a depth of 25 ft., and a crosscut from this point has penetrated the vein for 3 ft. The ore assays around \$50. Crosscutting continues to determine width of the ledge. A tunnel has been started to cut the vein system 650 ft. below the main workings. It will have an approximate length of 2100 ft. N. P. R. Hatch is manager.

At a point 3000 ft. south of the Hatch workings, the Buckskin National Co. is extending a crosscut tunnel to intersect the Upper vein. It lies about 285 ft. west of the developed ore body, which has been developed to a depth of 400 ft. Forrest Bell is superintendent.

NEW MEXICO.

Mogollon.

Work has been resumed on the Gold Dust Group, in southern part of district. The property has had 1800 ft. of tunnels driven, encountering two ore bodies. These are to be explored further and the main tunnel extended into center of property.

Supt. Cockran of A. Leschen & Sons Co., who are furnishing material for aerial wire rope tramway from Pacific mine to the plant of Socorro Mining & Milling Co., is on the ground superintending installation. Rollers and rim work are being placed on standards and terminals. Practically all the wood work has been completed. The tramway will have a length of 1 mile and a capacity of 10 tons per hour.

The Oaks Co. is getting in supplies and other material preparatory to starting work on its drainage and transportation tunnel on Mineral creek. When completed it will be the largest and longest tunnel in the district, and will encounter the principal ore bodies at depths of 1400 to 1800 ft., and be the means of effecting a great economy in future operations. It is planned to have a large capacity plant at the portal, and eventually centralize all metallurgical operations of the district at this point. The topography of the site is finely adapted to the consummation of this proposition.

Dr. Ransome, of the U. S. Geological Survey, spent the week in camp checking up geological work being done. An appreciable territory will have been covered when the assignment is completed.

OREGON.

Riddle.

The Oregon Nickel Mining Co. recently shipped 2 cars, 100 tons, of chromium ore to the Illinois Steel Co., Chicago. The ore averaged about \$30 per ton and the total value of the shipment was \$3068.95, Chicago.

Kerby.

The Seattle company which purchased the Neill Success mine has also purchased the Geo. W. Finch and George H. Mood mining claims on Fiddler's gulch. The firm is now shipping ore to Seattle to determine the best method for extracting the values.

Canyon City.

The Copper King mine in the upper Grave creek region of Jackson county is being equipped with a concentrating plant of 40 tons capacity.

Prairie City.

At the Cougar mine 7 men are now being employed and a Bryan roller mill is being installed to be propelled by water power. They have also adopted flotation. The ore after it leaves the mill is sent to a tank and oil is placed in the tanks. Agitators in the tank keep the ore moving and the

values are taken off in the bubbles formed with the oil. They also own the Washington and the Klondike group of properties and expect to do some extensive mining here.

The Standard is working a crew of 10 men, drifting on a small vein with the intention of crosscutting a big ledge on Copper ridge.

J. Howell is sinking some prospect holes on the Dixie creek placers. It is rumored that local people are financing the work for the purpose of prospecting the ground for dredging. The work was started some time ago, but had to be discontinued on account of the water. Pumps have now been installed.

The Ophir mine is to be organized into a company by Salt Lake interests. The property has been developed by Jeff Forester. There has been work done on the ground for the last 10 years and a low-grade free gold property has been developed. The ledge is 50 or 60 ft. wide.

The Dixie Meadows is idle and the property is in bad shape. Much of the workings have caved and it will take considerable expense to catch up. It is understood that the company is contemplating some work on the property, it being the belief that with the flotation process the property can be placed on a paying basis.

SOUTH DAKOTA.

Lead.

The Wasp No. 2 has shipped 7200 lbs. of 45% tungsten to the Chemical Products Co., Washington, D. C., at \$11 per unit. The mineral was shipped for making tests in tungsten extraction, which are now under way. Chemical Products has erected a new plant and are conducting experiments for testing their process of extraction. Wasp also shipped about \$6000 worth of ore east.

Deadwood.

A brick has recently been produced from a 10-day cleanup at the Deadwood-Standard mill, now under the supervision of Prof. Dove. At the present time they are running through the mill 55 tons daily, but hope soon to be able to treat 200 tons. There is still considerable work to be done on the mill. The product from the mine is curtailed because they have to do their development work as they go along. The ore that is being taken out is paying for all work and leaving a profit. It is said that the development work which will be necessary before the milling plant can be run at its full capacity will require several weeks to complete. The shoot is 15 to 28 ft. thick and of unknown width. It is said to be the most extensive deposit of ore that has yet been uncovered in any of the flat formations of the district and it is rumored the average is over \$6.

UTAH.

Alta.

The Emma Con. Mine Co. was incorporated last week under Delaware laws by Emma Copper interests. The officials will issue a statement to Emma Copper stockholders during the week. It will have to do with the taking over of the control of the Old Emma mines and the Emma Copper companies. The transfer office of the Emma Con. Mines Co. has been established at 40 Exchange place, New York. The registrar is the Registrar & Transfer Co., 120 Broadway, New York. Stockholders should immediately send their correct address to the Emma Con. Mines Co. at 40 Exchange place, New York, so that the official circular can be mailed to them direct.

Alta Tunnel & Transportation Co. is engaged in driving a tunnel from Silver Creek fork of Big Cottonwood canyon in a southerly course, destined eventually to cut through the mountain to the Alta side, on Little Cottonwood. Driving has been in progress some time, the heading at this date being 2000 ft. from the portal, and for that distance the tunnel is on the company's ground. The purpose of this bore is for mine development, drainage and ore transportation. It cross-

cuts the formation, and thus far has intersected several mineralized fissures; and numerous other similar fissures known to exist will be cut at depths of 500 to 1600 ft. as the tunnel work progresses. A considerable flow of water already has been developed, and by driving about 3000 ft. farther, as contemplated, a large area above the tunnel level will be thoroughly drained. A number of mineralized fissure veins crossing the course of the tunnel have been opened on the surface, and it is figured that this tunnel will make possible their development at great depth, and facilitate ore production on an economical basis. The Clements group, now controlled by this company, has yielded rich ore in workings from the surface, and plans are to open its ore bodies at much greater depth by driving to them from this tunnel. The tunnel with its drainage channel, track on permanent bed, and 10-in. air line, is in excellent condition, and driving is going on rapidly into ground where important disclosures are anticipated. This work is under direction of F. V. Bodfish, manager and mining engineer, Salt Lake.

Eureka.

Tintic Standard Mining Co. has a productive property in Tintic district, $2\frac{1}{2}$ miles east of Eureka. Its location is on the east slope of Tintic range, 500 ft. lower than the collar of Yankee shaft. The shipments of ore during last 4 months were as follows: July, 4 cars; August, 4 cars; September, 8 cars; October, 12 cars. A typical analysis of the ore shows 28% lead, 26 ozs. silver, 15% iron, 60 cts. gold, 0.1% copper, 5% sulphur, 40% silica. The ore occurs in a limestone zone, 400 to 600 ft. in width. This zone is fissured east-west and north-south, and from these fissures the ore makes out into the lime bedding. The development, thus far, is confined to an area 225 ft. east and west, and 50 ft. north and south. This work indicates the existence of a limestone-quartzite contact, the quartzite having the position of a foot wall. It shows an east-west strike of the ore bodies. Development has attained a depth of 1300 ft., in three sections, as follows: A vertical shaft 1000 ft. deep, with a 1200-ft. drift from bottom of shaft on the strike; then at the farther end of the drift is a 200-ft. incline at 49° ; this is followed by a drift from the bottom of the incline, at the breast of which is a 400-ft. incline at 30° . This work was exploratory, and resulted in opening excellent bodies of ore. The tonnage and grade of ore exposed justified more permanent improvements and better equipment. A contract has been let to sink a 3-compartment shaft to a depth of 1300 ft., which will strike the main body of the ore; the contract includes timbering, and putting ladderway in one compartment. A Chicago Pneumatic Tool Co. air-compressor, of 840 cu. ft. capacity, electrically driven, has been installed and is in operation. A double-drum electric hoist, ordered from Denver Engineering Works, will soon be in position at the collar of the new shaft. Other new equipment consists of a Sturtevant blower, electric driven, for mine ventilation. The money being expended for new buildings, equipment and new shaft amounts to \$60,000. E. J. Raddatz, president and manager of the company, has had 20 years' experience as superintendent and mine manager in Utah. Salt Lake, Tintic and eastern mining men are interested with him in the company.

Mammoth.

Mammoth mine, Tintic district, is now shipping 725 tons of ore per day, which is an increase over shipments of previous months this year. There are three grades of ore, ranging in value from \$7 to \$30 per ton. The predominant metal is copper, running from 1% to 18%. The main working shaft has a depth of 2360 ft., and the mine at this depth is free from water. The ore being mined comes from the 400, 600, 800, and 1500-ft. levels. The Mammoth has been a producer for 45 years. Dividends were paid this year in April, June and September. The property is controlled by Samuel McIntyre and associates, Earl McIntyre being superintendent.

WASHINGTON.

Molson.

Barney Quinn has given a 2-year lease and bond for \$10,000 on the Denver, Ohio, Valley View and Bluebird claims to George H. Cole, Oscar Johnson, William M. Clark and

David Allen, Butte, Mont., and Portland, Ore. The ledge is 100 ft. wide and assays taken across it at intervals run from \$8 to \$50 in gold and silver.

Laurier.

To date the Laurier Mining Co. has been taking ore from three flat lenses, but these have now changed to a vertical course. Manager Stewart says: "The vertical shoot has a length of 70 ft. at the point of greatest depth attained. It was followed from a point 125 ft. back in the blanket body, where the width is 25 ft. The vertical course was exposed under the stope, from which we removed 55 tons of ore. The ore has the same course as the vein in both the vertical and the blanket body. This encourages belief that the blanket body was a slip and that we are now in a permanent formation. Prospecting has been under way since the suspension of shipments on Sept. 10. We will now increase the force and hope to be on a shipping basis by Nov. 1. Net returns from the shipments were \$18,393.91. This was in payment for 1004 tons contained in 25 cars and at the rate of \$18.32 to the ton after the deduction of freight and treatment charges. The average content was 4.5% copper and 2.4 ozs. silver and the range from 3.4 to 7.6% copper and 2.2 to 6 ozs. silver." In further reporting on conditions, Stewart says: "In the stope from which recent shipments were made the ore has been diverted by a fault or fissure which lies almost vertical and strikes east and west. This fault is well defined and the cleavage of the ore has taken a sudden dip with the fault, instead of continuing on the dip that previous development had shown. In my opinion this fault will control the future of the ore body and the ore will probably be found on both sides of the fissure. The immediate future of the mine depends on the ore following this fault and will be determined by sinking 20 ft. This work will be rushed and a report made on its disclosures in the course of the next month. Shipments will be resumed on Oct. 28, when a lot of 40 to 50 tons will be sent to the smelter. This ore was taken from that part of the vein having a vertical course and is expected to yield 6 to 8% copper."

Republic.

C. S. Cox and J. E. Henwood, Kellogg, Idaho, have been given the contract for sinking and timbering the shaft at the Last Chance mine to the 500 level. The mine is owned by the Lone Pine Surprise Con. Co. of Idaho. It is intended equipping it with compressor, hoist and pump and material necessary for the construction of the shaft. The pay ore now in evidence extends in the Insurgent workings from the 350 level to the 540, at which point it passed on the dip wholly into Last Chance ground. G. C. Taylor is superintendent.

Operations have been suspended at the San Poil mine, taken over several months ago under lease and bond by the West Hill Mining Co., a Spokane corporation. "We could not get our ore up to high enough values to make it profitable," said J. W. Turner of Spokane, president of the West Hill Co. "We had expected it would go \$8, which, with the low freight and treatment rate granted us, would have made us a profit of about \$1 or \$1.25 a ton, for it cost us about \$6.75, all told. Instead of running \$8 it ran just about \$6.75, so we paid expenses, but that is all. It may be possible to do something with this property, for, if a shaft is sunk 300 ft., much better values may be found, as they have been in other Republic mines at about that depth."

WISCONSIN-ILLINOIS.

Platteville.

Reports covering the field for week ending Oct. 21 show delivery to track of 134 cars of zinc concentrates, 5283 tons. Some of the districts were not fully reported. Four cars of lead ore cleared, 125 tons, all going to the Federal Lead Co. Heavy shipments of pyrites came from the Mineral Point Zinc Co., 389 tons; National Separators, 357 tons; Linden Zinc Co., 111 tons. Production last week was 4107 tons. Net smelter product, 3297 tons.

A considerable gain in price of blende was registered, 60% ore and premium grades going on a base of \$63.50, as compared with \$60, reported the week before. The price

ranged downward on second and medium grade ores to \$58 base on ores as low as 50% zinc. A feature of the buying was shown in the increased deliveries consigned to Grasselli Chemical Co., Cleveland, 34 cars in all, 1278 tons, the bulk of this coming in under new contracts recently executed.

Shipments from local producers were light, 5 cars in all. The Vinegar Hill Zinc Co. is operating on a big scale, 450 employees. The Vinegar Hill mines are yielding 800 tons of zinc concentrates, all grades, weekly. Low-grade zinc ore is in demand for treatment at the National Separator Works, Cuba. A 20-ft. winze sunk at the Hodge mine is in a flat of zinc ore. A shortage of labor is reported in many of the mining camps south of Platteville. At this writing the Vinegar Hill Zinc Co. has 12 drilling squads engaged in exploration work, all south of Benton. The introduction of the Whaley type of electric shovel at the Martin mine is regarded as economical under present labor conditions. Some doubt is expressed whether same is true under normal conditions.

Benton.

Returns for week of 21st show delivery to track of 51 cars of zinc ore, 4,178,000 lbs. Fields Mining & Milling Co. and Vinegar Hill Zinc Co. were tied, with 12 cars each. The ores of the former went to Grasselli Chemical Co., the latter to National Separator Works at Cuba. Frontier Mining Co., also to Grasselli, 7 cars, 299 tons; New Jersey Zinc Co., from Penna-Benton mine, 3 cars, 129 tons. This is a greatly reduced output from this mine, while the Fox, another producer for years, has not reported shipments in 2 weeks or more. The Champion reported 8 cars, 318 tons, but this report was not held complete. Sally Mining Co., engaged in building a new boarding house, shipped 2 cars to Cuba, 87 tons. Longhenry Mining Co. reported out a car, the first in many weeks. Shipments from the Benton Roasters went to Eagle-Picher Lead Co., 45 tons, from the Skinner roasters, 2 cars, 80 tons, and 3 cars to American Zinc Co., 115 tons. The Kittoe and Crawhall mines each reported out a car of lead ore.

At the Blackstone mine a shortage of labor is reported. The Martin mine has been supplied with an underground gasoline locomotive. Drilling on the ore body ahead considerable distance has given exceptionally big reward. A new mine and mill will come into active co-operation with other Vinegar Hill zinc producers about Jan. 1 on the Meloy 80. The mill embodies new features, self-dumping cage and underground cars for mechanical shovel operation being installed. The nearest shipping point is Benton, 5 miles distant.

Galena.

Additions and improvements to the main plant of the Inter-State Light & Power Co. is giving employment to 300. Eight contracts have been secured recently covering transmission of power to as many mining corporations. The line is also being extended eastward in Jo Daviess county to supply two new towns, Hanover and Elizabeth. C. C. Whittier of Chicago is providing a surface plant to new lead ranges developed on the Reitz farm. J. H. Billingsley, engaged in prospect work with drill on the Hughlett land, known as Buck Hill, is meeting with exceptionally good results. Pease & Co. are likewise engaged on the Weinen ground adjoining the Black-Jack zinc producer. Henry Priestly has been appointed receiver for the Great Western Mining Co., bankruptcy proceedings being litigated in court. The Little Corporal, a new project with equipment newly installed, has thrown up the sponge. The Fields Mining & Milling Co., operating the Crawhall and Thompson mines at Shullsburg, have recently entered into contract with the Grasselli Chemical Co. of Cleveland for the entire output of these mines. This action eliminates from service the new Galena Refining Co.'s plant at this point, unless the company goes into open market for low-grade concentrates to supply this plant. The city of Galena has served notice on the Galena Refinery Co. to abate the nuisance of gas fumes. It is inferred from this that the plant will not be reinstated for service.

Linden.

The Weigle-Jacobs has struck big zinc deposits in the glass rock, at a depth of 142 ft. Ross Bros. Mining Co. continues running 10 tons of concentrates daily. The force is

working toward the old Glanville mine. The Gilman mine is operating double shift with 60 men and making 160 tons of 40% concentrates weekly and about 25 tons of lead ore. Optimo No. 2 has cut into big ore in the shaft, and two drills are prospecting the range. The Glanville mine is making 15 tons of concentrates daily. Stoner Bros. Mining Co., running on high-grade ore, is recovering 5 tons of 50% jack daily.

Shipments last week were made by the Linden Zinc Co., 2 cars separator ore to Lanyon Zinc Co., 80 tons; Optimo mines Nos. 1 and 2 to local refinery, 7 cars, 255 tons.

Miffin.

Shipments last week showed well, Grunow Mining Co. to Sandoval Zinc Co., 39 tons; Peacock, 2 cars, 84 tons; Lucky Six, 4 cars, 176 tons, and Wicks, a new producer, 1 car, 30 tons, all to Grasselli. B. M. & B. Co. to Benton Roasters, 2 cars, 70 tons; Coker mines to Mineral Point Zinc Co., 2 cars, 70 tons. The Senator, a new producer under Vinegar Hill control, shipped its first car of lead ore. Mineral Point locals delivered small lots, 26 tons in all. The O. P. David mine at Montfort shipped 1 car high-grade wets to LaSalle, 40 tons. At the Lucky Five mine, in the Dodgeville district, an accident resulted seriously for two miners, and several were injured.

Cuba City.

Receipts of raw ore last week at the National plant totaled 18 cars, 787 tons. Shipment of high-grade refinery product was heavy, 10 cars going to Granby Con., 388 tons; 3 cars to Illinois Zinc Co., 113 tons; Linden Zinc Co. to Illinois Zinc Co., 1 car high-grade, 33 tons. Standard Metals Co. of Chicago reported a car out to Wisconsin Zinc Co. for separator treatment, 37 tons. Superintendent George J. Barker, in charge of the National Separator Works, is meeting with good results following the installation of a gas producer plant for firing. No further improvements or extensions are planned.

Dubuque.

The Pike's Peak Mining Co., after a strenuous development program requiring the greater part of a year, is now in operating shape with a new rig complete, and the initial shipment of zinc ore was reported last week—1 car to Grasselli Chemical Co., 53 tons. Incidentally the Grasselli Chemical Co. has been quietly but persistently taking a generous slice of the zinc output of the tri-state field under contract agreements, and now seems to be in a fair way to figure most prominently for 2 or 3 years in the operations of the field.

Shullsburg.

The Oliver Mining Co., operating the Mulcahy mine, after a readjustment of plant and separator, again reports shipment of 2 cars of top grade jack to Edgar Zinc Co. last week, 84 tons. The surface rig is one of the finest in the field. Winskill shipped 4 cars, 138 tons.

WYOMING.

Lander.

Storage tanks are to be constructed by the Wyoming Petroleum Co. and 9 cars of material for this work have been received. An air compressor will be installed for use in constructing the tanks and a complete electric lighting plant was included in the shipment. The company has six producing wells and will increase the number to 20 under its present plans. Two more wells are nearly finished and the rigs will be kept at work until the expected number is completed. At present, owing to a lack of storage, the producing wells are not pumped to capacity. The work of completing the storage and drilling the wells planned on will take several weeks.

Cody.

From the present deposit being worked by the Midwest Sulphur Co. it is necessary to haul the ore around the mountain a distance of a mile to get to the plant, although in a direct line it is only $\frac{1}{2}$ mile. The deposit has been opened along the side of the mountain for 300 ft. and shows a face 45 ft. high. Holes have been put down at different places back of the face showing a solid block for 200 ft. beyond the face. In this it is estimated there is \$750,000 worth of sul-

phur figured on a normal market of \$9 a ton, instead of \$34, as at present. The plant is making 20,000 lbs. of sulphur a day and has contracted for the entire output for some time. A cave filled with pure sulphur and containing about 300,000 lbs., which has a value of \$5000, has been opened. The find is within 400 ft. of the refining plant and the product can be shipped direct. The company has entered into an agreement for a lease on adjoining ground, which will mean a large saving in hauling charges, as the ground is but a short distance from the plant. On it are tracks and a mill that was built some years ago. It was a failure on account of the process. It is said that the plant cost over \$65,000. The property contains considerable sulphur that was formed as fumaroles. It is the intention to take up the present tracks and use them to haul the ore over to the plant.

CANADA.

BRITISH COLUMBIA.

Slocan.

"Owing to the fact that the water supply failed 6 weeks earlier than usual this season, the Slocan Star Co. has been greatly hindered in its operations by lack of sufficient power, for which reason both mine and mill are working only one shift," says Sidney Norman. "All the machinery for the new hydro-electric power plant, with the exception of the wheel and one length of pipe, has arrived and is being installed so that the plant may be got into operation within a few days. During August the company shipped 5 cars of silver-lead ore and concentrates, which netted \$16,000 above operating expenses of \$10,000. The zinc shipments, whose proceeds are not included in the above figures, totaled 110 tons.

"The Rambler-Cariboo has much larger reserves of ore than it is usually credited with. Mining operations are proceeding on the 8, 9, 10, 12 and 13 levels, from which 75 tons of ore are being sent daily. Shipments of lead ore and concentrates average around 175 tons a month and the mill also produces about 75 tons of 33% zinc concentrates. Of the latter product there is now about 1000 tons on hand awaiting retreatment in the Kaslo custom concentrator, where it will be worked up to a satisfactory shipping product. One stope above the 9th level shows 16 to 18 ft. of first-class concentrating ore with a streak of clean galena from 1 to 2 ft. wide.

"The Lucky Jim mine has developed much ore and by the recent completion of a raise from a crosscut from the No. 5 tunnel to the big stope is now in shape to produce economically. It is shipping high-grade mill feed only to the Roseberry concentrator and mine run to Kaslo. The latter averages 21% zinc, 1.3% lead and 16% iron. The preliminary runs of the magnetic separator at the Kaslo mill yielded a product assaying 46% zinc and between 8 and 9% iron.

"One of the finest ore showings I saw on my trip was that in the Sovereign mine, recently bonded by Clarence Cunningham, who is operating the Queen Bess and Wonderful as well and is about to take over the Idaho-Alamo, all four properties being now on a producing basis. The intermediate level on the Sovereign shows between 3 and 4 ft. of clean galena in the face and has proved the shoot for a length of 30 ft. At one point the clean ore is fully 5 ft. wide. There are 70 tons of ore sacked and ready to ship to the smelter. In the Queen Bess Mr. Cunningham is mining an entirely new ore shoot on the 5th and 6th levels. Owing to its being in virgin ground it has a good chance of going to the surface and being found also at depth in the 9th level. It averages between 2 and 3 ft. of clean galena. He is shipping regularly also from the Wonderful.

"The new 100-ton mill being built by the Surprise and Ivanhoe companies jointly on the site near Sandon of the old Ivanhoe plant, which was destroyed by fire while treating Lucky Jim ore, will be in operation in a few weeks. The Ivanhoe tramway has been rebuilt and W. H. Yawkey of New York has resumed the development of that property, which is now in shape to resume production at any time. The ore bodies in the Surprise mine are large and clean. They are

opened to a depth of 1200 ft. below the apex of the vein in Surprise basin. The mine is managed by Alexander Smith, who has been financed entirely for 20 years by Congressman Charles Kent of California. The mine now contains vast ore reserves and netted \$180,000 last year.

"The Canadian group, adjoining the Ivanhoe, has been reopened and Bruce White has just let a contract to haul 100 tons of silver-lead ore from the Noonday mine at Cody to the railroad at Sandon. The Noble Five is working 3000 ft. below the apex of the Last Chance mine and is taking out a good grade of mixed lead and zinc ore."

Victoria.

The 1916 mineral production of British Columbia will be between \$45,000,000 and \$50,000,000, according to the estimate of Lorne A. Campbell, retiring minister of mines in the province, who probably is in closer touch with the mining industry in western Canada than any one else. "This is about \$15,000,000 in excess of the record of 1912, which was the best previous year in the history of British Columbia," says Minister Campbell, "and if the encouragement is given to the industry that is justifiable there is no doubt but there will be a gradual increase in the output for an indefinite period. The present increase is largely due to the increased prices consequent upon the enormous demand for the metals. This will prove a boon for mining in British Columbia in view of the fact that within the past year the industry has become equipped in a manner never before experienced. Large extensions to plants have been made, labor-saving machinery installed and the facilities for production vastly increased. A lot of new capital has been invested in the industry and more is seeking investment. Even if things do become normal practically all the large producers today are in a position to operate at good profits. The industry was never better organized than at present. The scarcity of labor has had a great effect in inducing the companies to instal up-to-date machinery and labor-saving devices."

MEXICO.

Cananea.

Despite the troubles it has encountered in Mexico the Greene-Cananea Co. has an excellent chance of showing increased earnings this year. The October output is expected to exceed 5,000,000 lbs., compared with 4,800,000 lbs. in September. When the American employees left the mine in June it was believed that the property would be obliged to shut down; but, nevertheless, 4,500,000 lbs. of copper was turned out in that month. While this represented a substantial decrease from the 5,948,000 lbs. produced in May, it showed that the conditions surrounding the property were not as serious as had been generally supposed. The June output was bettered in July by 100,000 lbs., while August showed an increase of 500,000 lbs. over the minimum monthly production of 3,348,000 lbs. in January. The production for the year is estimated at 60,000,000 lbs., and earnings should amount to \$10,800,000, equivalent to \$21.60 a share on the 500,000 shares of a par value of \$100 outstanding. Dividends are at the rate of \$8 per share per annum, so that earnings are 2.7 times dividend requirements, and the surplus after dividends would amount to \$13.60 a share, more than sufficient to pay another dividend and leave a handsome surplus besides. On a normal production of 6,000,000 lbs. monthly earnings would figure to over \$23 a share, or 44% on the present selling price of the issue. Four dividends paid out since January have called for \$2,846,460, leaving surplus earnings of about \$2,874,000 for the first 9 months. Including \$5,411,242 net surplus and cash assets as of Jan. 1, 1916, there remains a total of \$8,284,782. The current dividend rate of \$2 a share, expected to be continued at the meeting to be held the last week of this month, will call for the payment of \$948,822, leaving a surplus of \$7,334,960. The Greene-Cananea Copper Co. has an authorized capitalization of \$60,000,000, divided into 600,000 shares of a par value of \$100, of which \$5,000,000, or 500,000 shares, are issued and outstanding. The company has no bonded indebtedness.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Phalen, W. C.—*The Conservation of Phosphate Rock in Tennessee*. [On the geology, nature and genesis of the deposits and methods of stripping and mining the deposits, with notes on production].—Res. of Tenn. Oct. 1916; p 193; pp 24*.

Ore Genesis

Phalen, W. C.—*The Conservation of Phosphate Rock in Tennessee*. [On the geology, nature and genesis of the deposits and methods of stripping and mining the deposits, with notes on production].—Res. of Tenn. Oct. 1916; p 193; pp 24*.

II. ORES AND METALS

(I) METALS AND ORES

Alloys

Howe, Henry M.—*Recrystallization After Plastic Deformation*. [Deals with recrystallization after the cold-working of brass].—Bull. A. I. M. E. Oct. 1916; p 1851; pp 10*; 35c.

Northrup, E. F.; Sherwood, R. G.—*New Method of Measuring Resistivity of Molten Materials: Results for Certain Alloys*. [Gives complete details of the method of procedure and results in some cases].—Jnl. Franklin Inst. Oct. 1916; p 477; pp 35*; 60c.

Antimony

—*Antimony Ore in Southern Rhodesia*. [Types of occurrence and methods for calculating shipments and cost of the same are explained].—S. Afr. Mg. Jnl. Aug. 19 1916; p 465; pp 1; 35c.

Bismuth

Singewald, Joseph E.; Miller, Benjamin L.—*Prominent Mines of Junin, Peru*. [Three mines in the same district are described as regards their ore deposits. One is vanadium, one bismuth and the

last silver].—E. & M. J. Sept. 30 1916; p 583; pp 4¼*; 25c.

Chromium

Kelley, G. L.; Conant, J. B.—*Determination of Chromium and Vanadium in Steel by Electrometric Titration*.—Jnl. Ind. Eng. Chem. 1916; No. 8; p 719; pp 5.

Cobalt

—*Metal Production of Ontario, First Half of 1916*.—Mg. World Oct. 7 1916; p 626; pp 1; 10c.

Copper

Blood, Clifford C.—*Pinos Altos District, Grant County, New Mexico*. [A description of the district, its properties and their operation].—Mg. World Oct. 14 1916; p 659; pp 2*; 10c.

Laist, Frederick.—*Changes in Smelting Practice of Anaconda Copper Co.* [A review of recent progress in methods and equipment made at this smelter].—E. & M. J. Oct. 7 1916; p 635; pp 3*; 25c.

Magnus, B.—*Blast vs. Reverberatory Furnace*. [The advantages of the blast over the reverberatory furnace, as noted at Mount Morgan, Australia].—E. & M. J. Oct. 7 1916; p 668; pp 1½; 25c.

Vail, Richard H.—*Tuyere Connections for Copper and Lead Blast Furnaces*. [Detail drawings and descriptions for different constructions are given].—E. & M. J. Oct. 7 1916; p 639; pp 4¼*; 25c.

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Gold Fields and Mining

Magnus, B.—*Blast vs. Reverberatory Furnace*. [The advantages of the blast over the reverberatory furnace, as noted at Mount Morgan, Australia].—E. & M. J. Oct. 7 1916; p 668; pp 1½; 25c.

Scott, W. A.—*The Roosevelt Tunnel and Cripple Creek Mine Operations*. [Reviews the operations and equipment at the properties of the district].—Mg. World Oct. 7 1916; p 613; pp 5*; 10c.

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Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron Ores and Mining

—*Annual Report of Mine Inspector for Marquette County, Mich.* [Describes the accidents separately and classifies them in tabulated form].—Annual Report Sept. 30, 1916; pp 18.

—*Metal Production of Ontario, First Half of 1916*.—Mg. World Oct. 7 1916; p 626; pp 1; 10c.

Lead

Dwight, Arthur S.—*Lead-Smelting Practice in the United States*. [Advancements have been chiefly in changing the charge to the furnace].—E. & M. J. Oct. 7 1916; p 671; pp 6¼*; 25c.

Rain, Allan D.—*The Separation of Galena from Blende by the Horwood Process of Flotation*. [Abst. from Teniente Topics].—M. & S. P. Oct. 7 1916; p 529; pp 1½; 20c.

Vail, Richard H.—*Tuyere Connections for Copper and Lead Blast Furnaces*. [Detail drawings and descriptions for different constructions are given].—E. & M. J. Oct. 7 1916; p 639; pp 4¼*; 25c.

Mercury

Landers, W. H.—*The Smelting of Mercury Ores*. [Speaks of the general thermic methods now in common use and mentions the open field here for hydro-metallurgical methods and investigation].—E. & M. J. Oct. 7 1916; p 630; pp 5*; 25c.

Molybdenum

—*Metal Production of Ontario, First Half of 1916*.—Mg. World Oct. 7 1916; p 626; pp 1; 10c.

—*Quebec Mining Industry—A Review for the First Half of 1916*. [Brief accounts of operations at various properties].—Canadian Mg. Inst. Bull. Sept. 1916; p 796; pp 4; 50c.

Nickel

Stead, J. E.—*Notes on Nickel Steel Scale and on the Reduction of Solid Nickel and Copper Oxides by Solid Iron*. [Gives the method of procedure and results obtained in experimental work].—Iron & Steel Inst. Adv. Copy 7A; pp 9*; 50c.

—*Metal Production of Ontario, First Half of 1916*.—Mg. World Oct. 7 1916; p 626; pp 1; 10c.

Radium and Radio-Actives

Leaming, T. H.; Schlundt, Herman; Underwood, Julius.—*Comparison of the Ionization Currents Due to Equal Quantities of Radium Emanation in Different Types of Electroscopes*. [A method by which small quantities of radium may be determined].—American Electrochem. Soc. Adv. Paper 2; p 13; pp 14; 35c.

Silver

Blood, Clifford C.—*Pinos Altos District, Grant County, New Mexico*. [A description of the district, its properties and their operation].—Mg. World Oct. 14 1916; p 659; pp 2*; 10c.

—*Metal Production of Ontario, First Half of 1916*.—Mg. World Oct. 7 1916; p 626; pp 1; 10c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Titanium

Janssen, W. A.—*Use of Titanium in Steel Castings*. [A paper read before the American Foundrymen's Assn. telling of some of the advantages of ferro-titanium as a deoxidizer].—I. Tr. Rev. Sept. 14 1916; p 507; pp 5*; 25c.

Tungsten

Scott, W. A.—*Operations in the Tintic District, Utah*. [Describes the district and its operations in general, and then gives separate descriptions of the operations and methods of some of the companies].—Mg. World Sept. 30 1916; p 583; pp 1 1/4; 10c.

Vanadium

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Kelley, G. L.; Conant, J. B.—*Electrometric Titration of Vanadium*. [The titration is made with ferrous sulphate on an acid solution containing the vanadium as a vanadate].—Jnl. Amer. Chem. Soc. No. 38; 1916; p 341; pp 11.

Zinc

Bocking, F. W.—*Van Buren Smelting Plant, Arkansas*. [A description of the plant and its operations, with illustrations and drawings].—E. & M. J. Oct. 7 1916; p 655; pp 7 1/4*; 25c.

Ingalls, W. R.—*Comments and Speculations on the Metallurgy of Zinc*. [A general talk on methods used and the progress being made].—E. & M. J. Oct. 7 1916; p 621; pp 3 1/4*; 25c.

Ingalls, W. R.—*The Donora Zinc Works, Pennsylvania*. [A description of the plant, its equipment and operation].—E. & M. J. Oct. 7 1916; p 648; pp 7*; 25c.

Morgan, Harry J.; Ralston, O. C.—*Electrolytic Zinc Dust*. [A paper read before the American Electrochemical Soc.].—Met. & Chem. Engg. Oct. 15 1916; p 465; pp 3 1/4; 35c.

Rain, Allan D.—*The Separation of Galena from Blende by the Horwood Process of Flotation*. [Abst. from Teniente Topics].—M. & S. P. Oct. 7 1916; p 529; pp 1 1/2; 20c.

Ruhl, Otto.—*The Future of the American Zinc Industry*.—Mg. Cong. Jul. Oct. 1916; p 183; pp 10; 35c.

(II) NON-METALS**(A) FUELS****Coal Fields and Mining**

Nebel, Merle L.—*Specific Gravity Tests*

of Illinois Coals. [On the way in which the tests were made and the results as obtained with Illinois coals].—Univ. Ill. Bull. 89; pp 49*.

Wilson, Herbert M.—*Workmen's Compensation Insurance and the Coal Mining Industry*. [A general discussion of the subject from an economic viewpoint].—Mg. Cong. Jnl. Oct. 1916; p 156; pp 7; 35c.

Coal Preparation, Marketing, Etc.

Fear, Thomas G.—*Getting Clean Coal*. [A paper read before the Alabama Coal Operators' Assn. It states that the human factor, methods of mining and dockage have considerable to do with the question].—Coal Age Sept. 30 1916; p 541; pp 1 1/2; 20c.

Coal Dust, Fire Damp, Etc.

Haas, Frank.—*Mine Explosions*. [The better known safeguards against dust explosions are spoken of and the possible weak points of each brought out].—Coal Age Sept. 9 1916; p 418; pp 3 3/4; 20c.

Fuels Miscellaneous

Emley, W. E.—*The Comparative Values of Different Kinds of Fuels for Lime Burning*. [Specific data and information are included in the description].—National Lime Mfg. Bull. 22; pp 6; 25c.

Petroleum

Hamilton, Fletcher.—*California's Water Infiltration Law*. [In regard to the infiltration of oil-sands with water].—Mg. Cong. Jnl. Oct. 1916; p 131; pp 4; 35c.

(B) STRUCTURALS AND CERAMICS**Concrete**

—*Concreting the Sacramento Shaft, Bisbee, Arizona*. [Details of the construction, methods of doing the work and costs for materials and labor on the same are given].—M. & S. P. Oct. 7 1916; p 521; pp 8 1/2*; 20c.

Lime

Freeman, O. W.—*Gypsum and Lime Industry in Central Montana*. [A general description of the geology, nature and operation of the deposits, with some information on the operating properties].—Mg. World Oct. 14 1916; p 663; pp 2*; 10c.

(C) OTHER NON-METALS**Acids**

Ingalls, W. R.—*The Donora Zinc Works, Pennsylvania*. [A description of the plant, its equipment and operation].—E. & M. J. Oct. 7 1916; p 648; pp 7*; 25c.

Fertilizer

Lodge, F. S.—*The Sampling of Fertilizers*. [Details of different methods in common use].—Amer. Fertilizer Oct. 14 1916; p 26; pp 3*; 25c.

Phalen, W. C.—*The Conservation of Phosphate Rock in Tennessee*. [On the geology, nature and genesis of the deposits and methods of stripping and mining the deposits, with notes on production].—Res. of Tenn. Oct. 1916; p 193; pp 24*.

Gypsum

Freeman, O. W.—*Gypsum and Lime Industry in Central Montana*. [A general description of the geology, nature and operation of the deposits, with some information on the operating properties].—Mg. World Oct. 14 1916; p 663; pp 2*; 10c.

Mica

Schaller, Waldemar T.—*Mica in 1915*. [Gives prices, imports, exports, uses, pro-

duction, nature and place of occurrence, foreign markets and general conditions of the industry in U. S.].—Min. Res. U. S. 11:21; pp 14.

Potash

Koepping, Emil D.—*Can an American Potash Industry Be Established*. [A general review of the possibilities for the same].—Met. & Chem. Engg. Oct. 1 1916; p 385; pp 2 1/4; 35c.

Pyrites

Phalen, W. C.—*Sulphur, Pyrite, and Sulphuric Acid in 1915*. [A review of production and conditions, including some foreign countries].—Min. Res. U. S. 11:22; pp 16.

Quartz

Stead, J. E.—*Influence of Some Elements on the Mechanical Properties of Steel*. [Gives the results of tests made on steels containing small amounts of other metals, as copper, tin, silicon, phosphorous, sulphur, etc.].—Iron & Steel Inst. Adv. Copy; pp 91*; 50c.

Sulphur

Hayward, Carle R.—*The Effect of Sulphur on Low-Carbon Steel*. [A review of metallographic tests, giving both the structure and change in physical properties due to the presence of sulphur].—Bull. A. I. M. E. Oct. 1916; p 1841; pp 10*; 35c.

Stead, J. E.—*Influence of Some Elements on the Mechanical Properties of Steel*. [Gives the results of tests made on steels containing small amounts of other metals, as copper, tin, silicon, phosphorous, sulphur, etc.].—Iron & Steel Inst. Adv. Copy; pp 91*; 50c.

Miscellaneous Non-Metals

Higgins, Will C.—*The Ozokerite Deposits of Soldier Summit, Utah*. [A general description of the deposits, operating companies, etc.].—S. L. Mg. Rev. Sept. 30 1916; p 15; pp 3 1/2*; 25c.

III. TECHNOLOGY**MINES AND MINING****Ore Reserves**

—*British Association for the Advancement of Science*. [A report of the Fuel Economy Committee, dealing with the use, consumption and conservation of coal in different industries].—Coll'y Guard, Sept. 15 1916; p 499; pp 4*; I. & C. Tr. Rev. Sept. 15; p 299; pp 5*; 35c.

Explosives and Blasting

Fay, Albert H.—*Monthly Statement of Coal Mine Fatalities in the United States*. [Contains a list of permissible explosives, lamps and motors tested prior to Aug. 31 1916].—Bur. of Mines Statement July 1916; pp 28.

Drilling and Boring

Tillson, B. F.—*Hammer Drill Records at the Franklin Mines, New Jersey*. [From a paper read before the A. I. M. E. Results obtained in drifting, stoping, raising, etc., are given, with costs].—Comp. Air Sept. 1916; p 8123; pp 2 1/2; 20c.

Mine Water

Hopwood, William.—*Mining and Dealing with Mine Water in the Buckey Coal-field, England*. [A paper read before the National Assn. of Colliery Mgrs. Details

are given of the methods used in this mine].—I. & C. Tr. Rev. Sept. 15 1916; p 314; pp 3*; 35c.

Mine Gas

Thornton, W. M.—*Influence of Pressure on the Electrical Ignition of Methane*. [A paper read before the British Assn. Sec. G, dealing with experimental work. Curves are shown].—Colly Guard. Sept. 15 1916; p 503; pp 2*; 35c.

Shafts and Shaft Sinking

Thiele, H. G.—*Re-Timbering a Four-Compartment Shaft*. [Detailed drawings and description of the method].—M. & S. P. Oct. 14 1916; p 567; pp 2½*; 20c.

——— *Concreting the Sacramento Shaft, Bisbee, Arizona*. [Details of the construction, methods of doing the work and costs for materials and labor on the same are given].—M. & S. P. Oct. 7 1916; p 521; pp 8½*; 20c.

Tunnels and Tunneling

Scott, W. A.—*The Roosevelt Tunnel and Cripple Creek Mine Operations*. [Reviews the operations and equipment at the properties of the district].—Mg. World Oct. 7 1916; p 613; pp 5*; 10c.

Supports: Timbers, Props, Stowing

Hall, Albert E.—*Shaft Timbering Examples*. [Drawings and description of various methods of shaft timbering are given].—E. & M. J. Sept. 30 1916; p 589; pp 1½*; 25c.

Thiele, H. G.—*Re-Timbering a Four-Compartment Shaft*. [Detailed drawings and description of the method].—M. & S. P. Oct. 14 1916; p 567; pp 2½*; 20c.

Power Shovels and Excavators

Phalen, W. C.—*The Conservation of Phosphate Rock in Tennessee*. [On the geology, nature and genesis of the deposits and methods of stripping and mining the deposits, with notes on production].—Res. of Tenn. Oct. 1916; p 193; pp 24*.

Mine Sampling

Gahl, Rudolf.—*History of the Flotation Process at Inspiration, Arizona*. [A paper read before the A. I. M. E. dealing in detail with the subject and equipment used].—Met. & Chem. Engg. Oct. 1 1916; p 393; pp 12½*; 35c.

Transport

Warden-Stevens, F. J.—*Coal and Bunkering Ports of Canada*. [Speaks of the extent of operations of bunkers in the Dominion].—I. & C. Tr. Rev. Sept. 8 1916; p 449; pp 3*; 35c.

Haulage and Conveying

Burch, H. K.—*The Inspiration Mine Plant*. [Abst. from a paper read before the A. I. M. E. Describes the equipment and methods used for handling the ore from the mine, both underground and on surface].—E. & M. J. Sept. 23 1916; p 537; pp 5¾*; 25c.

Capron, W. C.; Kuzell, C. R.—*Metalurgical Works Tramways*. [Reviews and discusses the use of different types of locomotives used about smelters and in some cases gives cost data on their operation].—E. & M. J. Oct. 7 1916; p 613; pp 8*; 25c.

Green, Raoul.—*Actual Costs of Mine Haulage by Horses and by Compressed Air*. [A paper read before the Canadian Mg. Inst., giving actual costs under varying conditions].—Mg. World Oct. 7 1916; p 625; pp 1¼; 10c.

Storage

Burch, H. K.—*The Inspiration Mine Plant*. [Abst. from a paper read before the A. I. M. E. Describes the equipment and methods used for handling the ore from the mine, both underground and on surface].—E. & M. J. Sept. 23 1916; p 537; pp 5¾*; 25c.

Telephones and Signaling

Walker, Sydney F.—*Electric Signaling with Bare Wires*. [A general talk on proper practice resulting from investigations in England].—I. & C. Tr. Rev. Sept. 8 1916; p 279; pp 1; 35c.

Hoists and Hoisting

Burch, H. K.—*The Inspiration Mine Plant*. [Abst. from a paper read before the A. I. M. E. Describes the equipment and methods used for handling the ore from the mine, both underground and on surface].—E. & M. J. Sept. 23 1916; p 537; pp 5¾*; 25c.

Accidents

Hoffman, F. L.—*Mining Hazards on the Pacific Coast*. [States that the fatality rate here is excessively high].—Mg. Cong. Jnl. Oct. 1916; p 172; pp 11; 35c.

——— *Annual Report of Mine Inspector for Marquette County, Mich.* [Describes the accidents separately and classifies them in tabulated form].—Annual Report Sept. 30 1916; pp 18.

Labor and Management

Wilson, Herbert M.—*Workmen's Compensation Insurance and the Coal Mining Industry*. [A general discussion of the subject from an economic viewpoint].—Mg. Cong. Jnl. Oct. 1916; p 156; pp 7; 35c.

Production

Phalen, W. C.—*The Conservation of Phosphate Rock in Tennessee*. [On the geology, nature and genesis of the deposits and methods of stripping and mining the deposits, with notes on production].—Res. of Tenn. Oct. 1916; p 193; pp 24*.

——— *Metal Production of Ontario, First Half of 1916*.—Mg. World Oct. 7 1916; p 626; pp 1; 10c.

Mining Costs

Green, Raoul.—*Actual Costs of Mine Haulage by Horses and by Compressed Air*. [A paper read before the Canadian Mg. Inst., giving actual costs under varying conditions].—Mg. World Oct. 7 1916; p 625; pp 1¼; 10c.

——— *Concreting the Sacramento Shaft, Bisbee, Arizona*. [Details of the construction, methods of doing the work and costs for materials and labor on the same are given].—M. & S. P. Oct. 7 1916; p 521; pp 8½*; 20c.

Mining Miscellany

Hoffman, F. L.—*Mining Hazards on the Pacific Coast*. [States that the fatality rate here is excessively high].—Mg. Cong. Jnl. Oct. 1916; p 172; pp 11; 35c.

MILL AND MILLING

Sampling

Landers, W. H.—*The Smelting of Mercury Ores*. [Speaks of the general thermic methods now in common use and mentions the open field here for hydrometallurgical methods and investigation].—E. & M. J. Oct. 7 1916; p 630; pp 5*; 25c.

Lodge, F. S.—*The Sampling of Fertilizers*. [Details of different methods in common use].—Amer. Fertilizer Oct. 14 1916; p 26; pp 3*; 25c.

Woodbridge, T. R.—*Ore Sampling Conditions in the West*. [Excerpts from advance proofs of the U. S. Bureau of Mines Tech. Paper 86].—Mg. World Oct. 7 1916; p 619; pp 2¼; 10c.

Flotation

Penhoel, L. C.—*Notes on Flotation in the Southwest*. [A general review of flotation methods being used in that section of the country].—Mg. World Oct. 7 1916; p 623; pp 1¾; 10c.

Rain, Allan D.—*The Separation of Galena from Blende by the Horwood Process of Flotation*. [Abst. from Teniente Topics].—M. & S. P. Oct. 7 1916; p 529; pp 1½; 20c.

——— *Wilmington Decision in Miami Flotation Suit*. [A report on the proceedings and evidence given in the case].—Met. & Chem. Engg. Oct. 15 1916; p 441; pp 7; 35c. Mg. World Oct. 14 1916; p 667; pp 1½; 10c.

Concentration: Sorting, Sizing, Washing

Phalen, W. C.—*The Conservation of Phosphate Rock in Tennessee*. [On the geology, nature and genesis of the deposits and methods of stripping and mining the deposits, with notes on production].—Res. of Tenn. Oct. 1916; p 193; pp 24*.

Mill and Smelter Costs

Magnus, B.—*Blast vs. Reverberatory Furnace*. [The advantages of the blast over the reverberatory furnace, as noted at Mount Morgan, Australia].—E. & M. J. Oct. 7 1916; p 668; pp 1½; 25c.

CHEMISTRY AND ASSAYING

Chemistry

Jensen, E. B.—*Analysis of Mineral Waters by Volumetric Methods*. [In detail describes several methods of procedure].—Mg. Cong. Jnl. Oct. 1916; p 75; pp 24*; 65c.

Analysis

Jensen, E. B.—*Analysis of Mineral Waters by Volumetric Methods*. [In detail describes several methods of procedure].—Mg. Cong. Jnl. Oct. 1916; p 75; pp 24*; 65c.

Kelley, G. L.; Conant, J. B.—*Electrometric Titration of Vanadium*. [The titration is made with ferrous sulphate on an acid solution containing the vanadium as a vanadate].—Jnl. Amer. Chem. Soc. No. 38 1916; p 341; pp 11.

Kelley, G. L.; Conant, J. B.—*Determination of Chromium and Vanadium in Steel by Electrometric Titration*.—Jnl. Ind. Eng. Chem. 1916; No. 8; pp 719; pp 5.

Electrochemistry

Kelley, G. L.; Conant, J. B.—*Electrometric Titration of Vanadium*. [The titration is made with ferrous sulphate on an acid solution containing the vanadium as a vanadate].—Jnl. Amer. Chem. Soc. No. 38; 1916; pp 341; pp 11.

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METALLURGY

Electrometallurgy

Ingalls, W. R.—*Comments and Speculations on the Metallurgy of Zinc*. [A general talk on methods used and the progress being made].—E. & M. J. Oct. 7 1916; p 621; pp 3¼*; 25c.

Morgan, Harry J.; Ralston, O. C.—*Electrolytic Zinc Dust*. [A paper read before the American Electrochemical Soc.].—Met. & Chem. Engg. Oct. 15 1916; p 465; pp 3¼; 35c.

Thermic Metallurgy

Bocking, F. W.—*Van Buren Smelting Plant, Arkansas*. [A description of the plant and its operation, with illustrations and drawings].—E. & M. J. Oct. 7 1916; p 655; pp 7¼*; 25c.

Dwight, Arthur S.—*Lead-Smelting Practice in the United States*. [Advancements have been chiefly in changing the charge to the furnace].—E. & M. J. Oct. 7 1916; p 671; pp 6¼*; 25c.

Ingalls, W. R.—*Comments and Speculations on the Metallurgy of Zinc*. [A general talk on methods used and the progress being made].—E. & M. J. Oct. 7 1916; p 621; pp 3¼*; 25c.

Ingalls, W. R.—*The Donora Zinc Works, Pennsylvania*. [A description of the plant, its equipment and operation].—E. & M. J. Oct. 7 1916; p 648; pp 7*; 25c.

Laist, Frederick.—*Changes in Smelting Practice of Anaconda Copper Co.* [A review of recent progress in methods and equipment made at this smelter].—E. & M. J. Oct. 7 1916; p 635; pp 3*; 25c.

Landers, W. H.—*The Smelting of Mercury Ores*. [Speaks of the general thermic methods now in common use and mentions the open field here for hydrometallurgical methods and investigation].—E. & M. J. Oct. 7 1916; p 630; pp 5*; 25c.

Magnus, B.—*Blast vs. Reverberatory Furnace*. [The advantages of the blast over the reverberatory furnace as noted at Mount Morgan, Australia].—E. & M. J. Oct. 7 1916; p 668; pp 1½; 25c.

Pigott, Curtis.—*Blast-Furnace Slag Shells*. [Treats on the metal content of the shell left in the slag pot after a short period of cooling].—E. & M. J. Oct. 7 1916; p 626; pp 1; 25c.

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—*Separating Metals from Flue and Bag House Dust*. [Abst. of a patent description of the process].—Mg. World Oct. 14 1916; p 661; pp 1½; 10c.

POWER AND MACHINERY

Electricity

Capron, W. C.; Kuzell, C. R.—*Metalurgical Works Tramways*. [Reviews and discusses the use of different types

of locomotives used about smelters and in some cases gives cost data on their operation].—E. & M. J. Oct. 27 1916; p 613; pp 8*; 25c.

Gilman, R. E.; Fortescue, C. Le G.—*Single Phase Power Service from Central Stations*. [The unbalanced voltage in supplying single phase power from a polyphase system is explained].—Proc. A. I. M. E. Oct. 1916; p 1431; pp 21*; 35c.

Northrup, E. F.; Sherwood, R. G.—*New Method of Measuring Resistivity of Molten Materials: Results for Certain Alloys*. [Gives complete details of the method of procedure and results in some cases].—Jnl. Franklin Inst. Oct. 1916; p 477; pp 35*; 60c.

Compressed Air

Capron, W. C.; Kuzell, C. R.—*Metalurgical Works Tramways*. [Reviews and discusses the use of different types of locomotives used about smelters and in some cases gives cost data on their operation].—E. & M. J. Oct. 27 1916; p 613; pp 8*; 25c.

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Combustion Engines

Capron, W. C.; Kuzell, C. R.—*Metalurgical Works Tramways*. [Reviews and discusses the use of different types of locomotives used about smelters and in some cases gives cost data on their operation].—E. & M. J. Oct. 7 1916; p 613; pp 8*; 25c.

Miscellaneous Power and Machinery

Richards, J. H.—*Federal Control of Water Power*.—Mg. Cong. Jnl. Oct. 1916; p 135; pp 6; 35c.

IV. MISCELLANEOUS

Miscellaneous Costs

Capron, W. C.; Kuzell, C. R.—*Metalurgical Works Tramways*. [Reviews and discusses the use of different types of locomotives used about smelters and in some cases gives cost data on their operation].—E. & M. J. Oct. 7 1916; p 613; pp 8*; 25c.

Testing

Nebel, Merle L.—*Specific Gravity Tests of Illinois Coals*. [On the way in which the tests were made and the results as obtained with Illinois coals].—Univ. Ill. Bull. 89; pp 49*.

Northrup, E. F.; Sherwood, R. G.—*New Method of Measuring Resistivity of Molten Materials: Results for Certain Alloys*. [Gives complete details of the method of procedure and results in some cases].—Jnl. Franklin Inst. Oct. 1916; p 77; pp 35*; 60c.

Waste: Slag, Tailings, Fumes, Etc.

Leddell, W. A.—*Slag Lining for Launderers*. [The slag is cast into channel shapes for lining the tailings launder so as to make it more resistive to acid].—E. & M. J. Oct. 7 1916; p 644; pp 1¼*; 25c.

—*Boilers Heated by Coke-Oven Gas*. [On equipment and installations for following this practice. Drawings are given with description].—I. & C. Tr. Rev. Sept. 8 1916; p 280; pp 1¼*; 35c.

Law, Legislation, Taxation

Hamilton, Fletcher.—*California's Water Infiltration Law*. [In regard to the infiltration of oil-sands with water].—Mg. Cong. Jnl. Oct. 1916; p 131; pp 4; 35c.

McCullough, Ernest.—*Practical Surveying for Surveyors' Assistants, Vocational and High Schools*. [In a practical way what a surveyor is supposed to do, methods and surveying laws are explained].—Van Nostrand Co.; book; pp 400*; \$2.

—*Revision of the Mining Law in U. S.* [A referendum inaugurated by the Mining & Metallurgical Soc. of America].—E. & M. J. Oct. 14 1916; p 719; pp 4; 25c.

—*Wilmington Decision in Miami Flotation Suit*. [A report on the proceedings and evidence given in the case].—Met. & Chem. Engg. Oct. 15 1916; p 441; pp 7; 35c. Mg. World Oct. 14; p 667; pp 1½; 10c.

Government Ownership

Richards, J. H.—*Federal Control of Water Power*.—Mg. Cong. Jnl. Oct. 1916; p 135; pp 6; 35c.

Conservation

—*British Association for the Advancement of Science*. [A report of the Fuel Economy Committee, dealing with the use, consumption and conservation of coal in different industries].—Colly Guard. Sept. 15 1916; p 499; pp 4*. I. & C. Tr. Rev. Sept. 15; p 299; pp 5*; 35c.

Government Ownership

Evans, David.—*Nationalization of Coal Mines*. [A discussion of the subject from the point of view that this will be necessary because of the conflicts now starting between labor and capital in Great Britain].—I. & C. Tr. Rev. Sept. 8 1916; p 271; pp 2½; 35c.

Societies

Barbour, P. E.; Hall, R. D.—*Institute Meeting in Arizona*. [Details of the annual meeting of the A. I. M. E.].—E. & M. J. Oct. 14 1916; p 695; pp 8*; 25c.

Willis, Charles F.—*The Institute Meeting*. [An account of the meeting of the A. I. M. E., Arizona, Sept., 1916].—M. & S. P. Oct. 1916; p 534; pp 3*; 20c.

—*American Electrochemical Society, New York Meeting*.—Met. & Chem. Engg. Oct. 15 1916; p 475; pp 5¼; 35c.

—*American Mining Congress, Eighteenth Annual Meeting, San Francisco, California, Sept. 20, 1915*.—Mg. Cong. Jnl. Oct. 1916; p 15; pp 83; 35c.

—*American Mining Congress, Chicago Meeting, Nov. 13, 1916*.—Mg. World Oct. 7 1916; p 629; pp 1¼; 10c.

General Miscellany

Balliet, Letson.—*Two Kinds of Loyalty from Employees*.—Mg. World Oct. 7 1916; p 622; pp 1; 10c.

Manning, Van H.—*What the Bureau of Mines in the Department of Interior Is Doing and Hopes to Do for the Metaliferous Mining Industry*.—Mg. Cong. Jnl. Oct. 1916; p 103; pp 9; 35c.

Willis, Charles F.—*The Need of Better Mining Education*. [Reviews what is expected of the mining engineer today].—Mg. Cong. Jnl. Oct. 1916; p 141; pp 13; 35c.

—*Remarkable Metal Flumes Built in the West*.—Mg. World Oct. 14 1916; p 669; pp 1¼*; 10c.

Ore and Metal Markets; Prices-Current

New York, Oct. 26, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Oct. 25 were as follows:

	New York, cents.	London, pence.
Oct. 19.....	67 $\frac{3}{4}$	32 5/16
20.....	67 $\frac{3}{4}$	32 $\frac{3}{4}$
21.....	67 $\frac{3}{4}$	32 $\frac{1}{8}$
23.....	67 $\frac{1}{4}$	32 $\frac{1}{8}$
24.....	67 $\frac{3}{4}$	32 $\frac{1}{8}$
25.....	67 $\frac{3}{4}$	32 $\frac{1}{8}$

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York—1916			1915.		London Standard Oz.	
	High.	Low.	Avg.	Avg.		1916.	1915.
January	57 $\frac{3}{4}$	55 $\frac{3}{4}$	56.775	48.890	26.875	22.744	
February	57	56 $\frac{1}{2}$	56.755	48.477	27.000	22.759	
March	60 $\frac{3}{4}$	56 $\frac{3}{4}$	57.935	49.926	27.080	23.650	
April	73 $\frac{1}{2}$	60 $\frac{3}{4}$	64.415	50.034	31.375	23.259	
May	77 $\frac{1}{4}$	68 $\frac{3}{4}$	74.27	49.915	34.182	23.560	
June	68 $\frac{3}{4}$	62 $\frac{3}{4}$	65.02	49.072	31.038	21.577	
July	65	60	62.94	47.519	29.870	22.950	
August	67	64	65.50	47.178	31.25	22.750	
September	69 $\frac{1}{4}$	67 $\frac{3}{4}$	68.515	48.68	32.18	23.600	
October				49.385		23.923	
November				51.713		24.640	
December				55.038		26.232	
Year				49.690		23.470	

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Expectations that business in copper would soon become desultory were considerably upset in the past week when business in large volume appeared, buying being vigorous and well spread out. Producers were surprised by the influx of business following a few days of comparative quietness, which they assumed was a prelude to a dull spell. Domestic consumers came into the market rather suddenly and took metal for the second quarter of next year, although a good business was also done for delivery this year and over the first quarter of next year. The fact that consumers who had already covered first quarter needs decided to buy for the second quarter without waiting for a possible reaction in prices was a pleasing sign to copper sellers who now feel confident that their own optimism is shared by consumers.

Some foreign orders have been placed since our last report. Italy has ordered about 2,500,000 lbs., while a miscellaneous foreign business amounting to about 1,000,000 lbs., has been booked. Transactions last week are estimated at 15,000,000 lbs.

Indications are that records in production, domestic consumption and exports will be broken this year. Refinery yield this month is expected to total 170,000,000 lbs. and with cold weather driving labor to indoor employment it is expected that output will increase steadily, so that by December a production of 190,000,000 lbs. will have been attained. On this basis, it is figured that the average monthly yield for this year will be 175,000,000 lbs., giving a production which may reach 2,100,000,000 lbs. Domestic consumption for the year is estimated at 1,200,000,000 lbs. and exports are reckoned at 900,000,000 lbs. While these are records that the trade will feel proud of, the fact remains that 1917 will bring new records. Refinery output early next year is expected to total 200,000,000 lbs. a month and with business coming in at a rate that assures the full absorption of this output over the entire year a production of 2,400,000,000 lbs., domestic consumption of 1,200,000,000 lbs. and exports of 1,100,000,000 lbs. are considered probable.

The price situation has shown no essential change in the

past week. Dealers have adhered firmly to prices, while producers are declining more business than they are accepting. Some dealers are entirely cleaned out for this year. Spot electrolytic holds at 29 $\frac{1}{4}$ cts., with November at 28 $\frac{3}{4}$ cts. and December at 28 $\frac{1}{4}$ cts. January is quoted at 28 cts., February at 27 $\frac{3}{4}$ cts. and March at 27 $\frac{1}{2}$ cts., with first quarter contracts at 27 $\frac{1}{2}$ cts. and second quarter at 27@27 $\frac{1}{4}$ cts. Casting copper is very scarce and leading makers are unable to take business for delivery before late November, for which position sales at 27 $\frac{1}{2}$ cts. has been made. A few small spot lots sold at 28 cts.

The London market has been devoid of any spectacular movement. Electrolytic last week went up 10s to £143 10s, with gains of £1 in standard spot and £1 10s in futures.

Exports of copper since the first of October total only 16,785 tons, and unless southern and Pacific ports show large shipments the full month's total will be well under the exports of September, August and July.

Quotations for copper per pound at New York for the week ended Oct. 25 were as follows:

	Lake.	Electrolytic.	Casting.
Oct. 19.....	28 $\frac{1}{2}$ @29	28 $\frac{1}{2}$ @29	27 $\frac{1}{4}$ @27 $\frac{1}{2}$
20.....	28 $\frac{1}{2}$ @29	28 $\frac{1}{2}$ @29	27 $\frac{1}{4}$ @27 $\frac{1}{2}$
21.....	28 $\frac{1}{2}$ @29	28 $\frac{1}{2}$ @29	27 $\frac{1}{4}$ @28
23.....	28 $\frac{1}{2}$ @29	28 $\frac{1}{2}$ @29	27 $\frac{1}{4}$ @28
24.....	28 $\frac{1}{2}$ @29	28 $\frac{1}{2}$ @29	27 $\frac{1}{4}$ @28
25.....	28 $\frac{1}{2}$ @29	28 $\frac{1}{2}$ @29	27 $\frac{1}{4}$ @28

Quotations for copper per ton at London for the week ended Oct. 25 were as follows:

	Standard		Electrolytic.
	Spot.	Futures.	
Oct. 19.....	£124 0 0	£126 0 0	£143 10 6
20.....	124 0 0	120 0 0	143 10 0
21.....	124 0 0	120 0 0	143 10 0
23.....	124 0 0	120 0 0	143 10 0
24.....	124 0 0	120 0 0	144 0 0
25.....	124 0 0	119 0 0	144 0 0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	28.00	28.75	17.758
October				17.925
November				18.856
December				20.375
Year				17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	28.00	28.75	17.705
October				17.859
November				18.826
December				20.348
Year				17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	1916	1916	1915	1916	1915
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	25.50	27.00	26.40	116.10	68.560
October .....	.....	.....	.....	.....	72.677
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—Irregularity has characterized the tin market since our last report, but it is apparent that there is strength underlying the market. Straits tin reacted to 40¼ cts. for spot, but subsequently recovered to 41¼ cts. Spot Banka held steady at 40½@41 cts. Little business was done in futures. The east has been very firm with the limits and few of the offerings were taken up. Straits tin for November and December delivery is quoted at 41 cts., with January, February and March arrival at 40¼ cts. and April and May arrival at 40¼ cts.

At London there was a soft spot during midweek, but the market came firmer toward the close.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Oct. 25 were as follows:

	New York		London.	Singapore,
	Spot.	October.	Straits, spot.	shipments.
Oct. 19.....	41c	40¾c	£179 10 0	£183 15 0
20.....	41¼c	41c	179 10 0	185 15 0
21.....	41¼c	41c	179 10 0	185 15 0
23.....	41¼c	41¼c	180 0 0	184 15 0
24.....	41¼c	41¼c	179 15 0	185 15 0
25.....	41¼c	41¼c	181 5 0	184 10 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.386
September	39.50	38.00	39.60	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Quite a large business has been done in lead in the past few days. Canadian ammunition makers came into the market and took up options which producers had given them on about 2500 tons, while Far Eastern consumers bought 2000 tons. These purchases were the only developments of note in an otherwise drab market. Domestic consumers, being well covered, were not seeking metal. The market holds very strong, due to the sold-up position of all producers, while dealers are not large holders and are demanding the top price for the metal they control. Spot lead in the outside market held at 6.92½@6.95 cts. St. Louis, while spot New York was quoted at 7.20 cts. Producers took orders for November at a base price of 6.90 cts. New York, or 7.05 cts. New York with December delivery \$1 a ton less.

The London market has been dormant, prices holding unchanged for almost three weeks at £30 10s for spot and £29 10s for futures.

Quotations for lead per pound at New York and per ton at London for the week ended Oct. 25 were as follows:

	New York		London.	Futures.
	Indpts.	A. S. & R. Co.	Spot.	.....
Oct. 19.....	7.05c	7.00c	£30 10 0	£29 10 0
20.....	7.05c	7.00c	30 10 0	29 10 0
21.....	7.05c	7.00c	30 10 0	29 10 0
23.....	7.05c	7.00c	30 10 0	29 10 0
24.....	7.05c	7.00c	30 10 0	29 10 0
25.....	7.05c	7.00c	30 10 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	1916	1916	1915.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August	6.70	5.95	6.32	4.760	30.260
September	7.10	6.70	6.88	4.627	31.25
October .....	.....	.....	.....	4.612	.....
November .....	.....	.....	.....	5.152	.....
December .....	.....	.....	.....	5.346	.....
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—In the Missouri-Kansas-Oklahoma district during the week ended Oct. 21 the market made further gains, as during the previous week, and ores sold as high as \$87, though in many cases only \$80 was obtained per ton for concentrates. The production for the week was 1,787,480 lbs. and was valued at \$76,482. The total for the year to date was 83,512,447 lbs., valued at \$3,458,421.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	60.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	49.25
October .....	.....	.....	.....	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	63.34

Zinc Ore.—Though the top price for zinc ores remained at \$70, as during the previous week, the range was only down to \$65. Concentrates produced during the week totaled 12,250,200 lbs., valued at \$403,250, and the total for the year was 531,377,490 lbs., valued at \$22,462,538.

Calamine.—The market was about in the same condition as during the previous week and ores sold at from \$35 to \$45.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.60	62.50
April	100.00	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.06	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	60.00	58.75	60.25
September	65.00	45.00	55.00	76.75
October .....	.....	.....	.....	82.40
November .....	.....	.....	.....	92.60
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Galvanizers came into the market for spelter quite unexpectedly and the sudden activity caused prices to advance. A good business was done in prime western metal for delivery in the first quarter of next year. Brass makers were also in the market, but not to any large extent. Dealers who were active buyers a few weeks ago have been the principal sellers. Most of the important producers adhere to their determination not to dispose of first quarter output until November and December, when they expect better prices will be obtained. Spot prime western, after receding to 9¼ cts. New York, advanced to 10.30 cts. New York. The spot market at St. Louis was also very tight, holding only \$1 a ton lower than New York. Business in prime western for the first quarter was done from 9.50 cts. St. Louis up to 10½ cts. St. Louis, the higher price prevailing at this writing. No foreign demand was noted. Sellers of brass special reported

a fair domestic demand with the market steady at 11 cts. St. Louis for spot.

The London market declined early last week, but recovered slightly toward the close.

Quotations for spelter per pound at New York and per ton at London for the week ended Oct. 25 were as follows:

	New York.	London.	
	Spot.	Spot.	Futures.
Oct. 19.....	9% c	£53 0 0	£50 0 0
20.....	10.00c	54 0 0	51 0 0
21.....	10.20c	54 0 0	51 0 0
22.....	10.30c	54 0 0	51 0 0
23.....	10.30c	54 0 0	51 0 0
24.....	10.30c	54 0 0	51 0 0
25.....	10.30c	54 0 0	51 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	1916	1915	1916	1915	
	High.	Low.	Avg.	Avg.	Avg.
January	19.42½	17.30	18.801	6.519	89.840
February	21.17½	18.67½	20.094	8.866	97.840
March	20.50	16.50	18.40	10.125	100.720
April	19.37½	17.75	18.76	11.48	98.103
May	17.50	13.75	15.98	15.825	89.507
June	13.62½	11.25	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August	9.75	8.37½	9.11½	16.110	56.00
September	9.70	8.12½	9.22	14.493	51.30
October				14.196	
November				16.875	
December				16.675	
Year				13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—There has been no change in the situation in this metal. Sellers report a fair business moving, with the price holding at \$89 per flask for spot virgin. A more active demand from powder makers is expected, some very large contracts for gunpowder now pending, both for foreign and domestic account.

Platinum.—Refiners reported a steady demand from jewelers, with the market holding at \$90 for soft and \$96 for hard metal.

Tungsten.—Business continues very dull. Consumers who loaded up tungsten when the price was around \$90 a unit are so well supplied that they are not likely to enter the market for new supplies until next January. Producers in the meantime are accumulating stocks. Some small producers who are in need of money have been offering ore at \$16 per unit and requesting counter bids, which indicates that they would accept \$14 per unit delivered New York. The important producers, however, are holding for \$20@25 per unit and expect to secure that price, pointing out that the marked activity in the steel business means a large consumption of tungsten.

Antimony.—The market has been quiet, but prices are being maintained by sellers, who report that stocks here have been eliminated by the recent sales to Canada and Italy. Domestic producers, however, are holding spot metal, on which they are asking 13 cts.

Nickel.—The situation continues as previously, sellers reporting a fair demand, with prices repeated at 45 cts. for ordinary forms and 50 cts. for electrolytic.

Ferromanganese.—Selling of ferromanganese by the Carnegie Steel Co. and another producer in eastern Pennsylvania at prices lower than those asked by merchant producers has upset the market. The Carnegie company has done business at \$162 delivered, while merchant producers have been quoting \$166 delivered. British makers continue to quote \$165 seaboard.

Pig Iron.—The upward movement in pig iron prices continues. Bessemer of special analysis has sold at \$26 valley, while standard bessemer is strong at \$24 valley. Basic has sold at \$21 valley, with some dealers asking \$21.50 valley. Foundry grades are also advancing. Birmingham furnaces have sold spot No. 2 iron at \$16 furnace and are holding

first half iron at \$15.50 Birmingham. Virginia furnaces announced another advance to \$18.50 for No. 2 iron. Buying, both foreign and domestic continues active.

Manganese Ore.—Demand for this ore for blast furnace use has been rather quiet in the past week. Leading importers report that business in Cuban ores has fallen off considerably, recent importations showing high silicon contents. Cuban ore, 40% metal contents, is quoted at 55@58 cts. per unit, while ores lower in silicon are quoted at 65@70 cts. per unit at the seaboard. Chemical ore is quiet at 4½ cts. f. o. b. New York.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06½	to	.06½
Nitric, 40 deg.....	.06½	to	.07
Alcohol—U. S. P., gal., Grain, 190 proof.....	2.74	to	2.75
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.75	to	.80
Denatured, bbl.....	.60	to	.62
Alum.—Powdered, lb.....	.04½	to	.04½
Lump, lb.....	.04	to	.05½
Ground, lbs.....	4.10	to	4.12½
Ammonia—			
Muriate, white grain, lb.....	.10½	to	.11½
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.05½	to	.06
Red, lb.....	.62½	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	4.00	to	4.25
Foundry.....	3.75	to	4.00
Copperas—Spot, bbl.....	1.35	to	1.50
Ferromanganese.....	162.00	to	165.00
Ferrosilicon, 50%.....			85.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
Lead—Granulated, lb.....	.14½	to	.15½
Brown sugar.....	.11½	to	.12
White crystals.....	.13½	to	.15
Broken, cakes.....	.12½	to	.13½
Powdered.....	.17	to	.17½
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum—Oz. ref.....	90.00	to	96.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.39½	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.64	to	.65
Prussiate, red.....	1.90	to	2.00
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.30½	to	.31
Soda—Ash, 48% (43% basis), bbl.....	2.90	to	3%
Strontia Nitrate, casks, lb.....	.32	to	.35
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50%, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.28	to	.29½
Oxide, lb.....	.44	to	.46
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

Dividends on Issued Capitalization							Dividends on Issued Capitalization								
NAME OF COMPANY	Number Shares Issued	Par Val	Paid In 1916	Total to date	Latest Date	Am't.	NAME OF COMPANY	Number Shares Issued	Par Val	Paid In 1916	Total to date	Latest Date	Am't.		
Acacia, g.	Colo.	1,438,989	\$1	\$.....	\$126,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,916	\$1	\$.....	\$98,916	Sept. '01	\$0.01
Adams, s. l. c.	Colo.	80,000	10	.....	778,000	Dec. 13, '09	.04	Golden Star, g.	Ariz.	400,000	5	.....	120,000	Mar. 15, '10	.06
Adventure, c.	Mich.	100,000	25	50,000	60,000	July 20, '16	.50	Gold Com. Fra. g.	Nev.	922,000	1	.....	922,000	Oct. 15, '09	.10
Ahmek, c.	Mich.	200,000	25	1,200,000	5,000,000	July 10, '16	3.00	Goldfield Con.	Nev.	3,569,148	10	.....	28,999,831	Oct. 31, '16	.10
Alaska Goldfields.	Alaska	250,000	6	.....	403,250	Jan. 10, '15	.15	Good Hope, g.	Colo.	600	100	.....	941,250	Jan. '03	.25
Alaska Mexican, g.	U. S.	180,000	6	.....	3,507,381	Nov. 25, '15	.10	Good Sp. Anchor, z.	Nev.	550,000	1	33,000	119,755	June 16, '16	.01
Alaska Mines Sec.	U. S.	600,000	6	.....	90,000	Nov. 1, '06	.....	Grand Central, g.	Utah	600,000	1	.....	1,545,200	Dec. 23, '16	.02½
Alaska Treadwell, g.	Alaska	200,000	25	250,000	15,780,000	May 19, '16	.50	Grand Outch. c. s.	Nev.	239,384	2.50	17,790	19,187	Sept. 6, '16	.03
Alaska United, g.	Alaska	180,200	5	64,000	2,045,270	Feb. 28, '16	.50	Granite, g.	Alaska	430,000	1	17,200	17,200	May 10, '16	.02
Allouez, c.	Mich.	100,000	25	450,000	650,000	July 15, '16	2.00	Gwin, g.	Cal.	100,000	10	.....	481,500	Feb. '06	.25
Amalgamated, c.	Mont.	1,538,829	100	.....	103,444,983	Aug. 30, '16	3.77	Hazel, g.	Cal.	900,000	1	.....	1,114,000	Jan. 5, '15	.15
Am. Sm. & R., com.	U. S.	600,000	100	2,500,000	31,833,333	Sept. 1, '16	1.50	Hecla, s. l.	Idaho	1,000,000	0.25	1,110,000	4,855,006	Sept. 30, '16	.15
Am. Sm. & R. pf.	U. S.	500,000	100	2,625,000	57,421,846	Sept. 1, '16	1.75	Hercules, s.	Idaho	1,000,000	1	1,850,000	12,600,000	Sept. 16, '16	.20
Am. Sm. Sec. A. pf.	U. S.	170,000	100	765,000	11,495,000	July 1, '16	1.50	Hidden Treasure, g.	Cal.	30,000	10	.....	457,452	Sept. '00	.10
Am. Sm. Sec. B. pf.	U. S.	300,000	100	1,125,000	16,635,000	July 3, '16	1.25	Holy Terror, g.	S. D.	600,000	1	.....	172,000	Jan. '00	.01
Am. Zinc, L. & Sm.	Mo.	193,120	25	2,756,130	3,806,070	Aug. 1, '16	1.50	Homestake, g.	S. D.	251,160	100	1,469,286	37,174,994	Sept. 25, '16	.65
Anaconda, c.	Mont.	2,331,250	60	11,656,250	175,914,271	Apr. 28, '16	2.00	Hope Dev.	Cal.	500,000	1	.....	5,000	Dec. 31, '16	.01
Annie Laurie, g.	Cal.	25,000	100	.....	439,561	Apr. 27, '06	.50	Horn Silver, l. s. z.	Utah	400,000	1	40,000	5,182,000	June 30, '16	.06
Argonaut, g.	Cal.	200,000	5	55,000	1,685,000	Sept. 26, '16	.07½	Imperial, c.	Ariz.	600,000	10	.....	300,000	June 24, '07	.20
Arizona, c.	Ariz.	.....	.....	531,164	20,212,184	Apr. 1, '16	.....	Inspiration Con.	Ariz.	920,687	20	3,091,233	3,091,233	July 31, '16	2.00
Atlantic, c.	Mich.	100,000	25	.....	990,000	Feb. 21, '05	.50	Inter'l Nickel, com.	U. S.	1,673,384	25	7,948,574	34,451,411	Sept. 1, '16	2.00
Bagdad-Chase, g. pf.	Cal.	54,819	5	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, pf.	U. S.	89,126	100	401,067	6,748,613	Aug. 1, '16	1.60
Bald Butte, g. s.	Mich.	250,000	1	.....	1,354,648	Nov. 1, '07	.04	Intern'l Sm. & Ref.	U. S.	100,000	100	.....	4,100,000	May 2, '14	2.00
Baltic, c.	Mont.	100,000	25	.....	7,950,000	Dec. 31, '13	2.00	Interstate-Calahan	Idaho	484,990	10	2,092,455	4,649,900	Sept. 30, '16	1.60
Barnes-King, f.	Mont.	40,000	6	60,000	60,000	June 1, '16	.07½	Iowa, g. s. l.	Colo.	1,668,867	1	.....	270,167	Dec. 31, '16	.00½
Beck Tunnel Con.	Utah	1,000,000	0.10	.....	940,000	Nov. 15, '02	.02	Jawa Tiger, g. s. l.	Colo.	3,000	1	.....	25,179	Jan. 15, '16	.60
Big Four Expl.	Wis.	400,000	1	100,300	110,000	Sept. 4, '16	.06	Iron Blossom, l. s. g.	Utah	1,000,000	1	260,000	2,750,000	July 20, '16	.10
Board of Trade, z.	Colo.	120,000	1	.....	78,000	Jan. 16, '11	.06	Iron Cap pf. d. c.	Ariz.	33,481	10	6,422	28,803	July 1, '16	.35
Bonanza Dev.	Colo.	300,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Clad, g.	Colo.	1,000,000	1	.....	60,000	Nov. '06	.05
Booth (Reorganized)	Nev.	998,395	5	149,949	349,949	June 26, '15	.06	Iron Silver	Colo.	500,000	20	.....	5,050,000	Dec. 31, '16	.10
Boss, f.	Nev.	408,500	1	.....	40,850	Dec. 10, '14	.10	Isabella, g.	Colo.	2,250,000	1	.....	742,600	Mar. '01	.01
Boston & Colo. Sm.	Colo.	15,000	10	.....	402,350	Oct. '02	.75	Isle Royale, c.	Mich.	150,000	25	150,000	300,000	July 31, '16	1.00
Bost. & Mont. Con.	Mont.	100,000	25	.....	63,225,000	May 16, '11	4.00	Jamison, g.	Cal.	390,000	10	.....	378,300	Jan. '11	.02
Breecs, l. s.	Cal.	300,000	25	.....	220,000	Dec. 15, '13	.10	Jerry Johnson, g.	Colo.	2,500,000	10	.....	187,500	Nov. 5, '14	.00½
Brunswick Con. g.	Cal.	100,000	1	.....	203,315	Sept. 16, '15	.06	Jim Butler, c.	Nev.	1,718,020	1	343,604	615,405	Aug. 1, '16	.10
Bullion B. & Champ	Utah	100,000	10	.....	2,768,400	July 1, '08	.10	Joplin Ore & Spelter	Mo.	400,000	6	62,000	62,000	July 22, '16	.04½
Bunker Hill Con.	Idaho	327,000	10	1,318,000	18,018,000	Sept. 5, '16	.16	Jumbo Ext. g.	Nev.	1,550,000	1	194,000	684,998	June 30, '16	.05
Butte Alex Scott, c.	Mont.	75,000	10	814,662	1,054,119	Apr. 10, '16	10.50	Kendall, g.	Mont.	600,000	6	50,000	1,555,000	Apr. 3, '16	.10
Butte-Balaklava, c.	Mont.	250,000	10	.....	125,000	Aug. 1, '10	.50	Kenefick Zinc	Mo.	200,000	6	80,000	60,000	June 20, '16	.10
Butte Coalition, c.	Mont.	1,000,000	16	.....	4,700,000	Dec. 1, '11	.25	Kenecott, c.	Alas.	2,780,950	10	11,200,000	15,200,000	Apr. 30, '16	1.60
Butte & Superior, z.	Mont.	272,697	10	7,676,734	13,196,768	Sept. 30, '16	6.25	Kennedy, g.	Cal.	100,000	100	.....	1,801,001	June, '00	.05
Caledonia, l. s. c.	Idaho	2,605,000	1	703,500	1,586,081	Sept. 5, '16	.03	King of Arizona, g.	Ariz.	200,000	1	.....	396,000	Aug. 2, '09	.12
Calumet & Ariz. c.	Ariz.	641,923	10	3,849,522	26,997,847	Sept. 25, '16	2.00	Klar Piquett, z.	Wis.	20,000	1	.....	157,500	Dec. 16, '12	.25
Calumet & Hecla, c.	Mich.	100,000	25	6,000,000	134,250,000	Sept. 22, '16	20.00	Knob Hill, g.	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00½
Camp Bird, g.	Colo.	1,750,000	25	113,594	10,243,954	Jan. 1, '16	.17½	La Fortuna, g.	Ariz.	250,000	1	.....	1,200,500	Oct. '02	.01½
Cardiff, g.	Utah	500,000	1	375,000	500,000	Sept. 19, '16	.25	Lake View	Utah	500,000	1	60,000	114,600	June 23, '16	.01
Carla, g. s. c.	Utah	600,000	25	.....	60,000	Dec. '06	.01	Last Dollar, g.	Colo.	1,500,000	.05	.....	180,000	Feb. 23, '03	.02
Centennial, c.	Mich.	1,000,000	1	100,000	100,000	Sept. 1, '16	1.00	Liberty Bell, g.	Colo.	133,551	5	.....	1,762,795	Jan. 31, '16	.06
Centennial Eureka.	Utah	100,000	25	100,000	4,000,000	Apr. 25, '18	1.00	Lightner, g.	Cal.	102,255	1	.....	331,175	June, '06	.05
Center Creek, l. z.	Mo.	100,000	10	70,000	665,000	Sept. 1, '16	.15	Linden, z.	Wis.	1,020	10	.....	11,200	Dec. 31, '16	3.00
Central Eureka, g.	Cal.	100,000	1	.....	799,187	Mar. 5, '06	.05	Lititz, g.	Utah	300,000	1	15,000	16,000	Apr. 22, '16	.06
Century, g. s. l.	Utah	1,000,000	1	44,000	392,087	Feb. 15, '16	.06	Little Florence	Nev.	1,000,000	1	.....	430,000	Jan. '08	.03
Champion, c.	Mich.	100,000	25	5,640,000	15,610,000	Sept. 8, '16	6.40	Lost Packer	Idaho	150,000	1	.....	37,600	Oct. 23, '16	.25
Chiet Con.	Utah	882,960	1	132,323	483,360	Aug. 2, '16	.06	Lower Mammoth	Utah	1,000,000	1	.....	67,000	Dec. 15, '16	.01
Chino Copper, c.	N. M.	889,980	5	5,002,385	11,700,377	Sept. 30, '16	2.25	MacNamara, g. s.	Nev.	734,676	1	.....	48,800	Apr. 23, '06	12.00
C. K. & N. g.	Colo.	1,421,900	1	.....	171,828	Nov. '04	.01	Magma, c.	Ariz.	240,000	5.00	300,000	600,000	Sept. 30, '16	.50
Cliff, f.	Alaska	100,000	1	.....	115,000	Feb. 5, '14	.06	Mammoth, g. z. c.	Utah	400,000	.10	60,000	2,380,000	June 30, '16	.05
Cliff, s. l.	Utah	300,000	10	.....	90,000	Jan. 1, '13	.10	Manhattan Big 4, g.	Nev.	762,400	1	.....	30,248	Aug. 16, '11	.02
Clinton, g. s.	Colo.	1,000	100	.....	60,000	Dec. '03	.30	Mary McKinney, g.	Colo.	1,309,252	1	.....	1,169,306	July 28, '14	.02
Colo. G. Dredging.	Colo.	200,000	10	100,000	425,000	Feb. 23, '16	1.00	Mary Murphy, g. s. l. z.	Mich.	370,000	6	25,067	93,106	May 1, '16	.07
Colorado, s. l.	Utah	253,540	0.20	.....	2,000,000	Mar. 16, '13	.03	Mass Con. c.	Mich.	100,000	25	100,000	100,000	Aug. 15, '16	1.00
Columbus Con. l. s. c.	Utah	253,540	6	.....	212,623	Oct. 14, '07	.20	May Day, c.	Utah	800,000	0.2				

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid In 1916	Total to Date	Latest						Paid In 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah ..	600,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success.....	Ida. ..	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03
Pharmacist, g.	Colo. ..	1,500,000	1	.....	91,500	Feb. 1, '10	.00%	Superior, c.	Mich. ..	1,000,000	25	100,000	100,000	Sep. 30, '16	1.00
Phelps, Dodge & Co.	U. S. ..	450,000	100	9,000,000	67,371,627	Sept. 30, '18	8.00	Superior & Pitts, c.	Ariz. ..	1,499,792	10	.....	10,318,568	Dec. 21, '15	.35
Pioneer, g.	Alaska	6,000,000	1	.....	2,041,628	Oct. 7, '11	.03	Tamarack, c.	Mich. ..	60,000	25	.....	9,420,000	July 23, '07	4.00
Pittsburg, I. z.	Mo.	1,000,000	1	.....	20,000	July 15, '07	.02	Tamarack-Custer.....	Idaho. ..	2,000,000	1	106,676	106,675	Aug. 30, '16	.62
Pittsburg-Idaho, I.	Ida.	1,000,000	1	.....	249,104	July 15, '13	.04	Tennessee, c.	Tenn.	200,000	25	200,000	6,206,250	Apr. 15, '16	.75
Pitts Silver Peak.	Nev.	2,790,000	1	.....	840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100	.....	160,000	Jan. 3, '14	.....
Platteville, I. z.	Wis.	600	60	.....	179,500	June 15, '07	10.00	Tomboy, g. s.	Colo.	310,000	5	74,400	3,861,555	June 30, '16	.24
Plumas Eureka, g.	Cal.	150,625	10	.....	2,831,294	Apr. 9, '01	.06	Tom Reed, g.	Ariz.	909,555	1	.....	2,555,934	Sept. 6, '15	.01
Plymouth Con.	Cal.	240,000	5	116,500	289,300	Aug. 10, '16	.24	Ton-Belmont, g.	Nev.	1,500,000	1	362,600	8,206,527	July 1, '16	.12%
Portland, g.	Colo.	3,000,000	1	270,000	10,447,080	July 20, '16	.03	Ton-Extension, g. s.	Nev.	1,272,901	1	113,560	1,400,856	July 1, '16	.16
Prince Con, a. l.	Nev.	1,000,000	2	175,000	300,000	Sept. 6, '16	.05	Tonopah, g. s.	Nev.	1,000,000	1	450,000	13,450,000	July 21, '16	.16
Quartette, g. s.	Nev.	100,000	1	.....	375,000	July 31, '07	.20	Tonopah Midway, g.	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.06%
Quicksilver, pf.	Cal.	43,000	100	.....	1,931,411	Apr. 8, '03	.50	Transm.	Cal.	200,000	2.50	.....	234,000	Apr. 25, '15	.02
Quip, g.	Wash.	1,500,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,100,000	Oct. 29, '15	3.00
Quincy, c.	Mich.	110,000	25	2,120,000	22,987,500	Sept. 25, '16	4.00	Tuolumne, c.	Mont.	800,000	1	.....	435,525	Apr. 15, '13	.10
Ray Con, c.	Ariz.	1,571,273	10	2,743,748	7,322,875	Sept. 30, '16	.75	Uncle Sam Con, s.	Utah.	500,000	1	.....	470,000	Sept. 20, '11	.05
Red Metal, c.	Mont.	100,000	10	.....	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	335,350	1	.....	167,070	Nov. 16, '15	.10
Red Top, g.	Nev.	1,000,000	1	.....	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	50,000	100	.....	1,500,000	Apr. 15, '07	3.30
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	.....	6,125,000	Aug. 3, '07	1.75
Richmond, g. s. l.	Nev.	54,000	1	.....	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	.....	211,527	Oct. 15, '07	.50
Rocco-Homa, I. s.	Nev.	300,000	1	.....	162,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Rochester Ld. & L.	Mo.	4,900	100	.....	190,846	July 1, '12	.50	United (Crip. Clk.) ..	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev.	889,018	1	.....	363,964	Aug. 25, '13	.04	United Olobe, c.	Ariz.	23,000	100	1,173,000	3,749,000	Oct. 30, '16	8.00
Sacramento, g.	Utah.	1,000,000	6	.....	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	50,000	100	.....	11,000,000	Sept. 23, '10	6.00
St. Joseph, I.	Mo.	1,409,468	10	1,761,830	12,029,729	Sept. 10, '16	.75	United Verde, c.	Ariz.	300,000	10	2,925,000	38,722,000	Sept. 9, '16	1.50
St. Mary's M. L.	Mich.	160,000	25	2,403,000	6,880,000	Sept. 15, '16	2.00	United Verde Ext.	Ariz.	1,000,000	50	600,000	600,000	Aug. 1, '16	.03
Schoenhr-Wal'n, z. l.	Mo.	10,000	10	.....	90,000	Sept. 20, '11	.20	U. S. Red, & R. com.	Colo.	58,188	100	.....	41,075	Oct. 9, '16	1.00
Scratch Gravel.	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,456	100	.....	1,776,936	Oct. 1, '07	1.50
Seven Tra. Ch. g. a.	Nev.	1,443,077	1	36,076	252,532	Apr. 1, '16	.02%	U. S. R. & M. com.	U. S. M.	351,115	50	965,666	7,590,745	July 15, '16	1.00
Shannon, c.	Ariz.	300,000	10	.....	750,000	Jan. 30, '13	.60	U. S. R. & M. pf.	U. S. M.	486,350	50	128,668	18,094,362	July 13, '16	.87%
Shattuck-Ariz.	Ariz.	350,000	10	1,225,600	4,200,000	June 20, '16	1.25	Utah, c.	Utah.	1,624,490	10	13,808,160	46,530,012	Sept. 10, '16	3.00
Silver Hill, g. s.	Nev.	108,000	1	.....	88,200	June 24, '07	.05	Utah-Apex, a. l.	Utah.	628,200	6	396,114	462,750	Oct. 30, '16	.25
*Silver King Coal'n	Utah.	1,250,000	5	662,600	14,147,485	July 1, '16	.15	Utah Con, c.	Utah.	300,000	6	676,000	9,820,000	Sept. 26, '16	.75
Silver King Con.	Utah.	637,682	1	127,616	942,373	July 22, '16	.10	Utah M. & T. f.	Utah.	750,000	1	326,000	1,285,495	Aug. 15, '16	.60
Silver Mines Expl.	N. Y.	10,000	100	.....	250,000	June 16, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00
Sioux Cons, I. s. c.	Utah.	745,389	1	.....	872,105	July 20, '11	.04	Victoria, g. s. l.	Utah.	250,000	1	.....	207,500	Apr. 23, '10	.04
Skidoo, g.	Cal.	1,000,000	1	.....	365,000	Oct. 2, '14	.01	Vindicator Con, g.	Colo.	1,500,000	1	135,000	3,397,500	July 25, '16	.03
Smuggler, s. l. z.	Colo.	1,000,000	6	.....	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D.	500,000	1	100,000	649,446	May 15, '16	.02%
Snowstorm, c.	Idaho	1,500,000	1	.....	1,169,610	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,000,000	1	400,000	1,050,000	July 1, '16	.02
Socorro, c.	N. M.	377,842	6	56,599	196,070	Aug. 1, '16	.05	West End Con.	Nev.	1,788,486	1	.....	536,545	Jan. 15, '16	.05
South Eureka, g.	Cal.	299,381	1	167,920	1,408,754	Aug. 15, '16	.07	West Hill, c.	Wis.	20,000	1	8,000	40,000	June 22, '16	.20
South Hecla, c.	Ida.	500,000	1	39,450	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal.	200,000	10	80,000	130,000	Aug. 23, '16	.10
So. Swansea, g. s. l.	Utah.	300,000	1	.....	287,600	Apr. 3, '04	.01%	Wilbert, c.	Ida.	1,000,000	1	30,000	40,000	Aug. 15, '16	.01
Spearfish, c.	S. D.	1,600,000	1	.....	165,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	369,000	8,760,000	Apr. 1, '16	6.00
Spokane Con, g. s.	Cal.	178,394	10	.....	6,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c.	Ariz.	118,674	15	.....	53,403	.....	.25
Standard, c.	Ariz.	425,000	1	.....	69,500	Sept. 8, '05	.60%	Wurk, g.	Colo.	1,500,000	1	.....	1,697,685	Apr. 31, '12	.04
Stewart, I. z.	Idaho	1,238,362	1	.....	2,043,297	Dec. 31, '16	.05	Yak.	Colo.	1,000,000	1	120,000	2,127,685	June 30, '16	.07
Stratton's Crip. Clk.	Colo.	2,000,000	1	.....	300,000	Sept. 6, '08	.02%	Yankee Con, g. s. l.	Utah.	1,000,000	1	.....	167,500	Feb. 1, '13	.21
Stratton's Ind.	Colo.	1,000,000	6	.....	6,028,568	Dec. 23, '06	.12	Yellow Aster, g.	Cal.	100,000	10	19,000	1,181,759	Sept. 1, '16	.02
Str'n's Ind. (new) g.	Colo.	1,000,000	.30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine, z. I. s.	Nev.	1,000,000	1	700,000	1,593,000	Sept. 15, '16	.10
Strong, g.	Colo.	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	.....	102,583	July 15, '14	.10

Corrected to October 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675.00.

†Consolidated with Bingham-New Haven.

Dividends of Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest Date	Amt.					Paid in 1916	Total to Date	Latest Date	Amt.
Ajuchitan.....	Max.	50,000	\$ 6	\$.....	\$237,600	July 1, '13	\$0.25	Las Cabrilas.....	Mex.	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00
Amistad y Concordia g.	Mex.	9,600	30	.....	429,358	July 15, '08	1.29	La Roi No. 2, g.	B. C.	120,000	25	.....	1,627,320	Dec. 15, '16	\$0.24
Amparo, s. g.	Mex.	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.05	Lucky Tiger.....	Mex.	715,337	10	379,129	3,672,502	Sept. 30, '16	.03
Barlo de Medina Mill	Mex.	2,000	25	.....	103,591	Aug. 1, '07	.60	McKinley-Darragh-Sav.	Ont.	2,247,692	1	202,293	4,010,061	July 1, '16	.03
Batopilas, s.	Mex.	446,268	20	.....	55,570	Dec. 31, '07	.12%	Mexican, I. pf.	Mex.	12,500	100	.....	1,019,750	May 1, '12	3.50
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex.	240,000	10	.....	660,000	Mar. 10, '08	.25
Boleo, g.	Mex.	120,000	20	.....	721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex.	180,000	5	.....	1,478,500	June 26, '14	.96
British Columbia, c.	B. C.	591,709	5	.....	615,399	Jan. 6, '13	.15	Minas Pedrazzini.....	Mex.	1,000,000	1	.....	497,600	Jan. 23, '11	.06%
Buena Tierra, c.	Mex.	330,000	5	.....	160,380	Jan. 30, '16	.24	Mines Co. of Am.	Mex.	900,000	10	.....	4,958,600	July 25, '13	.12%
Buffalo, Ont.	Ont.	1,000,000	1	.....	2,787,600	July 1, '14	.05	Mining Corp. of Canada.	Can.	2,075,000	1	259,375	1,037,500	Mar. 30, '16	.12%
Canadian Goldfields.	Can.	600,000	10	.....	237,089	July 15, '14	.01%	Montezuma, I. pf.	Mex.	6,000	100	.....	402,500	Nov. 15, '12	3.50
Cananea Central, c.	Mex.	600,000	10	.....	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex.	500,000	1	.....	100,000	July 20, '09	.04
Cariboo-Cobalt.	Ont.	1,000,000	1	.....	295,000	Sept. 1, '15	.09	Mother Lode.....	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11
Cariboo-McKinney, g.	B. C.	1,250,000	1	.....	66,250	Dec. 1, '09	.00%	Naica, s. l.	Mex.	100	300	.....	3,190,000	Oct. 11, '09	\$293
City of Cobalt.....	Ont.	500,000	1	.....	138,375	May 15, '09	.01	N. Y. & Hond. Rosario.	C. A.	200,000	10	220,000	3,370,000	July 23, '16	.50
Cobalt Central, s.	Ont.	4,761,500	1	.....	192,845	Aug. 24, '09	.01	Nipissing, s.	Ont.	1,200,000	5	900,000	4,340,000	July 20, '16	.25
Cobalt Lake, s.	Ont.	3,000,000	1	.....	465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	.....	533,000	Feb. 25, '10	.02
Cobalt Silver Queen.	Ont.	1,650,000	1	.....	317,000	Dec. 1, '08	.24	Paloma, g.	Mex.	3,000	100	.....	29,600	Dec. 1, '12	5.00
Cobalt Townsite, s.	Ont.	139,282	5	.....	1,042,259	Aug. 20, '14	.24	Panuco.	Mex.	10,000	.....	7,465,000	Nov. 4, '09	6.00	
Coniagas, s.	Ont.	800,000	5	400,000	8,240,000	Aug. 6, '16	.25	Pandora, s. g.	Mex.	120,000	20	.....	6,451,687	Sept. 30, '13	1.25
Con. Mg. & Sm., g. s. c.	B. C.	53,650	100	420,517	2,740,654	July 1, '16	2.50	Paracrina, pf.	Mex.	10,000	100	.....	328,656	Sept. 1, '10	8.50
Crown Reserve, s.	Ont.	1,999,957	1	.....	8,102,408	July 15, '15	.03	Peterson Lake.	Ont.	2,401,820	1	84,064	304,287	July 1, '16	.01%
Dolores.	Mex.	400,000	5	.....	1,374,865	July 24, '11	.22%	Pinguico, pf.	Mex.	20,000	100	.....	780,000	Apr. 15, '13	3.00
Dome Mines, s.	Ont.	400,000	10	600,000	1,000,000	Sept. 1, '16	.50	Porcupine Crown.	Ont.	2,000,000	1	180,000	600,000	July 2, '16	.03
Dos Estrellas, (El Oro)	Mex.	300,000	0.50	.....	15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex.	5,000	15	.....	963,360	Apr. 1, '16	1.00
El Favor.	Mex.	3,500,000	1	.....	210,000	Apr. 30, '14	.01	Rambler-Cariboo.	Ont.	15,000	100	70,000	490,160	Aug. 1, '16	.01
El Oro.	Ont.	1,147,500	2	.....	9,135,500	Sept. 1, '14	.24	Rea Maria, Leadst.	Ont.	200,000	.....	12,750	Feb. 20, '15	.06%	
El Rayo, g. s.	Mex.	280,020	2	.....	140,410	Apr. 24, '11	.15	Right of Way.	Ont.	1,685,500	1	16,855	560,614	June 15, '16	.00%
El Triunfo, c.	Mex.	2,000,000	1	.....	20,000	Aug. 28, '11	.01	Rio Plata.	Mex.	374,518	5	.....	345,744	Jan. 1, '13	.06
Esperanza, s. g.	Mex.	450,000	5	.....	12,521,250	Dec. 31, '15	.10	San Francisco Mill.	Mex.	6,000	25	.....	445,086	Oct. 15, '08	1.00
Granby Con., c. g. s.	B. C.	149,985	100	749,926	6,350,311	Aug. 1, '16	2.00	San Rafael.	Mex.	2,400	25	.....	6,798,280	Jan. 11, '12	2.00
Greene-Cananea, c.	Mex.	474,410	100	2,431,045	6,666,830	Aug. 23, '16	2.00	San Toy, s. l.	Mex.	6,000,000	1.00	.....	640,000	July 24, '13	.01
Greene Con., c.	Mex.	1,000,000	10	2,500,000	12,544,900	Mar. 25, '16	1.00	Santa Gertrudis, Hdgr.	Mex.	1,500,000	5	364,500	2,819,772	June 16, '16	.24
Greene-Gold-Silver, pf.	Mex.	200,000	10	.....	194,871	May 28, '07	.....	Santa Gertr'y Guadalupe, g.	Mex.	60,000	.....	3,960,000	Mar. 27, '09	4.00	
Guanaquato Con., s.	Mex.	540,000	5	.....	600,000	Oct. 8, '08	.07%	Sta. Maria del Paz.	Mex.	9,800	12%	.....	6,806,000	Jan. 5, '13	2.50
Guanaquato Dev. pf.	Mex.	10,000	100	.....	274,356	Jan. 1, '11	3.00	Seneca-Superior.	Ont.	478,444	.....	66,214	1,687,420	Sept. 15, '16	.30
Guggenheim Explorat.	Mex.	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.85	Soledad, s. l.	Mex.	960	20	.....	4,439,340	Oct. 17, '11	8.00
Haleybury, s.	Ont.	50,000	1	.....	50,000	Apr. 5, '11	.50	Sorpresa, g. s.	Mex.	19,200	20	.....	3,979,240	Jan. 5, '11	34.00
Hedley.	B. C.	120,000	10	180,000	2,003,520	Sept. 30, '16	.60	Standard, s. l.	B. C.	2,000,000	1	450,000	2,250,000	Sept. 10, '16	.02%
Hinds Con., g. s. l.	Mex.	6,000,000	1	.....	88,000	Feb. 27, '08	.02	Temiskaming & Hud. Bay	Ont.	7,761	1	.....	1,940,250	Nov. 10, '14	3.00
Hollinger.	Ont.	4,000,000	6	1,440,000	5,610,000	Sept. 8, '16	.05	Temiskaming, s.	Ont.	2,600,000	1	75,000	1,534,156	July 22, '16	.03
Johns.	Ont.	10,000	100	.....	2,775,000	Feb. 27, '11	.09	Tetahutan, c.	Mex.	8,000	100	.....	1,855,000	Jan. 1, '09	1.50
Kerr Lake.	Ont.	600,000	5	.....	6,560,400	July 15, '16	.05	Tezcuhtlan, s.	Mex.	63,500	1	199,31	265,750	July 3, '16	.1%
La Blanca.	Mex.	140,000	20	.....	275,700	Mar. 31, '13	.30	Tretheway, s.	Ont.	1,000,000	1	.....	1,061,988	July 15, '14	.06
La Republica, s.	Mex.	400,000	6	.....	110,000	Aug. 15, '11	.06	Wettlaufer-Lorrain, s.	Ont.	1,416,690	1	.....	656,386	Oct. 20, '13	.05
La Rose Con., s.	Ont.	1,498,627	6	224,793	5,611,913	July 20, '16	.06	Yukon, g.	Y. T.	3,500,000	6	787,500	8,370,610	Sept. 30, '16	.07%

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The Formation and Achievements of the American Mining Congress

The American Mining Congress was organized 19 years ago, at the height of the agitation for free silver coinage. In Colorado, where mining men felt the great need of co-operation in matters pertaining to the industry which had just received its most serious setback, the idea was born. And, strange to say, its first rather indefinite purpose was to have a "Gold Mining Convention." Over in Gilpin county, where vast fortunes both in silver and gold had been taken out of the ground, there at the home of the late Senator Henry M. Teller, the greatest of "silver" zealots, were men who believed that "gold was also an important factor in the economy of the world." In fact, all over the state there was this feeling of getting down to business on a "gold mining" basis.

International Mining Congress Formed.

And on July 7, 1897, the delegates assembled in Denver and elected former Governor Alva Adams as temporary chairman. The representation was excellent. When the inevitable free-coinage resolution had been debated, when all the rancor of the previous 2 years of free silver discussion had been fairly well boiled out of the convention, the delegates started in to do something tangible for the mining industry. It was termed the International Gold Mining Congress, and under this name it labored for 5 years.

At the very outset it gave itself the task of agitating for the creation of a federal department of mines and mining. The resolutions adopted had the right ring, but no concerted effort was made to put them into effect. The second meeting of the convention was held in Salt Lake City, former Governor L. Brandford Prince of New Mexico presiding. The honor of the first actual presidency had been given him at the Denver convention.

The third convention of the Congress was held in Milwaukee in June, 1900, Col. B. F. Montgomery, of Cripple Creek, former Lieutenant-Governor of Colorado, presiding.

In 1901 in the convention at Boise, Idaho, Governor Prince was again chosen president. The fifth convention was held at Butte, Mont., and all of the movements which had received previous endorsement were again made a prominent feature.

These early years of the Congress comprised its formative epoch. The best mining men of the country, men who knew what was needed to rehabilitate the industry, took an interest in the affairs of the Congress. At the sixth annual convention, which was held at Deadwood and Lead, S. D., Hon. J. H. Richards presided.

Becomes American Mining Congress.

As a matter of fact the real history of the American Mining Congress, the period of effective labors, begins with the Portland convention in 1904.

Now it was that the great mining engineers of the country began to take part in its deliberations. Government experts appeared at conventions with important papers. In 1904 for the first time the president of the United States was persuaded to appoint delegates. Great men now proffered advice, and realized that only by such co-operation as the Congress furnished could the mining industry be uplifted, and made a great power in the United States. Men like Charles W. Goodale, S. A. Taylor, James W. Malcolmson, Dr. James Douglas, D. W. Brunton, Hennen Jennings, John Hays Hammond, J. R. Finlay, J. Parke Channing, Edward B. Kirby, S. W. Mudd—to mention only a few of the many prominent engineers who are now among its most active members—took a hand in its deliberations. From this time on the resolutions passed by the Congress were accepted by legislatures and by both houses at Washington, as authoritative in the mining world.

Hon. J. H. Richards continued as president during the sessions at Portland in 1904; at El Paso, Tex., in 1905; at Denver, in 1906; at Joplin, Mo., in 1907, and Pittsburgh in 1908, and at Goldfield in 1909.

In 1904 at the Portland convention James F. Callbreath became secretary and permanent headquarters were established at Denver. The American Mining Congress now became a tremendous factor in the development of the mining industry of the country—perhaps the greatest factor.

Demand for a Bureau of Mines.

Out of the early propaganda for a mining department came the more practicable demand for a Bureau

of Mines. Of this the late Dr. J. A. Holmes, who was its first director, said at the meeting following the establishment of the bureau:

"This movement for appropriate recognition and aid for the mining industry from the national government has been under way for many years. Among its early and most active supporters have been the California Miners' Association and the American Mining Congress. It is, therefore, eminently appropriate that at the first session of the American Mining Congress, following the creation of the Bureau of Mines, at a session held in California, something should be said of the policy and purposes of the new Bureau."

And in outlining these purposes Dr. Holmes expressed the thought that he would continue to lean heavily upon the American Mining Congress for the expression of what would be best for the mining industry in the future. It was at the sessions, and from the men in charge of the work of the American Mining Congress, that he hoped to get his inspiration for the labors which were so close to his heart.

But the history of the American Mining Congress can now best be told in the great utterances of its leaders, in the splendid committee work, in the resolutions passed, and in the determination to accomplish what had been resolved upon.

History is never a mere narrative of meetings and elections. It is, or rather should be, a chronicle of the spirit of co-operation by which men uplift themselves as well as their industry.

At the meeting of the American Mining Congress in Joplin in 1907 Dr. J. A. Holmes made this epochal utterance:

"We are going to ask the American Mining Congress to march into the coal field and capture the help of the mining interests in the central portion of the United States. Then with the concentrated effort on the part of the mining men from all sections of the country, we may be prepared to obtain the co-operation and help from both the federal and state governments to which we claim the mining industry is entitled. We are today using up our mineral resources so rapidly that we are consuming both our own share and the share belonging to the future. We are dealing with great national problems as never before in the history of our mineral development; and we must consider and solve these problems in a true national spirit. In this connection the American Mining Congress must capture the east and the south as it has the west. Let us, therefore, hold our next two meetings, one in the heart of the Mississippi Valley coal fields, and another in the heart of the Alleghenies, probably at Pittsburgh. We will thus gain in eastern membership and influence and will become truly representative of the great American mining industries. We will then the more easily accomplish the great national purposes for which we have our being."

Impromptu as was the utterance, it was in a way climacteric. For, true to his prediction, the next meeting was held at Pittsburgh, and the east opened its heart to the Congress. In fact, within 2 years, and by reason of the tremendous help given the original idea by the coal interests of the country, Congress passed the act creating the Bureau of Mines.

The successful battle on the flotation of worthless mining stock by unscrupulous promoters took definite shape at this meeting.

At this time also the objects of the American Mining Congress had crystallized into clear-cut issues, all of them of vast importance to the mining interests of the country. These had been carefully prepared by

the officials and President Richards, in reading them, said: "These summarize just what was presented to Secretary Garfield and what seemed to him to justify us in our claim to the right to a department."

"We believe the mining industry will be greatly aided:

"(1) By the granting of continued and larger appropriations for the investigations by the Geological Survey, so that the results may be reached rapidly enough to more nearly meet the growing needs of the country, including:

"(a) The classification of the public lands;

"(b) The exploration, surveying and mapping of the geological formations, ore bodies, mineral deposits, etc.;

"(c) The investigations of the nature, extent and origin of these deposits and of the origin of the coals of the country.

"(2) By the establishment at this time of a Bureau of Mines, with ample authority and funds for the investigation of and inquiries into:

"(a) The methods and processes employed in the mining and quarrying industries and in the handling and treatment of mineral products with a view to aiding these industries, preventing mine and quarry accidents, and recommending appropriations;

"(b) The wise utilization and conservation of the mineral resources through the prevention of waste, the development of more efficient methods, etc.;

"(c) The mining conditions, and the most efficient methods for the handling, treating and using of ores and other mineral products in foreign countries, with a view to benefiting American mining, quarrying and other mineral and metallurgical industries;

"(d) The publication, in such form as to be really available, of the information obtained from all these investigations and inquiries; the wide and prompt distribution of these publications among the mining men of the country; and co-operation of impartial government experts in this educational work by public addresses in mining camps and at the meetings of men associated with mining and quarrying industries, with a view to the prevention of accidents, the preventing of waste, and more efficient work.

"(3) The above action is recommended with a view to the establishment from time to time of other allied bureaus and ultimately the establishment of a Department of Mines if the conditions may warrant such action.

"(4) By revising existing legislation relative to mineral lands and mining:

"(a) To provide for the separation of surface from underground ownership, with a view to the independent development of the mining and of the agricultural or forest industries;

"(b) To prevent fraud in the entries made to and patents obtained on mineral lands; and

"(c) To facilitate the disposition of these lands by lease, sale or otherwise, under such conditions as will best facilitate legitimate and practical mining."

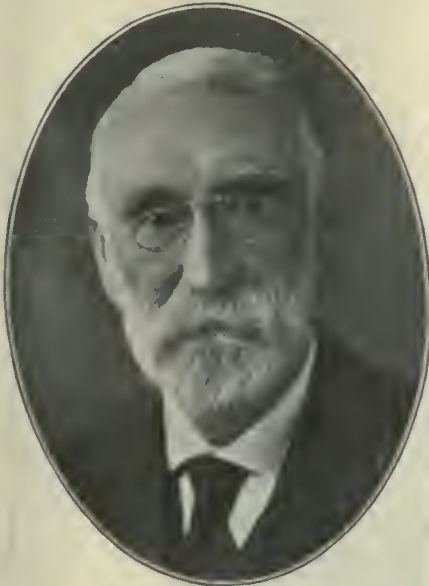
President Richards announced that when these were presented to Secretary of the Interior Garfield he said: "I think you are entitled to a Bureau," and President Roosevelt promised a definite recommendation in his next annual report.

Thus was the great struggle securing friends—through the endless presentation of facts, through the persistent pounding of great and determined men upon the doors of the departments and of Congress. For even at this session a message was sent to the president thanking him for what had been done and forcibly reminding him of his promise.

At the session of 1907 George Otis Smith, director of the U. S. Geological Survey, presented an important paper on "The Possibilities and Limitations of Geological Survey Work as Applied to the Mining Industry," and Edward Goodrich Acheson, the discoverer of a method for the manufacture of car-

borundum, discussed some of his remarkable experimental work in the production of crucibles from artificial graphites. At this session, too, the work of all the mining schools of the country was thoroughly gone into, and the first steps were taken to secure

became an historical fact. For the coal men not alone participated in the proceedings but joined their problems and their energies to what, while national in scope, had up to this time been a purely western organization. At Pittsburgh the American Mining Con-



James Douglas.



John Hays Hammond.



J. H. Richards.



Hennen Jennings.



John Dern.

government aid for experimental work in mining states.

First Session Held in the East.

In 1908 the American Mining Congress invaded the east, holding a session in Pittsburgh from Dec. 2 to 5. And here the inspired prediction of Dr. Holmes

gress, in its membership, and in its activities, put on the purple toga of nation-wide co-operation.

Safety Legislation Demanded.

At the Pittsburgh convention the American Mining Congress definitely planned what, up to this time,



THE LATE DR. E. R. BUCKLEY.

President, 1910.

had been but a tentative program, for the most stringent possible "safety" legislation.

The fact brought out that in 1907 3000 miners were killed in accidents, an increase of 50% over the record of 1906, brought home to the convention the need of the most drastic action.

Congressmen J. F. Burke of Pennsylvania and John C. Chaney of Indiana and Senator Charles Dick of Ohio took an active part in the proceedings at Pittsburgh, and were the sponsors for the measures which were later drafted into law, and which had been brought up and discussed at the meeting of the American Mining Congress at Pittsburgh.

It is appropriate at this point to add that the impetus given for the enactment of "Safety" measures at the Pittsburgh convention was far-reaching in its influence. Here is record that speaks for itself:

Year.	Production (short tons).	Employed.	Killed.	Rate per 1000 empl.	Killed per million tons.
1907.	480,363,424	680,492	3,242	4.81	6.78
1908.	415,842,698	690,438	2,445	3.60	6.97
1909.	460,814,616	666,552	2,642	3.96	5.73
1910.	501,596,378	725,030	2,821	3.89	5.62
1911.	496,371,126	728,348	2,656	3.65	6.35
1912.	534,466,580	722,662	2,419	3.35	4.53
1913.	570,048,125	747,641	2,785	3.73	4.89
1914.	513,525,477	763,185	2,454	3.22	4.78
1915†.	618,000,000*	767,553†	2,264	2.95	4.37

*Estimated by U. S. Geological Survey. †Subject to change.

Meantime, acting on the humanitarian impulse created by this movement, many large industrial and railroad organizations have created special "Safety-First" movements, through which marvellous results are being obtained in the way of preventing accidents.

It is interesting in this connection to note that one of the sessions of the American Mining Congress was held at the Government Station for investigation of mine explosions, which on that day, Dec. 3, 1908, was formally opened, Hon. James R. Garfield, Secretary of the Interior, delivering the dedicatory address.

The Pittsburgh Meeting.

The proceedings of the Congress at Pittsburgh commanded world-wide attention. Among the notable papers read were the following: Relation of the Federal Government to Mining, by Senator Charles Dick, of Ohio; Transportation of Mineral Products, by Edward H. Harriman; The Importance of Arbitration as a Factor in the Advancement of the Mining Industry, by Carroll D. Wright; The Federal Government in Its Relation to the Mining Industry, by Secretary of the Interior James R. Garfield; Problems of the Coal Mining Industry, by Dr. J. A. Holmes; Conservation in the Coal Industry, by John Mitchell; Arbitration as a Factor in the Mining Industry, by Judge George Gray, of Delaware, and Thomas H. Lewis, president of the United Mine Workers of America; and Distribution of the Nation's Mineral Wealth, by George Otis Smith, director of the U. S. Geological Survey.

Goldfield Meeting.

The twelfth annual session of the American Mining Congress was held at Goldfield, from Sept. 27 to Oct. 2, 1909, Judge J. H. Richards presiding. At

this meeting Secretary Callbreath announced the first great advance in the movement to establish a Bureau of Mines. "During the sixtieth Congress," he reported, "a bill was introduced in the Lower House for the creation of a Bureau of Mines, and passed by that body by a vote of 229 to 21. The bill was approved by the Senate Committee, but was talked to death in the final hours of the session. We will have to begin our work all over again."

And the Congress went on record again with a determination to win out at the next session.

Among the notable addresses at the Goldfield gathering were the following: National Problems, by Hon. Francis G. Newlands, of Nevada; Silver and the National Government, by Judge C. C. Goodwin, of Salt Lake City; Inspection of Mines, by Dr. J. A. Holmes; The Mining Men's Interest in Land Classification, by George Otis Smith.

Los Angeles Meeting.

Dr. E. R. Buckley, of Rolla, Mo., head of the Missouri School of Mines, took the presidency at the Thirteenth Annual session, which was held at Los Angeles from Sept. 26 to Oct. 1, 1910. And at this Congress Dr. J. A. Holmes delivered his first public address as head of the newly created Bureau of Mines.

But the creation of the Bureau of Mines was a task that had its ramifications, and the Congress at Los Angeles lost no time in formulating by resolution much of the work it expected the new bureau to accomplish.

This covered a wide latitude from effective safety measures for both coal and metal mines, to a most comprehensive exploitation of the underground resources of the United States. It meant, moreover, that the Congress must put its shoulder to the wheel and urge the largest possible appropriation for effective work.

It was at this session of the Congress that the movement for a thorough revision of the mining laws of the country was given a decided step forward.

But the most important report submitted was that of the Committee on Prevention of Mine Accidents. Its recommendations became of international interest, and have since been incorporated into the statutes of many of the mining states of the country. The committee consisted of Walter R. Ingalls, chairman, J. Parke Channing, James Douglas, James R. Findlay and John Hays Hammond. It was first appointed by the American Mining Congress in 1906, reported progress in 1907 and 1908, and in 1909 was given permission to submit its report to the American Institute of Mining Engineers and to the Mining and Metallurgical Society of America, as well as to the American Mining Congress.

This committee collated the mining laws of all the states and of foreign countries, and from a study of these compiled the now famous model statute "Relating to Metalliferous Mines, and to provide for the health and safety of persons employed in and about

the same." It gathered all available statistics on fatal mine accidents, and clearly established what had up to this time been only suspected, namely, that the loss of life in metal mining in the United States is fully as great as in coal mining. One of its most important recommendations, and which resulted in greater state appropriations through the west, was the concluding paragraph in its report on mine inspection:

In the opinion of the committee, the essential steps toward reducing the loss of life in metalliferous mining are (1) a comprehensive and effective law; and (2) an adequate system of mine inspection. The latter is the keystone of progress. Much can be accomplished by an adequate system of mine inspection, even if a comprehensive law be lacking, but no matter how thorough and effective in theory a law may be, it will fail in its purpose unless provision be made for its sincere, impartial and positive enforcement by an adequate system of competent mine inspection.

To secure such a system of mine inspection, the states must appropriate a good deal more money than any has yet done. Each state must have a mine inspector, and he must be provided with a sufficient number of deputies to enable frequent inspections of all operating mines to be made. One inspection of a mine in a year is not enough. The inspector and deputies must, moreover, be provided with proper funds for clerical work, traveling expenses, etc. So far as we are aware, the state of Colorado makes the largest appropriation for inspection of metal mines, its appropriation being \$25,000 per year. Other important mining states appropriate only \$10,000 per year. In the opinion of the committee, such appropriations are utterly inadequate. For states possessing a mining industry of the importance of that in Colorado, Utah, Montana, Nevada, California, and, in fact, all of the states and territories west of the Rocky mountains, an annual appropriation of \$50,000 to \$100,000 per state is necessary. Such expenditures are thoroughly justified by the importance of the end to be gained.

At this session of the Congress another important report was that of the committee on "Standardization of Electrical Equipment in Coal Mines." The proposed code of rules presented at this time, and as revised at the following sessions, have since been incorporated in the statutes of many of the states.

Among the notable addresses at this session were the following: The Bureau of Mines and Its Work, by Dr. J. A. Holmes; Proposed Legislation for the Disposition of the Public Lands, by Hon. Richard A. Ballinger; Shall We Have Private Ownership or a Leasing System, by Hon. F. W. Mondell; Conservation as It Affects the Oil Industry, by Hon. Gifford Pinchot.

Chicago Meeting.

The fourteenth annual session was held in Chicago, from Oct. 24 to Oct. 28, 1911, Hon. John Dern, of Salt Lake, presiding. The event of greatest import was the presence at this session of Hon. William H. Taft, President of the United States, who spoke on the topic: The Government and the Mining Industry. M. Jean de Pulligny, director of the French Mission of Engineers to the United States, was another notable guest whose address to the convention covered conditions of mining abroad. England and Canada also had prominent representatives in attendance who participated in the discussions.

The subject of Workmen's Compensation Law was ably discussed, the report of the committee on that topic furnishing the basis for most important legislation.

At this session steps were taken to establish headquarters in Washington, and the by-laws were amended to permit of an extension of the work by admitting to membership coal mining organizations or kindred bodies. These changes have been of great import in the history of the American Mining Congress. By establishing its headquarters in Washington the Congress was able to keep in close touch with federal legislation on all mining subjects, to suggest measures approved by the conventions and to oppose whatever might be deemed injurious to the industry.

Among the notable addresses at this convention in addition to those already mentioned were the following: The Public Land Question, by Governor William Spry, of Utah; The Past, Present and Future of Copper, by Horace J. Stevens, of Houghton, Mich.; The Economics of the Coal Industry, by Carl Scholz, of Chicago; What the West Needs in Coal Land Legislation, by Dr. George Otis Smith, of Washington; Alaskan Problems, by Hon. Walter L. Fisher, Secretary of the Interior, and The Relation of Congress to the Mining Industry, by Dr. Martin D. Foster, chairman of the House Committee on Mines and Mining.

Spokane Meeting.

The fifteenth annual convention of the Congress was held at Spokane, Wash., from Nov. 25 to Nov. 29, 1912, Samuel A. Taylor, of Pittsburgh, presiding.

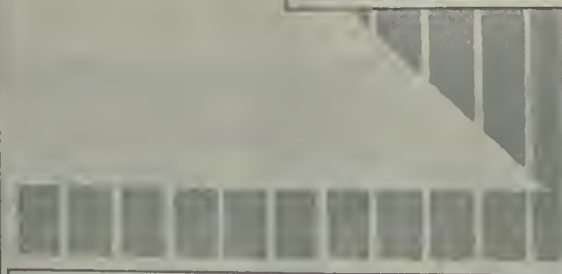
The detailed report of the Committee on Standardization of Electrical Equipment in Metal Mines was submitted at this session, and is today considered an authoritative document in the compilation of legislation on this subject.

Among the notable addresses at this session of the Congress were the following: The National Forests and Development of Natural Resources, by Henry S. Graves, United States Forester; The Washington Compensation Act, by John H. Wallace, of Olympia, Wash.; and The Leasing of Mineral Lands, by William Griffith, of Scranton, Pa.

Philadelphia Meeting.

In 1913 the American Mining Congress held its sixteenth annual session at Philadelphia from Oct. 20 to Oct. 24, David W. Brunton, of Colorado, presiding. The question of a revision of the mining laws of the country, which had been agitated during successive Congresses, was now taking more definite shape. The co-operation of the American Institute of Mining Engineers and of the Mining Metallurgical Society of America was announced, and it was hoped that the three bodies acting together would obtain the long-sought-for legislative reforms in Congress.

Among the notable addresses at the Philadelphia Convention were the following: Relation of Big Business to Industrial Property with Special Reference to Mining, by Dr. Charles A. Van Hise, president of the University of Wisconsin; Conservation from the Western Standpoint, by Senator John F. Shafroth, of



Offices of American Mining Congress, in the Munsey Building, Washington, D. C.

(1) Reception room. (2) Publicity Department. (3) Secretary Callbreath at his desk. (4) Filing Department. (5) Assistant to the Secretary, Mrs. Coombes.

Colorado; Needed Changes in Our Mineral Land Laws, by Senator Thomas J. Walsh, of Montana; Arbitration as a Factor in the Mining Industry, by Wm. B. Wilson, Secretary of Labor; The Public Land Laws, by Assistant Secretary of the Interior A. A. Jones; Our Radium Resources, by Charles L. Parsons, Chief of the Division of Mineral Technology, Bureau of Mines; The Federal Government and the Mining Industry, by Hon. M. D. Foster, chairman of the House Committee of Mines and Mining; Lessons of the Year in Our Mining Industry, by Dr. Joseph A. Holmes, director of the U. S. Bureau of Mines.

Phoenix, Ariz., Meeting.

The seventeenth annual session at Phoenix, Ariz., held from Dec. 7 to Dec. 11, 1914, was presided over by Carl Scholz, of Chicago, and was marked by the last appearance at its session of the late Dr. Joseph A. Holmes, director of United States Bureau of Mines.

His remarks, brief as they were, had all the brilliancy of the past. He had traveled a long distance to be at these sessions, which, to his far-seeing mind, formed the basis for all the success achieved in the establishment of the Bureau of Mines, and for whatever it could do in the future. Here he felt he was in touch with the mining men of the country, the working and the operating classes, the men who knew what was best for the industry. And so he came to speak when he was physically too weak to make such an effort. He had a message to deliver, but could not complete it, and, only when a friendly point of order was raised, did he consent to take his seat. But these last remarks before the American Mining Congress contain a message of work, of duty yet to be performed. He said:

Since the Bureau of Mines was organized there has been comparatively little increase in the moneys appropriated for the actual investigations of mining, consequently we have not been able to do the amount of work which we would like to have done. Our plans for the present year are in no way enlarged upon those of the past year. Now, that is a condition which is going to continue as it is now until the mining people of this country make up their minds to the fact that they are not being treated on the square. You realize this very interesting information brought out by the President in his address the other evening, that whereas every miner in this country contributes something like \$1800 a year to the national wealth, as compared to \$800 or \$900 contributed by every farmer of the country to the national wealth, at the same time the people of the United States contribute 28 to 30 cts. per capita for the advancement of agriculture and less than 2 cts. per capita to the advancement of mining; that in spite of the fact that mining is the most hazardous of our great industries and agriculture is the safest; that in mining we have one lot of mineral resources, and that when they are gone the nation must depend upon something else or some other country, whereas agriculture is a self-perpetuating industry. Why is it that it is so difficult to get anything done out of the federal or state treasury on behalf of mining? And the first reason which I found in talking with members of Congress is the fact that when you talk to them about helping mining, what they see is the Homestake and the Treadwell and the United Verde and half a dozen great big mines in the country, and they say: Why, those fellows are rich enough to take care of themselves. They don't see the small miners of the country; they don't see the struggling miners who are trying to build up a great industry, and the reason they don't see these things is because they are not presented to them; and in that connection I want to emphasize one of the most important lessons for this session of the Mining Congress to learn thoroughly, and that is that until

the mining people of this country do what the railroad companies of the country are doing, educating public sentiment as to what the great industry is, and what it means to this nation, the people of the United States will never understand it.

The letter from Hon. Woodrow Wilson, President of the United States, was in a way a keynote for the work of the Congress:

"It will always be a tribute to your foresight and energy," he wrote, "that this new Bureau of Mines in the short period of its existence, with the kindly co-operation of state and other agencies, has been able, by persistent and intelligent effort, to turn an isolated, local movement for greater safety into a great national movement for 'Safety First' that has already gone beyond the mining industry into every industry of the country. I venture to say that thousands of lives have been saved by that movement and that many thousands more will be saved in the future.

"Gratifying as the results of this life-saving campaign may have been, however, there is still vigorous work for your Congress to do. I am informed that during the last year more than three thousand men were killed and a hundred thousand injured in the mining and metallurgical industries of the country. * * * I suggest this situation as an opportunity for further endeavor on your part to cut down this excessive toll of death and injury."

At this session a decided advance was made in formulating the views of the country on mine taxation, and on mine law revision, and putting both these topics into statutory shape.

The first steps were also taken to establish as an adjunct to the American Mining Congress a Bureau of Mining Economics, which is to gather information covering every phase of practical mining, which is to keep in touch with markets, with production, with legal decisions, etc., etc. This movement is still under serious consideration and is making good headway.

San Francisco Meeting.

The eighteenth annual convention was held in San Francisco from Sept. 20 to 22, 1915, President Carl Scholz presiding. The notable event of the gathering was the Holmes memorial service, at which a vast host of admirers and friends paid tributes to the work and character of the late director of the U. S. Bureau of Mines.

All of the great problems which had come before the American Mining Congress in past sessions, and still needed settlement, were carefully discussed, and prepared for presentation to state and national legislative bodies.

Among the notable addresses at this convention was that by the successor of Dr. Holmes as director of the Bureau of Mines, Hon. Van H. Manning. His presentation of What the Bureau of Mines in the Department of Interior Is Doing and Hopes to Do for the Metalliferous Mining Industry, was masterful and comprehensive.

Other notable addresses at this session were the

following: Plain Writing, by Dr. George Otis Smith; Prejudice Against Regulation, by Rush C. Butler; California's Water Infiltration Law, by Fletcher McN. Hamilton; Federal Control of Water Power, by Hon. J. H. Richards; The Need of Better Mining Education, by Charles F. Willis; The Development of Mine Taxation in Arizona, by G. H. Dowell; Workmen's Compensation Insurance and the Coal Mining Industry, by Herbert M. Wilson; The New Plan of Mining Insurance, by David Ross; Mining Hazards on the Pacific Coast, by Dr. Frederick L. Hoffman; and Future of the American Zinc Industry, by Otto Ruhl.

The More Intimate Work of the Congress.

This history of the American Mining Congress is compiled largely from the records of the conventions held from year to year, and to a great extent, and necessarily, bridges over an immense amount of labor done by officials and committees between sessions. But it would not be a history in any sense if it did not include as far as this is possible some mention of what one must call the more intimate work of the congress.

When James F. Callbreath was elected secretary in 1904 at the Portland convention, the Congress felt that its influence must not begin and end with annual discussions and resolutions. Here were the expressions, the sentiments, here was the consensus of opinion of the mining men of the country. It was imperative that these recommendations should be shaped into laws, both state and national, and to the secretary was given the task of driving home, so to speak, the determinations of the Congress. How well the task was done, how brilliantly and conscientiously the pur-

poses of the mining congress were brought to the attention of the law makers of the land, is best attested by the results. The task was in many respects Herculean, for there were vast interests opposing every progressive movement of the Congress. And it was sheer grit and a gripping persistence on the part of the officials of the Congress and the men who worked with them in the intervals between conventions, that wrested from legislators, state and national, important reforms that have bettered the working conditions in the mines, have saved the lives of thousands of workmen, changes that have made mining investment safe and stable, new laws that have uplifted the mining industry of the country.

And the work of preparing for the conventions, of mapping out programs, of securing speakers of note, of interesting a greater number of mining men in the co-operative work of the Congress, all the vast details, preliminary work, has been done by Mr. Callbreath with rare zeal and intelligence, and is reflected in a constantly growing organization and in more and more interesting and instructive conventions.

In 1913 Carl Scholz, of Chicago, was elected president of the American Mining Congress. He was re-elected at both the following conventions, and without reflecting on the many capable executives of the past, it is but just to him to say that no one has had the welfare of the Congress more at heart, no one has ever served it with a greater zeal for the advance of the mining interests in America. No task in behalf of the industry proved too arduous for him to undertake, and no executive has ever carried out with greater skill and with more success the determinations of the Congress.



A Distinguished Gathering at the Chicago Meeting, 1911, Ex-President Taft in Center.

Official Roster American Mining Congress

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J. F. CALLBREATH, Secretary.

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1916

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Wm. Scanlon.....Helena, Mont.
Horace V. Winchell.....Minneapolis, Minn.
E. B. Kirby.....St. Louis, Mo.
D. C. McDonald.....Ely, Nev.
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Isadore Broman.....Austin, Tex.
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W. R. Woodford.....Cleveland, Ohio
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Charles M. Moderwell, Chicago, Chairman.
Hugh Shirkle.....Terre Haute
M. S. Kemmerer.....New York
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G. T. Watson.....Fairmont, W. Va.
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(Continued on next page.)

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What Will be Done at the Chicago Meeting

On Nov. 13, when the nineteenth annual session of the American Mining Congress opens at Hotel La-Salle, Chicago, there will be in attendance a delegation from every mining state in America, and representatives from nearly every important mining section of the country.

President Wilson has notified Secretary J. F. Callbreath of his appointment of the following delegates: E. H. Benjamin, Oakland, Cal.; H. M. Chance, Philadelphia; Curtis H. Lindley, San Francisco; James MacNaughton, Calumet, Mich.; Van H. Manning, Washington; E. P. Mathewson, Anaconda, Mont.; Charles Piez, Chicago; W. L. Saunders, New York; George Otis Smith, Washington; A. H. Woodward, Woodward, Ala.

E. H. Benjamin was for many years the president of the California Mining Association, and is one of the great mining engineers of the country.

Dr. H. M. Chance, of Philadelphia, is also a noted mining engineer and one of his activities at present is the working out of the engineering features for the production of iron ore in northern New York. Curtis Lindley is the author of "Lindley on Mines," the accepted standard among mining lawyers on matters pertaining to mining law. James MacNaughton is the vice-president and general manager of the Calumet & Hecla Mining Co. E. P. Mathewson has been prominent in the Anaconda Copper Mining Co.'s metallurgical affairs. Charles Piez is president of the Link-Belt Mfg. Co., of Chicago. W. L. Saunders is president of the Ingersoll-Rand Co., past president of the American Institute of Mining Engineers, and at present on the President's Naval Consulting Board. Van H. Manning is director of the U. S. Bureau of Mines. Dr. George Otis Smith is director of the U. S. Geological Survey. A. H. Woodward is a noted southern mining engineer and at present general manager of the Woodward Iron Co., of Woodward, Ala.

The conference of coal mining men from the middle west called by Governor Dunne will be held in conjunction with the Congress and its conclusions, particularly in matters pertaining to uniformity of laws, will be of national interest.

Wherever possible the railroads have granted a special rate. In the Western Passenger Association territory, where the rates approximate 2 cts. a mile, no further concessions are made to any gatherings. From California and Pacific coast common points the information is given out that the nine-months' tourist rate of one and one-third fares to Chicago and return applies for the period of the sessions of the American Mining Congress.

The Central Passenger Association, which covers common points in Illinois, Indiana, Ohio, Pennsylvania, West Virginia, Michigan, eastern Missouri, western New York, has made a 2-ct. rate each way.

These tickets will be sold Nov. 11, 12, 13, and have a return limit to Nov. 20. Holders must reach original starting point before midnight of Nov. 20.

The special sessions in the interests of a western "Public Lands" policy will form a most important part of the Congress. The responses received and the delegates already appointed indicate that 12 and possibly 14 states will participate in the conference.

Governor Geo. W. P. Hunt, of Arizona, in his letter says: "This matter is of such importance that it merits serious attention from each of the western states."

Governor Kendrick, of Wyoming, is "of the opinion that such a convention will do much to bring to the attention of the press and public this important work."

"The great difficulty," says James F. Callbreath, secretary of the American Mining Congress, who is organizing the conference, "has been that the west has had no comprehensive policy, and even western representatives in Congress could not get together upon an intelligent plan for handling this question. The conference will be the means through which we will arrive at a practical solution of the public land problem."

"The belief that the resources which are essential to industrial prosperity should not be permitted to pass beyond public regulation must be considered, but it must also be recognized that the individual states must have the benefit of their own natural resources."

"In view of the present legislative situation at Washington, I feel that the conference is opportune and that it will begin a campaign to reopen mineral resources to development, to protect the interests of the states, to meet the eastern criticism against fuel and power monopoly and to work out the conservation that stands for the highest use and the least possible economical waste of the great mineral resources of the west."

The exhibit, which will take up the 17th floor of the hotel with the exception of two meeting rooms, is now an assured success. Arizona has taken two of the larger spaces for its exhibit. The University of Illinois is preparing a fine educational photographic display. The U. S. Bureau of Mines exhibit now at Detroit, will, of course, be shown and will be one of the main educational features on the floor. H. R. Ameling, of St. Louis, has engaged one of the larger rooms to show twice or three times daily with moving pictures, the operations of the core drill.

Roebing, Goodman Mfg. Co., General Electric, Justrite Mfg. Co., Macomber & Whyte, Stephens-Adamson, Link-Belt, Electric Storage Battery Co. of Philadelphia, Stromberg-Carlson, G. L. Simonds, and the Tool Steel Gear & Pinion Co. all promise thoroughly representative exhibits.

The rooms for the section meetings are all spacious



CARL SCHOLZ.
President, American Mining Congress.



B. F. Brush.



D. W. Brunton.
Former President.



Geo. H. Dern.



L. A. Friedman.
Director.



J. F. Callbreath.
Secretary.



Harry N. Taylor.



E. A. Montgomery.
Director.



Geo. Wingfield.



S. A. Taylor.
Director.



Theodore Van Wagenen.



Geo. Otis Smith.



Van H. Manning.

and light. These are to be held during the afternoons. Particularly interesting will be the discussions on topics pertaining to the oil industry. There will be several interesting papers on the oil resources of the country. In a letter congratulating the Congress on its "oil" program, Rear Admiral John R. Edwards, U. S. N., writing from his home at Bristol, R. I., to Secretary Callbreath, sounds a new note in the country's industrial "preparedness" program:

"The extensive oil shale deposits of the Rocky Mountain region," says the Admiral, "offer far-reaching possibilities to the industrial and maritime interests as well as to the military departments of the nation, and the action of the American Mining Congress in giving special consideration to the question is another instance where the engineer is preparing to render an inestimable service in promoting national defense.

"It is by no means improbable that the existing industrial supremacy of the United States may be imperiled if we lose our relative lead in oil production, and therefore who can measure the importance of the service that has been rendered even in the past 2 years by the mining engineers of the country in pointing out the extent and character of the oil shale deposits of the United States. For it is in the direction of the retorting and distillation of the vast areas of shales of minable thickness and commercial richness that we must look to retain our lead in the production of the commercial petroleum products. The development of these shale areas ought to be one of the industrial responsibilities of the nation. In this work the mining engineer ought logically lead the advance."

The convention promises in its program to make even the technical side of many important questions interesting. This, in addition to the moving pictures



Dr. Henry Mace Payne.



Dr. W. R. Whitney.



James D. Phelan.



J. C. McDowell.



Frederick Laist.



Hon. W. R. Allen.

of the "core drill" there will be a great mass of interesting still and action pictures in connection with the various educational exhibits. Dr. Henry Mace Payne's lecture on the frozen gravels of Alaska and Siberia will have some marvelous films to supplement the technical side of the discourse.

It is hoped to have some moving pictures showing the effects of "explosions" in the work of mining. Then, of course, there will be the moving picture of the big Mexican oil gusher, the Cerro-Azul, of Mexico, to be shown and lectured upon by E. L. Doheny, of Los Angeles.

The address of Dr. Willis R. Whitney, who has been doing some wonderful research work for the General Electric Co., promises to be an epoch-making feature. It is to be on the subject of the Necessity for Research Work in the United States. It is to be a clarion call for national aid such as is given to the great research laboratories abroad.

On the general subject of "Safety" which is to be the feature of the morning session Tuesday, the 14th, there will be several notable addresses. These will be followed by a discussion on the Responsibilities and the Duties of the Operator, the Miner and the Public.

For the general session Wednesday when the subject will be Efficiency in Mining Operations there will be on hand a group of the country's greatest experts. Van H. Manning, director of the U. S. Bureau of Mines, will speak on Federal Aid to Mining Efficiency. The Federal Trade Commission and the Mining Industry will be discussed by Chairman E. N. Hurley, of the Federal Trade Commission. Charles M. Mod-erwell, a member of the executive committee of the Congress, will have an interesting report to present from the committee on relations with the Federal Trade Commission.

For the general session on Thursday, the subject will be Conservation. On this day Dr. Whitney's ad-



H. G. James.



H. H. Stock.



Ralph Crewes.

dress which has already been mentioned will give occasion for a great deal of discussion. President Carl Scholz will speak on The Conservation of Property.

The Section meetings, many of the topics for which were published in our last issue, promise much in the way of information that will be of great value to coal, oil, zinc, lead, copper, and precious metal mining men.

The address of Ralph Crews, of Chicago, on the subject Co-operation in the Marketing of Coal is to be followed by a discussion to which the secretaries of leading American Coal Marketing Associations have been invited. A sufficient number of acceptances assure a most thorough review of the entire subject. In fact the interest in the matter is so great that the time of the debate will probably be extended.

The address on The Federal Petroleum Bureau, by H. G. James, of Kansas City, will be the occasion for a warm discussion in the oil section. Dr. J. C. McDowell's paper on Geology in its Relation to the Oil Industry, is one that will greatly interest men in the oil industry.

Frederick Laist's paper on Electrolytic Separation gives promise of some revelations of intense interest in the way of improved processes.

In the coal section the paper to be read by H. T. Willard, of Cleveland, on Co-operation will drive home some great needs of the coal industry.

Dr. F. G. Cottrell's paper on New Things in Science is awaited with considerable interest, as he is the scientist who has had much to do with the progressive work done in the past 2 years by the U. S. Bureau of Mines.

Van H. Manning, director of the U. S. Bureau of Mines, has notified J. F. Callbreath that the government exhibit at the convention will surpass any mine display yet made by the bureau. There will be a collection of 175 underground coal mining safety pictures, arranged in series, and a group covering the same idea in metal mining. The government's complete set of approved electric wire lamps will be shown—the approved gas detectors, and a complete set of rock-dusting pictures and drawings.

In mine rescue and first aid display there will be a set of Fleuss-Proto apparatus, the Bureau of Mines oxygen inhalator, the Bureau of Mines first aid cabinet, the Bureau of Mines surgeon's emergency chest and a floor plan of one of the new steel cars.

Mr. Manning, director of the Bureau, will be in attendance on the sessions of the Congress and with him will come the leading experts of the department.

The "Public Lands" conference will have as delegates the west's most representative men, including a group of Senators and Representatives, who promise to bear the message of the gathering direct to the halls of Congress.

The men who have been chosen as delegates are determined to formulate a western policy on this ques-

tion, which will give to every state the power to develop the vast resources which have, in a way, been locked up by federal regulations and enactment.

The letters received from the governors give a clear idea of the general trend of the conference. For instance Governor Withycombe, of Oregon, says that there is even in the west a group of men that proceeds on the assumption that the state is not fit to care for the resources God has given it, and that the only administration of them which can be equitable to public interest must be centralized in Washington.

Governor John B. Kendrick, of Wyoming, writes that he will "co-operate in every way," in the enunciation of a western policy on the "Public Lands" question and "is of the opinion that such a convention will do much toward bringing to the attention of the press and public this most important work."

Governor Lister, of Washington, was one of the first of the western governors to appoint his delegates.

Governor Emmett D. Boyce, of Nevada, announces that "it will give me great pleasure to name delegates from Nevada."

And Governor George W. P. Hunt, of Phoenix, Arizona, writes: "This matter is of such importance that it merits serious attention from each of the western states."

The American Mining Congress at the coming session plans to devote considerable attention to the oil industry. The general meetings are to be held in the mornings, and the sections devoted to oil, coal, lead and zinc, copper and precious metals, are to meet every afternoon in their own assembly rooms at the hotel. One of the special questions in the oil section will be that relating to the rights of the western oil claimants upon lands withdrawn from entry and upon which large development has been made.

But there will also unquestionably be an emphatic protest against policies of the government in the proposed creation of naval oil reserves, and more particularly against the policies which work gross injustice to oil claimants who located their claims and carried on development work under the provisions of then existing legislative conditions.

The assured success of the convention is due to a great extent to the splendid work of the local committee and the unstinting labors of the president of the Congress, Carl Scholz, of Chicago, and to Secretary Callbreath, without whom there would be no American Mining Congress today.

Mention should be made of the publicity bureau, which under the management of Alfred Patek, did splendid work this year. Mr. Patek was formerly publisher of the Denver Times, and has recently removed to Chicago where he will carry on a general publicity bureau.

The details of local entertainments are now being prepared. The banquet will be in every way notable. Luncheons and one or two excursions to neighboring plants are also under consideration.

Program Nineteenth Annual Meeting

GENERAL SESSION.

Monday, Nov. 13—2 P. M.

Convention called to order by Harry C. Adams, Chairman, Committee of Arrangements.

Invocation: Rev. Frank W. Gunsaulus, Chicago, Ill.

Address of Welcome: Hon. Edward F. Dunne, Governor of Illinois.

Address of Welcome: Hon. Wm. H. Thompson, Mayor of Chicago.

Address of Welcome: J. W. O'Leary, President Chicago Association of Commerce.

Response to Addresses of Welcome: Three-minute responses by representatives of the several states, each with resolution embracing state's most important mining issue.

Tuesday, Nov. 14—10 A. M.

Subject: Safety in Mining Operations.

CARL SCHOLZ, President American Mining Congress, Presiding.

CHARLES S. KEITH, Alternate Chairman, Kansas City, Mo.

Introduction of Resolutions.

Address: The Record of Mine Safety Work, Albert H. Fay, U. S. Bureau of Mines.

Address: State Mine Rescue Methods, Dr. H. H. Stoek, Urbana, Ill.

Address: Safety Work as an Investment, Dr. C. W. Goodale, Butte, Mont.

Address: Responsibilities and the Duties of the Operator, Thomas M. Gann, Knoxville, Tenn.

Address: Of the Miner. David Ross, Springfield, Ill.

Address: Of the Public. Judge W. D. Hoag, Joplin, Mo.

Open discussion under 10-minute rule.

Selection of Committee on Resolutions.

Recess.

Tuesday Evening, Nov. 14—8 P. M.

Annual Members' Meeting for the Election of Directors and the Transaction of Routine Business.

Wednesday, Nov. 15—9 A. M.

Subject: Efficiency in Mining Operations.

HENNER JENNINGS, Washington, D. C., Presiding.
DR. JAMES E. TALMAGE, Alternate Chairman, Salt Lake City.

Introduction of Resolutions.

Report: Committee on Relations with Federal Trade Commission. Charles M. Moderwell, Chairman, Chicago, Ill.

10 A. M.

Address: Federal Aid to Mining Efficiency. Van H. Manning.

Address: The Federal Trade Commission and the Mining Industry. Hon. E. N. Hurley, Washington, D. C.

Address: Industrial Co-operation Under the Sherman Law. Glen W. Traer, Chicago, Ill.

Address: The Sherman Law and Its Relation to Mining. To be selected.

Address: Efficiency in Ore Treatment. E. P. Mathewson, Anaconda, Mont.

Discussion.

Thursday, Nov. 16—9 A. M.

Subject: "Conservation."

WALTER DOUGLAS, New York City, Presiding.
SAMUEL A. TAYLOR, Alternate Chairman, Pittsburgh, Pa.

10 A. M.

Introduction of Resolutions.

Report: Committee on Forest Relations. Carney Hartley, Denver, Colo., Chairman.

Address: Conservation: Its Purpose, Its Effect, and Who Should Pay for it.

Address: The Accomplishment of Invention and Its Relation to Labor and Capital. Hennen Jennings, Washington, D. C.

Address: Conservation in Mining Through Water Power Development. Charles F. Potter, Los Angeles, Cal.

Address: Waste in the Mining Industry—In Mining—In Distribution and in Use—and the Relation of These Wastes to—The Operator, The Consumer—and the Public. To be selected.

(Continued on next page.)

Address: The State Geologist and Conservation. Dr. A. H. Purdue, Nashville, Tenn.

Address: X-Ray Development. Dr. W. R. Whitney, Schenectady, N. Y.

Address: The New Things in Science. Dr. F. G. Cottrell, San Francisco, Cal.

Thursday Evening, Nov. 16—8 P. M.

Banquet.

Address: Co-operation, the Basis of Safety, Efficiency and Conservation in the Use of the Nation's Mineral Resources. Carl Scholz, Chicago.

Address: Organized Capital and Organized Labor and Their Relation to Efficiency, Conservation, Better Wages, Better Living Conditions, Lawlessness, Strike Disorders and Industrial Freedom. Col. George Pope, Hartford, Conn.

Friday, Nov. 17—9 A. M.

Excursion to Gary, Ind.

GENERAL MEETINGS.

Monday Evening, Nov. 14—8 P. M.

SIDNEY NORMAN, Spokane, Wash., Presiding.

Illustrated Lecture: Mining in the Arctic Regions of Alaska and Siberia. Dr. Henry Maco Payne, New York City.

Illustrated Lecture (Moving): The Cerro Azul Gusher, E. L. Doheny, Security Building, Los Angeles, Cal.

METALLIFEROUS SECTION.

Tuesday, Nov. 14—2 P. M.

IRVING T. SNYDER, Denver, Presiding.

GEORGE E. COLLINS, Alternate Chairman, Denver.

Address: The World's Gold Supply and Its Sufficiency for Business Needs. Dr. Waldermer Lindgren, Boston, Mass.

Address: The Mining Industry. C. A. Tupper, Chicago, Ill.

Address: The Lead and Zinc Resources of the United States. C. E. Siebenthal, U. S. Geological Survey, Washington, D. C.

Address: A Tariff for Revenue as Related to a Compensating Duty on Lead and Zinc Ores. Otto Ruhl, Joplin, Mo.

Address: The Copper Resources of the United States. Walter Harvey Weed, New York City.

Wednesday, Nov. 15—2 P. M.

HON. ALBERT JOHNSON, Hoquiam, Wash., Presiding.

W. W. RISON, Alternate Chairman, Albuquerque, N. M.

Topic: Mine Manufacturing the Best Industry of the Rocky Mountain West. John Hays Hammond, New York City.

Address: How to Protect the Small Investor in Metalliferous Mines. Hon. W. R. Allen, Butte, Mont.

Address: Smelter Contracts and Market Quotations. R. M. Henderson, Breckenridge, Colo.

Address: Copper in Its Relation to Preparedness and Industrial Efficiency. To be selected.

Address: The Marketing of Zinc Ores. W. B. Shackelford, Webb City, Mo.

Address: Oil Flotation. Dorsey A. Lyon, Salt Lake City.

Address: Co-operation in the Lead and Zinc Industry.

Open Discussion under 5-minute rule.

Thursday, Nov. 16—2 P. M.

D. W. BRUNTON, Denver, Presiding.

Report: Committee on Revision of Mineral Land Laws. E. B. Kirby, New York, Chairman.

Address: The Foster Bill. Dr. M. D. Foster, Chairman, House Committee on Mines and Mining.

Address: The Revision of Mining Laws. Hon. Chas. S. Thomas, U. S. Senator from Colorado, and Frank L. Peckham, Washington, D. C.

General Discussion.

Address: The Rate Metals. Dr. R. B. Moore, Denver, Colo.

Address: The Prospector and the Apex Law. Theo. F. Van Wagenen, Denver, Colo.

Address: Workmen's Compensation in the Metalliferous Mining Industry. Hon. Thomas Kearns, Salt Lake City, Utah.

Address: Electrolytic Separation. Frederick Laist, Anaconda, Mont.

OIL SECTION.

Tuesday, Nov. 14—2 P. M.

RALPH ARNOLD, New York City, Presiding.

Address: The Oil Resources of the United States. W. A. Williams, U. S. Bureau of Mines.

Address: The Authority of States to Tax Production from Indian Lands. Hon. J. G. Gamble, Asst. Atty. C. R. I. & P. Ry., Des Moines, Iowa.

Address: Oil Land Withdrawals. Judge George H. Patrick, Washington, D. C.

Address: The Relation of the Federal Government to Western Oil Production. W. R. Wheeler, Washington, D. C.

(Continued on next page.)

Address: The Federal Government and the California Oil Claimants. Hon. Jas. D. Phelan, Senator California.

Discussion: Led by Thomas A. O'Donnell, Los Angeles, Calif.

OIL AND GAS SECTION.

Wednesday, Nov. 15—2 P. M.

DR. NORMAN BRIDGE, Los Angeles, Cal., Presiding.

Address: Geology in Its Relation to the Oil Industry. C. C. McDowell, Pittsburgh, Pa.

Address: The Standardization of Oil Testing Methods. W. H. Fehsenfeld, Baltimore, Md.

Address: The Future of the Dye Industry Through the Use of Petroleum. Dr. Walter F. Rittman, Empire building, Pittsburgh.

Address: Practical Phases of the Standard Oil Dissolution, and the Necessity of Combinations Among Independent Producers to Meet Unfair Competition. R. N. Welch.

Address: Federal Co-operation with the Oil Industry. H. G. James, Kansas City, Mo.

Thursday, Nov. 16—2 P. M.

S. Y. RAMAGE, Oil City, Pa., Presiding.

Address: The World's Oil Supply. Ralph Arnold, New York City.

Address: Naval Oil Reserves as a Necessity to National Preparedness. To be selected.

Address: The Future of the Natural Gas Industry. Judge Thomas J. Flannelly, Independence, Kas.

Address: The Relation of the Federal Government to Scientific Research in the Oil and Gas Industry. To be supplied.

Address: Modern Oil Storage. To be supplied. Discussion led by Alf. G. Heggem, Tulsa, Okla.

Address: The Chemical Possibilities of Petroleum. Dr. David T. Day, Washington, D. C.

COAL SECTION.

Tuesday, Nov. 14—2 P. M.

C. M. MODERWELL, Chicago, Presiding.

Report: Committee on Uniform Cost Accounting System. S. A. Taylor, Pittsburgh, Chairman.

Address: Co-operation in the Marketing of Coal. Ralph Crews, Chicago, Ill.

Discussion under 10-minute rule.

C. P. White, Cleveland, Ohio; C. G. Hall, Terre Haute, Ind.; R. A. Hord, Lexington, Ky.; W. P. DeArmit, Pittsburgh; G. H. Barker, Columbus, Ohio; W. H. Huff, Denver, Colo.; H. N. Taylor, Kansas City, Mo.; W. J. Spencer, Brereton, Ill.; Jas. E. McCoy,

Knoxville, Tenn.; T. L. Lewis, Charleston, W. Va.; W. W. Bridges, Drakesboro, Ky.; W. H. Cunningham, Ashland, Ky.

Open Discussion under 5-minute rule.

Report: Committee on Workmen's Compensation. T. L. Lewis, Charleston, W. Va., Chairman.

Address: The Cost of Coal. George Otis Smith and C. E. Leshner, U. S. Geological Survey.

Address: New Ideas in the Preparation of Eastern Coal. Warren Roberts, Chicago, Ill.

Address: The Disadvantages of Widely Fluctuating Coal Prices. Hugh Shirkie, Terre Haute, Ind.; D. J. Jordan, Oklahoma City, Okla., and John Laing, Charleston, W. Va.

Wednesday, Nov. 15—2 P. M.

DR. I. C. WHITE, Morgantown, W. Va., Presiding.

Address: The Colorado Industrial Commission. Wayne Williams, Denver, Colo.

Address: Co-operation in the Coal Industry. H. E. Willard, Cleveland, Ohio.

Address: The Duties of Mine Inspectors. J. W. Paul, Pittsburgh, Pa.

Address: The Closed Shop and the Check-off as Related to Efficiency in Mining Operations. Dorset Carter, Oklahoma City, Okla.

Address: What Becomes of the Benefits of Production Efficiency? George H. Cushing, Chicago, Ill.

Address: The Influence of Inter-district Competition on Economy in Southwestern Coal Production. J. G. Puterbaugh, McAlester, Okla., and Harry N. Taylor, Kansas City, Mo.

Address: Cohesion Among Coal Operators. Thomas T. Brewster, St. Louis, Mo.

Address: The Experience of Anthracite Operators in Storing Coal to Equalize Production. E. W. Parker, Wilkes Barre, Pa.

Thursday, Nov. 16—2 P. M.

J. C. KOLSEM, Terre Haute, Ind., Presiding.

Address: Coal and Its By-Products. Alfred M. Ogle, Terre Haute, Ind.

Address: Two Years' Experience in the World's Coal Markets and Its Lesson. F. S. Landstreet, New York City.

Discussion.

After the Association, What? W. S. Bogle, Chicago, Ill.

Unequal Distribution of Bituminous Coal and Its Cost to Operator, Retailer and Consumer. K. U. Maguire, Louisville, Ky.

Wasteful Methods of Coal Distribution. Chas. L. Dering, Chicago, Ill.

Difficulties I Have Met in Coal Litigation and the Remedies. R. W. Ropiequet, Belleville, Ill.

The Future of Coal Export Industry and the Necessities for Its Success. J. A. Renehan, New York City.

Who's Who in the Jos. A. Holmes Safety Association

In a previous issue we referred to the organization which had its origin in the endeavor to give proper recognition to one of the greatest public servants that the United States ever saw and of whom President Wilson has said in introducing this Association to the public:

In the death of Dr. Jos. A. Holmes the country has lost a public servant of unusual character and of singular devotion to duty. We are often called upon to note the career of some public benefactor, but we do not often enough note the services of the devoted men who, with little compensation and little public fame, seek to advance the interest of their fellow-countrymen through services of the departments of the Federal Government at Washington. Dr. Holmes was one of the most distinguished and most serviceable of these. He devoted his whole time and thought to turning science to human and generous use.

Inasmuch as the Dr. Holmes Safety Association is altogether remarkable in its purpose and in the national spread of its organization, it is interesting to note who the men actually are who have been taken from a membership of 50,000 or 60,000 men to do the actual work of this association. It is made up of the following representatives of the national societies taken in alphabetical order of the societies which they represent:

Dr. L. O. Howard is the permanent secretary of the American Association for the Advancement of Science. Probably there is no man in the United States whose sympathetic personality as well as his national relationship with scientific men, who is so thoroughly acquainted with what can be done nationally in general movements of this sort. It is unnecessary to say that he was one of Dr. Holmes' personal associates, especially in the Cosmos club in Washington.

Dr. Charles Baskerville, representative of the American Chemical Society, is professor of chemistry in the University of New York. For many years he has been professor of chemistry in the University of North Carolina, and has been associated with the work of Dr. Holmes in his native state.

Dr. F. G. Cottrell, representing the American Electro-Chemical Society, has become nationally known as a developer of the Cottrell process for condensing flue dust. He is even better known as an altruist who has dedicated the great financial returns for which his patent are capable, to the formation of a company for the development of technologic processes generally.

A. E. Holder is one of the chief organizers and administrators of the American Federation of Labor, and naturally brings to this association a thorough understanding of the problems which confront the miner and other laborers in live industries. He knows their weaknesses, their tendency to recklessness, and he best knows how these characteristics can be fought and the miner developed.

P. S. Ridsdale, representing the American Forestry Association, will be closely associated with Mr. Holder in developing safety among the ax-men and other laborers in the lumber trade.

John H. Finney, acting for the American Institute of Electrical Engineers, has become a national character in his efforts to develop sane legislation concerning conservation of the country's reserves, especially water powers in the southern states.

Hennen Jennings has been selected as representative of

the American Institute of Mining Engineers because of the fact that he is spending all of his time at present in applying a long life of experiences in mining engineering to the betterment of mining conditions. He is taking to heart the example and the experiences of Eckley B. Coxe and E. W. Parker and other men who have spent their greatest energy in developing mining.

Dr. David T. Day, of the Bureau of Mines, represents the American Mining Congress. He is exceptionally well known in the mining fraternity, because of his public service as the organizer of the reports on the mineral resources of the United States in the U. S. Geological Survey. In publishing some 20 annual reports of this character, Dr. Day has been associated with mining men of all kinds and has an unusually large acquaintance.

Maj. Robert U. Patterson represents the American Red Cross Society. Dr. Holmes allied himself with the American Red Cross as with every other movement associated with rescue work or mine betterment, and the society has entered energetically into this new nation-wide movement.

Dr. A. W. Gibbs of the American Society of Testing Materials is perhaps one of the best known members of that society.

Dr. John A. Brashear of Alleghany, Pa., president of the American Society of Mechanical Engineers, has consented to represent that body. As everybody knows, Dr. Brashear is more responsible than anyone else for the team work which characterizes scientific technical work in Pittsburgh. When, last summer, the governor of Pennsylvania selected him as the greatest citizen of Pennsylvania, it was giving a new kind of recognition to a man known all over the world for his scientific attainments. On Dr. Brashear's last birthday over 1000 scientific men and other friends gathered in Pittsburgh to do him honor, and the demonstration included a parade of 40 different scientific societies of which he is a member. Perhaps he has become nationally better known by the name by which Pittsburgh has always known him, "Uncle John." By the article appearing in the American Magazine last summer his alternate and Washington representative in this work is Gen. W. H. Bixby, a man whose constant work in the betterment of labor conditions is well known.

Van H. Manning, director, represents the Federal Bureau of Mines. Not even Dr. Holmes could be said to have any bigger heart than Manning. This could not be better shown than by his loyalty to his former chief and the steadfast way in which he has continued to develop his projects, and his big heart and loyalty go further. The mining fraternity is already recognizing that he is their greatest national friend.

Dr. Jos. Hyde Pratt, representing the Geological Society of America, was a fellow associate of Dr. Holmes and succeeded him as state geologist of North Carolina.

Eugene McAuliffe represents the International Railway Fuel Association. In certain ways Mr. McAuliffe has entered into the work of this association with a keen sympathy for the purpose and understanding of the problem which separate him out from all the others.

J. W. Paul of the Mine Inspectors' Institute was long associated with Dr. Holmes in the Bureau of Mines and is in perhaps closest touch with rescue work among the coal mine operators.

Geo. S. Rice represents the Mining and Metallurgical Society of America. Mr. Rice was the first to propose a memorial for Dr. Holmes, and took up, as temporary secretary, all of the preliminary work and brought it to the stage of an organization. He is better acquainted with the conditions of coal mining than any other man in America from the standpoint of mine betterment.

Dr. David White of the National Academy of Sciences is



THE LATE DR. JOSEPH A. HOLMES.

chief geologist for that organization and represents most adequately the personal friends of Dr. Holmes in Washington.

H. M. Wilson represents the National Safety Council, an organization which will always stand in close touch with the new organization, inasmuch as the chief work of the Safety Council is a related one of developing new ideas of mining safety.

Dr. Chas. D. Walcott of the Smithsonian Institution ranks with the largest organizers of the American states, a capacity which he developed as director of the U. S. Geological Survey.

M. E. Wadsworth and his alternate, O. P. Hood, chief mechanical engineer of the Bureau of Mines, will represent the Society for the Promotion of Engineering Education.

William Green, president of the United Mine Workers of America, has associated himself with this project from its beginning and will bring to it the sympathy of the entire mining workers' fraternity.

Dr. Jos. D. Cannon of the Western Federation of Mine Workers will bring the sympathy and co-operation of all the mine workers of the United States.

Dr. George Otis Smith, director of the U. S. Geological Survey, represents that organization, in which Dr. Holmes first developed the project of a national Bureau of Mines through the Technologic Branch of the Survey which he organized after the World's Fair of St. Louis.

The morning after Dr. J. A. Holmes was appointed by the president, director of the Federal Bureau of Mines, it is said that his desk contained the largest pile of telegrams of congratulation ever sent to a government official. As we know, Dr. Holmes threw into this work a whirlwind of energy which brought into order a universally organized structure—the Bureau of Mines—in so short a time as to make the mining world fairly gasp with surprise.

Hardly had the world felt that a great work was in progress for the benefit of mining, when it was shocked by the death of Dr. Holmes—the necessary result of his putting into the task more energy than any one man could continually produce. As Day put it, "He gave his life to the mining industry."

It is impossible to conceive that such a life would go out without some sufficiently great memorial to his work, and it has been a matter of some surprise that thus far nothing has been forthcoming. It now is obvious that this delay has been fitting and appropriate in the effort to develop adequate recognition of this great public servant. The movement was begun by the American Institute of Mining Engineers, who appointed a committee to act with other national societies in arranging a memorial.

Promptly at its annual meeting the American Mining Congress appointed a similar committee. This met and felt justified in asking 20 other national societies affiliated with mining interests, and of most of which Dr. Holmes was a national member, to join in organizing a proper memorial. They formed the Jos. A. Holmes Safety Association, consisting of representatives of these national societies.

Considering the nature of the memorial, it was evident at the outset that an ordinary memorial, monument or tablet was inconsistent to the character of the man and his work. The feeling was unanimous that a mere statement in the form of what Dr. Holmes had accomplished, or what he aimed to ac-

complish, was inadequate. Fortunately, Dr. Holmes was single-minded in his idea of what he hoped to accomplish. It was simply the betterment of mining conditions in the United States, especially the condition of miners themselves and of like workmen in a live industry where the products of the mine are manufactured in useful commodities. It seemed easy to associate the whole idea with "Safety-First," an expression which did not originate with Dr. Holmes, but which he was first to apply, nationally. The association resolved, therefore, to carry forward the work of developing safety in mines and mining industries by such means as are not already taken care of by other enterprises. For efficiency and management, the following executive committee has been selected and the work will go forward rapidly in their hands:

President, Van H. Manning, director Bureau of Mines.

Vice-President, Chas. D. Walcott, secretary, Smithsonian Institution.

Second Vice-President, Samuel Gompers, president American Federation of Labor.

Hennen Jennings, American Institute of Mining Engineers.

Dr. John A. Brashear, president American Society of Mechanical Engineers.

The first object of the association will be to provide awards for ideas which will increase safety in mining, and again to provide a medal for each man who contributes to the safety of another man at the risk of his own safety, which is a good definition of a hero.

Mining Issues Pending Before Congress.

Discussing the various issues now pending before Congress, Secretary Callbreath of the American Mining Congress, says:

"The next session of Congress will have under consideration the Foster bill for revision of the mineral land laws of the west. It will be recalled that a bill for a commission to investigate conditions through public hearings in the western mining centers and make recommendations to Congress was introduced by Senator Smoot and passed the Senate, but failed to receive the approval of the House committee on mines and mining. In its stead Dr. Foster, chairman of the committee, introduced a bill intended to meet the requirements without the preliminary work of a commission. This bill was severely criticized by the west and the mining journals. A thorough discussion of the subject will take place at the Chicago convention. Dr. Foster himself will lead the discussion and defend the plan he proposes. The discussion will be lively if the critics of his bill meet him on the floor. A plan for future action will probably be outlined, and a campaign begun to bring about the practical legislation desired.

What the Mining Companies are Doing

International Nickel Co.

International Nickel Co. made profits of \$6,344,246 in the 6 months ended Sept. 30 while surplus after dividends amounted to \$3,566,793. From the semi-annual statement just issued it becomes apparent that the third quarter of the year practically duplicated the June 30 quarter, in which profits were \$3,959,135.

In both periods earnings were of record proportions. Cash at the end of September was down to \$2,081,110, against \$4,137,633 on June 30 but on the later date certificates of deposits had grown to \$4,280,000 from \$2,030,000 at mid-year.

The consolidated profit and loss statement for the 6 months ended Sept. 30, compared with the official June 30 quarter and the estimated Sept. 30 operations, follows:

	Six mos. Sept. 30.	June 30 quarter.	Estimated Sept. 30 quarter.
Earnings	\$7,775,145	\$3,959,135	\$3,816,010
Other income	137,628	66,262	71,366
Total income	\$7,912,773	\$4,025,396	\$3,887,377
Admin. and general expense...	563,896	222,422	341,474
Net income	\$7,348,876	\$3,802,974	\$3,545,902
Depreciation and mineral ex- haustion	1,004,630	497,409	507,230
Profits	\$6,344,246	\$3,305,574	\$3,038,672
Dividends	2,777,454	133,689	2,643,765
Balance	\$3,566,793	\$3,171,885	\$ 384,907

The balance sheet of the International Nickel Co. as of Sept. 30 compares:

Assets.	1916.	1915.
Property	\$44,193,831	\$43,649,163
Investments	2,003,396	57,760
Inventories	4,773,758	3,170,143
Accounts receivable	2,045,156	1,491,197
Loans on call	515,000	1,000,000
Certificates of deposit.....	4,289,000	5,500,000
Cash	2,081,110	1,907,888
Total	\$50,892,251	\$56,976,152
Liabilities.		
Preferred stock	\$ 8,912,600	\$ 8,912,600
Common stock	41,834,600	38,031,500
Accounts payable	1,951,255	1,005,458
Preferred dividend	133,680	133,689
Common dividend		3,803,150
Account and insurance funds.....	199,119	180,813
Previous surplus	3,294,195	
Profit and loss surplus.....	3,566,703	4,910,941
Total	\$50,892,251	\$56,976,152

Shattuck-Arizona Ore.

The Shattuck-Arizona Copper Co.'s report for the quarter ended Sept. 30 compares with the previous quarters as follows:

	Sept. 30.	June 30.	Inc.
Gross earnings	\$1,275,890	\$1,207,780	\$68,110
Expense and taxes	534,692	518,164	16,528
Net earnings	\$ 741,198	\$ 689,616	\$51,582

This makes total net earnings for the 9 months approximately \$3,212,000, or at the rate of \$7.70 a share for the year. Net of \$741,198 for third quarter is at the rate of \$8.47 a share for the year. In the 12 months Shattuck should show earnings of at least \$8 a share.

Copper production amounted to 4,663,466 lbs. at a cost of 9.20 cts. a pound, compared with a production of 4,169,873 lbs. in the previous quarter at a cost of 10.44 cts. a pound. There were also recovered 1243 ozs. of gold, 79,995 ozs. of silver and 661,034 lbs. of lead.

Refinery delivered 4,312,049 lbs. of refined copper. Including unsold copper at 25 cts., average sales price of third quarter's production was 25.05 cts. a pound against an average for previous quarter of 26.85 cts.

Tennessee Copper & Chemical Co.

The plans for rehabilitating the Tennessee Copper Co. call for two active companies, one of which—the newly organized Tennessee Copper & Chemical Co.—will act as a holding and banking company. The outstanding bonds of Tennessee Copper Co. will remain undisturbed.

Something new for a copper company will be the proposed 5 years' voting trust. It will also be the third copper company to issue stock without par value, the pioneers being Kennecott and Cerro de Pasco.

The new interests in charge were with the company in its early days and during the construction of the original sulphuric acid plant. It is expected that the company ultimately will sell all of its assets—(mining properties, smelter and sulphuric acid plant) to the Tennessee Copper & Chemical Co.

The company will net \$2,800,000 from the sale of 200,000 shares of stock which go to the bankers at \$14 per share, to underwriters at \$15 and to stockholders at \$16. Pressing needs approximate \$2,750,000 comprised principally of: Advances by Russia, \$1,140,000; due banks and others, \$1,500,000; total, \$2,640,000.

Miscellaneous.

C. F. Kelley, managing director and vice-president of the Anaconda Co., states that the new zinc plant at Great Falls, is proving a great success. Two of the five units now in operation are turning out 60 tons of zinc per day, which is 10 tons more than the theoretical capacity. Owing to the delay in the delivery of certain heavy machinery other units will not be in operation until the first of the year. Work has just been started on a \$100,000 bag house which will be completed the first of the year and will contain 1440 bags through which will pass fumes from the reverberating furnace, the bags collecting the lead now wasted.

Shortage of labor, particularly trammers, continues to handicap the Lake Superior copper companies. Wolverine was able to ship during September but 27,455 tons of rock; in July the total milled was 29,275 tons. The copper yield amounted to but 470,190 lbs., which was the lowest monthly output since January. The yield per ton was 17.12 lbs. President Stanton has gone on record with the prediction that Wolverine has at least another 10 years to live. The immediate problem is that of getting the best results from the rock remaining. As no stoping will be necessary, the copper to come from the lower Wolverine workings should be secured at a low cost.

Operations at the Shattuck-Arizona in September resulted in a production of 1,566,446 lbs. of copper from 14,486 tons of ore. There was also obtained 26,928 ozs. of silver and 419 ozs. gold. In addition 805 tons of lead ore were shipped to the El Paso smelter for treatment. The net cost of producing copper after crediting income from subsidiary metals was 9 cts. a pound. The net profit for the month totaled \$260,028, which is at the rate of \$8.92 a share per annum. During the 9 months ended Sept. 30 Shattuck produced 13,543,030 pounds of copper; 240,040 ozs. of silver; 3828 ozs. of gold, and 6273 tons of lead ore. The cost of copper during the above period was 8.42 cts. a pound and the company earned \$2,213,994, equivalent to \$8.43 a share per annum.

According to B. H. Dosenbach, who installed the flotation process at the Boston & Corbin property, the results obtained are attracting considerable attention. The flotation treats all tailings made in the concentration portion of the mill, which necessarily gives the unit a very lean tonnage to work on. With heads of about ¾% copper it was expected that a 9% copper concentrate would be made. The first half of October the actual result was 13.4% copper and 9.9 ozs. in silver. The tailings from the unit contain less than 0.2% copper. Changes in the mill have greatly increased the tonnage treated. It has handled 100 tons daily during October and on one day over 130 tons. The average grade of concentrates has been steadily improved, and it is now running over 5¼%. There is good reason to expect that both tonnage and grade can be further improved. There is, in fact, prospect that, barring unforeseen developments, Boston & Corbin in October will show a profit from operations.



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*Illustrated.

Mines' Dividend Statistics Educate Public to Importance of Mining.

At the Arizona meeting of the American Mining Congress the late Dr. Holmes emphasized that one of the most important lessons that should be learned thoroughly in order that the people of the United States may understand the importance of mining industry, was to do as the railroad companies of the country are doing—educating public sentiment to what that great industry is.

What more favorable publicity could be given the mining industry than is now afforded by the dependable dividend statistics as published in the Mining and Engineering World. The greatness of the industry and the wonderful productiveness of its mines are clearly shown by the unusually large dividends that have accrued to holders of mining stocks in the past and are continuing at an unprecedented rate.

It is to be regretted that statistics of earlier dividend paying companies are not available at the present writing for with these added to the disbursements of present-day dividend payers a total would be reached of startling size.

The wonderful earning powers of American mines and works can best be illustrated by referring to the disbursements made by 167 companies during the 10 months of 1916. These companies, between Jan. 1, 1916, and Oct. 31, 1916, divided among shareholders the princely sum of \$184,830,127. If the dividend payments of the securities-holding corporations were to be included (and a large proportion could be rightfully included), the year's total would reach \$223,433,208, a wonderful and convincing argument that mining, as now carried on, is one of the principal reasons for our present standing at the head of the world's great industrial centers.

That these companies not only enjoyed a remarkable prosperity during the past 10 months, but in previous years we are able to show by reports made to Mining and Engineering World, that these companies paid dividends amounting to \$1,067,277,064, which, with the dividends paid in 1916 makes a total of \$1,252,107,191. This is a return of better than 133% on the combined issued capital of the companies. When it is considered that a large number of these companies did not pay a dividend previous to 1915 or 1916, this is a remarkable record and one, we believe, not duplicated by any other industry.

While October disbursements were not as large as during the previous month they were considerably larger than in any other October in the history of American mining industry. With 60 companies participating, dividends were paid to shareholders during the month totaling \$16,663,385. This does not include the \$630,000 disbursed by the holding companies. The copper companies contributed \$7,517,580 of this, the gold-silver-lead-zinc companies \$8,154,447 and the metallurgical companies \$991,358.

Of the 167 companies participating in the 1916

disbursements 42 operate copper properties, all but two in the United States, and these divided among shareholders \$88,280,814. In previous years these companies paid dividends amounting to \$571,530,726, making their total to date \$659,811,540. This is a return on the combined issued capital of 186%.

One hundred nineteen properties, classified as gold-silver-lead-zinc producers, paid dividends during the 10 months of 1916 amounting to \$77,149,398. Added to dividends paid in previous years brings their total to \$380,088,724, on the combined issued capital of \$309,979,039, a return of practically 124%.

Of the 119 companies mentioned above 91 are operated in the United States and they have to their credit in 1916 dividend payments of \$64,530,768. Added to the dividends paid previously brings their total to \$294,657,558, a return of approximately 150% on the \$197,644,778 outstanding.

Twenty-three of the above 167 companies operate properties in Canada and they contributed to the 1916, \$9,210,621, making their total to date \$69,522,318. This is a return of nearly 75% on the outstanding share capital and is a splendid record considering the comparatively few years of operation.

But three Mexican companies report as having paid dividends in 1916, these paying \$1,108,009. To date these companies have disbursed \$8,858,848.

Six metallurgical companies, looking to their profits largely from the treatment of ores for other companies had a very prosperous 10-months' period, for they disbursed among shareholders \$19,399,915. Added to previous disbursements these companies have paid dividends totaling \$212,206,927. This is a return of approximately 80% on the \$273,003,040 outstanding share capital.

Eight securities-holding corporations, mentioned above, divided among shareholders during the 10 months of 1916, no less than \$19,399,915. Since incorporation disbursements total \$156,054,205.

In the following table is given a list of companies paying dividends in October, the date of payment, amount per share and amount paid:

	October.	Per share.	Amount paid.
Ahmeek, Mich.	10	\$4.00	\$800,000
Allouez, Mich.	4	2.50	250,000
American Sm. Sec., pfd. A.	2	1.50	255,000
American Sm. Sec., pfd. B.	2	1.25	375,000
Arizona Commercial, Ariz.	30	.50	130,000
Arizona United, Ariz.	10	.01	50,000
Bunker Hill Con., Calif.	4	.02½	5,000
Bunker Hill & Sullivan, Idaho.	4	.20	81,750
Caledonia, Idaho	5	.03	78,150
Center Creek, Mo.	2	.15	15,000
Champion, Mich.	8	6.40	640,000
Cons. Mg. & Sm. Co., Canada.	2	2.50	210,687
Dr. Jack Pot, Colo.	2	.01	28,441
Empire, Idaho	2	.05	50,000
Golden Cycle, Colo.	10	.02	30,000
Grand Central, Utah.	10	.02	18,600
Greene Con., Mex.	25	1.00	1,000,000
Hecla, Idaho	20	.15	150,000
Hercules, Idaho	2	.20	200,000
Hollinger, Ont.	3	.05	240,000
Homestake, S. D.	25	.65	163,254
Inspiration, Ariz.	30	2.00	2,363,756
Intermountain, Mont.	20	.005	8,075
Iron Blossom Con., Utah.	25	.10	100,000
Isle Royale, Mich.	31	2.00	300,000
Judge Mg. & Sm., Utah.	2	.25	120,000
La Rose Con., Ont.	20	.05	74,931
Lucky Tiger, Mex.	20	.10	64,380
McKinley-Darragh-Savage, Ont.	2	.03	67,431
National Z. & L., Mo.	31	.02	10,000
New Idria, Calif.	2	1.00	100,000

	October.	Per share.	Amount paid.
New Jersey Zinc.	10	\$10.00	\$3,500,000
N. Y.-Honduras, S. A.	20	.50	80,000
Nipissing, Ont.	20	.50	600,000
North Butte, Mont.	23	.75	322,500
Osceola, Mich.	30	5.00	480,750
Peterson Lake, Ont.	2	.01½	42,032
Pittsburgh-Idaho, Idaho	2	.04½	58,250
Porcupine Crown, Ont.	2	.03	60,000
Portland, Colo.	20	.03	90,000
Prince Con., Nev.	5	.02½	25,000
St. Mary's Mineral Land.	14	2.00	320,000
Seneca Superior, Ont.	14	.20	95,768
Shattuck-Arizona, Ariz.	20	1.25	427,500
Silver King Coal'n., Utah.	2	.15	187,500
Silver King Con., Utah.	2	.10	63,758
Standard, B. C.	10	.02½	50,000
Superior, Mich.	10	1.00	100,000
Temiskaming, Ont.	22	.03	75,000
Tonopah Belmont, Nev.	2	.12½	187,500
Tonopah Ext., Nev.	2	.15	190,920
Tonopah Mining, Nev.	21	.15	150,000
Tough Oakes, Ont.	3	.12½	66,437
U. S. Sm., Ref. & Mg., pfd.	15	.87½	429,556
U. S. Sm., Ref. & Mg., com.	14	1.00	351,115
United Verde, Ariz.	2	.75	225,000
Utah Apex, Utah.	30	.25	132,054
Vindicator, Colo.	25	.06	90,000
Wellington, Colo.	2	.02	200,000
West End Con., Nev.	24	.05	89,424
Wolverine, Mich.	2	6.00	360,000
Yellow Aster, Calif.	6	.05	50,000
Yellow Pine, Nev.	25	.10	100,000

Science Expanding Copper Output.

In considering the future of the copper metal situation and its relation to investments, a Copper Country correspondent writes that there is one point to which very little attention has been directed, yet it is of greatest importance relative to the world's output of the metal. At present the output of copper is the largest in history, due to the fact that all regular producing mines are operating to the limit of capacity and many smaller mines are working now that could not operate profitably when the price of the metal is at its average.

When the European war ends and the sensational demands for war munitions are a thing of the past, there will be a continuance of an unusual production, even if the high cost properties are compelled by the drop in price to shut down. The larger producing interests have already accomplished, by improvements in treatment of their copper rock, or copper ores, a big stride forward toward a large production. Anaconda, for instance, by utilizing the flotation process, has brought its savings of copper from 76% up to 92%. Some of the porphyries are doing the same thing by the same process. The operation of regrinders and the leaching process at the Calumet & Hecla will, when the system is completed, cut the losses in the copper sands from this mine down to such a small figure that Calumet & Hecla can get 95% of all the copper out of the rock, whereas a 50% loss was nothing to bother about in the early days.

These improvements in concentration make for a larger output of copper metal from the same amount of mine rock taken out. They are, of course, offset to an extent in most properties, by a lower grade of rock mined, but they make possible the successful treatment of a lower grade. They are facts worthy of consideration in connection with the discussions of metal prices following the conclusion of the war in Europe.

PERSONAL.

J. Parke Channing of New York is visiting various western sections.

George Nordquist of Chicago recently inspected mining properties in Utah.

J. W. McBride of Spokane has been inspecting mining properties in British Columbia.

Dr. L. D. Ricketts recently inspected a copper property in the vicinity of Jerome, Ariz.

Charles A. Peet, consulting engineer, recently examined the Goldstrike-Virginia property, Utah.

George O. Bradley of San Francisco is looking over the new work being done at the Utah Copper property.

W. H. North of the Standard Silver-Lead Mining Co. in British Columbia has been in Wallace, Idaho, recently.

R. E. Gardner, mining engineer, recently inspected a mining property in Barton Gulch, Madison county, Montana.

Richard Lockey of Helena, Mont., has been in the Coeur d'Alene region of Idaho, looking after mining interests.

J. J. Morrison, superintendent of construction for the Empire Zinc Co., has returned to Canyon City, Colo., from New York City.

L. P. Barrett, geologist for the Michigan Board of Geological Survey has recently been at Houghton, Mich., on business for the state.

C. W. Whiteley, general manager in the northwest for the American Smelting & Refining Co., is conferring with company officials in the east.

Hugh H. Tarbet will superintend operations at the property of the Fort Schellbourne Mining & Milling Co. in White Pine county, Nevada.

W. Parsons Todd, of New York, vice-president of the Quincy and a director of the Adventure, is in the Michigan copper country on business connected with the mines.

Frederick Burbidge, general manager of the Federal Mining & Smelting Co., has returned to the Salt Lake office of the company, after a 2 weeks' visit to the property in Idaho.

Chester Ellsworth of Virginia City, Nev., is in Prescott, Ariz., from which place he will direct investigations of mining properties in the vicinity for San Francisco-Tonopah interests.

Prof. Michiga Siroaka of the Higher Technical schools of Osaka, Japan, is at Houghton, Mich., for the purpose of studying the mines and smelters of the Lake Superior copper district.

W. R. Bolley, superintendent of the White Pine Extension, has been made assistant superintendent of the Wolverine. Mr. Bolley will reside at Kearsarge, the residence location of the latter.

William Corkill, who has been in charge of the underground work at the property of the Volunteer Ore Co., on the Cascade range, Michigan, will take charge of the development work of the North Butte Co.

H. J. Stander, flotation engineer with the Yaryan Rosin & Turpentine Co., Brunswick, Ga., and author of "The Flotation Process," just published by the Mining World Co., was in Chicago last week on his way to Ontario, where he

will superintend experimental flotation work for the Mond Nickel Co. at Sudbury.

OBITUARY.

Alexander McKinnon, a pioneer of Iron county, Michigan, and the forerunner of Iron River, Mich., died Oct. 17, after a 2 weeks' illness. He was born in Mull, Argylshire, Scotland, in 1842, and crossed the ocean when an infant with his parents. The latter settled on a farm on Owen Sound, Canada, where he attended school when opportunity offered, learned to handle tools and assisted his father in building boats to ply the Great Lakes. After mastering the carpenter's trade at the age of 17 years he struck out into the world to make his fortune and located at Marquette, just at the time the upper peninsula was becoming known as a prospective mining region. After following the carpenter's trade a while he learned to burn charcoal, then an important industry. In 1878, with his brother, Daniel McKinnon, he walked from Quinnesec to Iron River, the two carrying their tent and supplies on their back the whole distance of 50 miles and pitched their camp, which has since become the prosperous village of Iron River. The two filed claims on different mines and tracts of land and cleared 4 acres in 1882, built a shanty and planted potatoes, the first attempt at farming in this part of the state. Early in the same spring Mr. McKinnon and his brother platted the town of Iron River and the same year opened the Beta mine. He had large interests in various mining properties at the time of his death.

SCHOOLS AND SOCIETIES.

Haileybury School of Mines.—The new mining and millinery laboratory of the Haileybury School of Mines is nearing completion and the school is now getting its machinery and equipment. The laboratory will comprise a complete small size concentrator, a cyanide mill, flotation plant, assay office, blacksmith shop, and carpenter shop, and will contain most of the machines met with in these lines. The school has the co-operation of the mines of the Haileybury (Ont.) district and of the manufacturers of mining machinery.

Rocky Mountain Club.—The Rocky Mountain Club will receive election returns by Western Union service on Tuesday, Nov. 7, at the clubroom. The first of a series of their famous "No Limit" beefsteak dinners to be given during the season will be served at the clubrooms on the same evening at 7 o'clock. The Rocky Mountain Club, of which John Hays Hammond is the first and only president, will celebrate the tenth anniversary of its birth on Tuesday, Jan. 9, 1917. This promises to be a big night for western men, and those concerned in western development, and celebrations will take place in the large cities in the west on the same evening.

Colorado Metal Mining Association.—The annual meeting of the Colorado Metal Mining Association has been called by the executive committee of the association for Jan. 3, 4 and 5. Mine operators, employees and all interested in mining, will be invited to attend the meeting, at which a number of important questions will be discussed. A representative of the Department of the Interior at Washington will be present to discuss with the mining men their protests against the government's conservation policies and withdrawals of public lands. Other questions to be discussed are "The Proposed Repeal of the Present Law for the Taxation of Producing Mines," "Proposed Regulation of Smelters by the State Public Utilities Commission," "Changes in Laws Regarding Compensation and Industrial Insurance," "Tariff Laws" and "The Proposed New Federal Mining Law."

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

That part of central Alaska lying between the lower Koyukuk river and the Yukon was until recently but little known. In 1913 it was explored by H. M. Eakin, and his results are presented in a report entitled "The Yukon-Koyukuk region," recently issued by the Geological Survey as Bulletin 631. The region is essentially a rolling upland above which rise some higher mountain masses reaching altitudes of 5000 to 6000 ft. This upland is broken by broad valleys and lowlands. The mountain slopes are clothed with spruce trees up to altitudes of 2000 ft. Spruce and birch also cover the lowlands. Above timber line the vegetation is chiefly moss. The timbered areas, notably in the lowlands, are broken by meadows covered with a luxuriant growth of grass. Moose, caribou, and bear still roam over much of this region, which is seldom visited by white men. No important mineral resources have been found in the Yukon-Koyukuk region, but many of the stream gravels carry some fine colors of gold. This gold seems to have been derived from the contact zones of granitic intrusive rocks, which are abundant in the region. That some of these deposits are of commercial importance is shown by the fact that the placers of the Indian river district, which lie in the Yukon-Koyukuk region, have for several years been mined on a small scale. It is not improbable that other commercial placers may be found in the region, but the prospecting thus far done does not indicate the presence of any very rich deposits.

Valdez.

On the lowest or 4th level a strike has been made in the mines of the Alaska Mines Corporation. It was encountered while mining a tunnel and is reported as a 6-ft. vein of high-grade chalcopryrite. The extent of the deposit is not yet known. This find shows that the development so far done has demonstrated that the vein not only carries the ore marked on surface, but that the vein is persistent.

Anchorage.

A recent cleanup of a 13-day run at the Martin mine in the Willow Creek district had a total value of \$26,000. Martin reports that they are just getting into good ore and that he will run the mill just as long as the weather permits. He will keep a force of rock miners in the mine through the winter and will possibly put in electric power next spring and run the year around. He expects to commence extensive development on other quartz property in the district next spring.

Brooks.

There is plenty of water now in this district and considerable freight is being brought in. Among some of the encouraging things is the discovery by N. A. Brown and George Kilmar on Lucky gulch, at the head of Livengood creek, which appears to be an old lake bottom. The ground is 105 ft. deep. Pay is as good as that found on any of the claims toward the upper end of the creek. The operators are now crosscutting the claim to determine the extent of the pay.

Juneau.

According to A. S. LeNeau things are not encouraging for the small operator in the Lituya Bay country. There is gold in the country, he states, and plenty, but to operate profitably the ground must be worked on a large scale. In describing the country, he says: "The sands are spotted. A miner may strike a spot and take out a couple of ounces and then the sands will become barren. There is no lead and no gravel to work. I do not think there will be a miner in the

district this winter. Everyone signified his intention of coming out."

ARIZONA.

Globe.

An experimental leaching plant is now being constructed at Inspiration for determining a method which will extract carbonate and silicate values now going to waste with the tailings. The 6th level drift from the inclined shaft to the Joe Bush body will soon have reached its objective, so that active development work on the lower section of this ore body will be possible.

The 3-compartment working shaft at the North Dominion, started some days ago, is progressing, and is now working two shifts. The shaft is being sunk at the intersection of the limestone and quartzite ledges. Experts claim that the main vein should be cut at 300 ft.

The 2-compartment shaft of Miami Con. has been started. A crew of 30 men will proceed to develop the company's commercial ore body with a view to making shipments at once. Nineteen men have been engaged in getting out commercial ore for more than a month, but the operations will be extended immediately and a much larger crew employed. Orders have been placed with the Star Drill Machine Co., Akron, Ohio, for two large churn drills.

Bisbee.

In the monthly report by Supt. Houle of the Shattuck-Arizona it is stated that between the 200 and 100 levels, a large body of oxide ore assaying 6½% has been opened. It has been exposed for 130 ft. and continues to make to the south and west. The same ore was encountered in crosscuts 3 and 5 on the 100 level, and we expect to encounter it with crosscut No. 6 on the 100 level. On the 200 level south of the shaft, on the Iron Prince claim, we have opened an important shoot of high-grade copper and lead ore in crosscuts 11 and 12. The lead is found in crosscut 11 on the foot wall of the copper ore and will average 14% and \$6 in gold and silver. The copper on the hanging wall has been exposed for a width of 11 ft. and a length of 31 ft. The ore will average 5% copper and \$2 gold and silver. Promising new territory is being developed in crosscuts 72, 75 and 77 on the 500 level. This is entirely new territory. We are prospecting the same territory from the 600 level in crosscuts 66 and 67. The developments in crosscut 66 are especially encouraging. On the 800 level the massive sulphide in the Copper Rock claim shows a greater percentage of bornite and chalcopryrite. The developments around raises 188 and 195 indicate a flat lense of sulphide ore assaying 5½% copper for 80 ft. with the face going south in the same ore.

Prescott.

For some time past the Oro Belle Development Co., a corporation dominated by E. J. Riggs, M. G. Bradshaw, C. C. Cowan and Eli Perkins, has been operating profitably the holdings of the Tiger Gold Mining Co. in the Crown King country. Recently, however, the property was sold to H. O. Howard, a Nevada mining man. Howard in turn has interested New York capital in the venture and is now in New York arranging for mining operations on a more extended scale than formerly. The plans include the erection of a mill, the opening of the mine at greater depth and extensive exploration in the ore bodies already exposed. The old Tiger Gold is one of the bonanzas of former years and has to its credit an ore production of nearly \$2,000,000. At depth, however, the ores became base and failed to respond satisfactorily to the treatment processes of the past and the

mine was closed down. The success which attends reduction by the oil-flotation process has again given the Tiger Gold ores a commercial value. Bradshaw, Riggs and associates have been handling these ores at a profit for a number of months in the small mill at the property and will continue to do so until such time as Howard inaugurates his more comprehensive mining and milling plans.

Connection of the two main levels in the Nelson mine affords 500 ft. of backs, or stoping ground, and puts the property in line for immediate production. The ore now being mined carries a gold content in excess of \$25 per ton and is being saved for shipment. The property has been undergoing development for nearly 3 years and is considered one of the most promising in the Crown King section. In the near-surface levels very high-grade gold ore was from time to time discovered. Now that the continuation of these ore bodies at depth has been demonstrated it would appear as though the Nelson was in line for a large and regular production.

Reorganization of the Cash Mines Co. has been perfected through N. H. Getchell and a development fund of \$200,000 subscribed. New York and other eastern capitalists are back of the reorganization plans and will visit the property immediately after the election. The Cash mine is located beyond Senator in the Groom Creek country, and is one of the country's best known gold propositions. Getchell has opened it at depth and has exposed a large tonnage of pay ore. During the past 6 months five mining engineers have examined the property and made favorable reports thereon. In each report the recommendation was made that electrical appliances and an oil-flotation unit be established at the Cash mill. These recommendations are to be acted upon at once and will be followed by the reduction of 100 tons of ore per day. The plans of the company likewise include the sinking of the main shaft to greater depth.

The 50-ton mill recently installed at the Arizona property near Humboldt by the Arizona Mines Supply Co. of this city has been in operation for the past 2 weeks, and is successfully treating the mine product. High-grade concentrates are being recovered and shipped to El Paso. The Arizona is owned by F. M. Anderson and Sidney Birch of Prescott, and has for many months been in the productive class while undergoing development. During that period 21 carloads of silver-gold ore were shipped to El Paso. Hereafter, however, only the concentrates will be shipped. The mill will reduce all ores mined and has been tested sufficiently to insure a high saving of values. A large tonnage is on dump and blocked out in the mine workings, and is said to be a better grade in the lower levels than in the near-surface levels. Until Anderson & Birch took it over the mine had been idle for about 25 years.

A large and modern plant of machinery, including a Diesel engine and 5-drill air compressor, is being set up at the old Octave mine in the Congress country. Additional machinery is en route. It includes an oil-flotation unit and the other equipment requisite for reducing the large tonnage of ore that has been opened up during the past 3 years. About 4 years ago a group of Boston mining men acquired title to this old-time producer under bankruptcy proceedings. Since then the main-working shaft has been deepened and levels established to a depth of 1200 ft. Drifts and crosscuts have been run on each level and gold ore has been blocked out. The development work of the past 15 months has been especially prolific in the opening of commercial ore.

Within 30 days a new plant of machinery will be in commission at the Last Chance property in the Walker district and development work again in force. The plan includes a hoist, air compressor, jackhammers, ore cars, track, etc. C. B. Hayes is backing the venture personally. Crosscutting from the main shaft has exposed a large deposit of pay gold ore through which pass bands, or lenses of exceptional value. Hayes had expended a large sum in carrying out his development plans.

John Harlan, superintendent of the Crook mine, reports steady mining and milling operations and the shipment of concentrates to El Paso at frequent intervals. The Crook tunnel has a length of 1800 ft. at this time and is being driven with three shifts. The face of the tunnel is carrying an

excellent grade of gold ore and values are holding strong as it is advanced. A large tonnage of pay ore is in sight and the general situation at the property very encouraging.

New machinery has been installed at the Beehive property and development at depth is well under way. The property adjoins the Octave mine on the east and is located on the rich Octave fissure. The mineral content is gold and is increasing in value as development progresses.

The usual daily production of 80 tons of copper ore is being maintained at the Commercial mine in Copper Basin and is being regularly forwarded to the Humboldt and Clarkdale smelters. S. L. Landon recently assumed charge of the mine as assistant to Major A. J. Pickrell.

D. A. Burns of Oatman has assumed charge of the Mint group in Copper Basin and is shaping the property for extensive mining operations. The workings are being unwatered and as soon as this work is finished the drift on the 200 level will be extended to pick up an ore shoot that gave high gold returns at surface and nominal depth. Burns recently acquired ownership to the Mint group and has the financial resources necessary to thoroughly develop it.

Chloride.

The power line being constructed by the Desert Power & Water Co. is now within 5 miles of Chloride. The line is being built at a rate of half a mile a day, so that in 10 days it ought to be very close to town.

E. M. Binds, a mining engineer of Los Angeles, is here to direct the commencement of operations on the Emerson, adding still another property to the long list in active operation here.

A road is being constructed from the mouth of Alum Wash to the Black Jack mine and an extension of this road is being surveyed to run from the Black Jack to the Gladstone. The entire road will be about 2½ miles in length, and will serve several other good prospects in the east section of the camp.

The Black Jack ore has commenced to go through town on its way to the smelter. The ore is being packed by burros from the mine to Tramway landing, thence by wagon to the railroad.

The water company plans extensive improvements and extensions to accommodate the fast growing town. A new reservoir is to be built at the head of Tennessee avenue to give the camp better pressure for fire-fighting. More cross-mains are to be laid in the north and south sections. The camp is spreading mostly in a southern direction, along the new boulevard now being built by the county, and this section is compelled to rely upon the water wagon for its water supply.

CALIFORNIA.

Jackson.

Deputy U. S. Marshal Otis Bohn and attorneys representing the mine operators have served injunctions on 100 striking miners, restraining them from interfering with working of the mines. This follows a recent order of the U. S. District Court at San Francisco. An injunction has also been issued against Assistant State Labor Commissioner J. J. Kelley. Attorneys in the employ of the Western Federation of Miners, will represent the strikers when the temporary injunction comes up for argument.

Large numbers of strikebreakers are coming into the district, and it is evident the operators will make a determined endeavor to resume operations. All the mines remain idle, with the exception of the Plymouth Con., at Plymouth, and the old Eureka, near Sutter Creek. Several clashes have recently developed, but the strikers have been generally peaceable. Pumps are still idle at the South Eureka, but the miners have agreed the company may keep the mine unwatered.

Grass Valley.

A meeting of stockholders of the Union Hill Mines has been called for the purpose of dissolving the corporation and distributing treasury funds; \$85,000 remains in the treasury,

after meeting all expenses. New interests recently took over the property and are operating it at a profit. Rich tungsten ore continues to be mined, and driving is proceeding with a view to intersecting the Georgia and Union Hill veins. Additional territory has also been acquired.

General Manager C. K. Brockington of the Golden Center and Grass Valley Mines companies has placed orders with local foundries for a 10-stamp addition to the Golden Center 10-stamp mill, and a complete 20-stamp plant for the Allison Ranch mine. The shaft of the Golden Center has been completed to a depth of 1000 ft. and drifts are advancing along shoots of rich ore. Unwatering of the Allison Ranch is proceeding slowly, and the new pumping system is to be in service about Nov. 10. Construction of the mill and mine buildings is making good headway.

Bishop.

Heavy shipments of tungsten concentrates are being made regularly by the Tungsten Mines Co., a shipment last week being valued at \$20,000. Eleven concentrators are running with three shifts employed. At the Little Sister mine surface ore is being quarried, and good ore opened in the tunnel workings. Howard Moore has been appointed superintendent.

Considerable work is going on in the Standard group, where some excellent tungsten ore has been blocked out. The company is erecting new buildings and bringing in winter supplies. It is planned to continue work throughout the winter months.

Sonora.

Rich quartz has been intersected in the drift from No. 1 winze in the Omega. The discovery was made about 25 ft. below No. 1 level and shows a 9-ft. vein containing broad shoots of ore averaging better than \$200 per ton in free gold, with considerable sulphurets also present. The ledge is broadening as drifting advances, and the discovery is considered a most important one. The mine formerly yielded much bonanza and at this time is operated under bond and option by Lange & Hussey, understood to represent New York people. C. W. Ayers is manager.

Additional concrete bases and foundations are being installed at the Dutch mine and mill for support of new equipment. The milling plant is being improved and enlarged. The Dutch, App and Sweeney properties are worked through the Dutch shaft and late important developments have warranted the installation of much new machinery.

The Black Oak Co. has installed a diamond drill on the 900 level and has arranged for extensive explorations below this point. Rich ore is coming from the main levels. The Confidence Gold Mining Co. has been formed to take over and operate the Confidence mine. Satisfactory developments will be followed by installation of new equipment.

The McAlpin Mines Co. is opening excellent ore in its property at McAlpin in the southern end of Tuolumne county. The vein is 4 ft. wide and assays \$90 in gold. The strike was made near the 500-ft. point and about 700 ft. of backs are available along the strike of the new ledge. Frank P. Whitcomb is president.

Heroult.

Three furnaces are running steadily at the Heroult electric smelter, producing ferromanganese, ferrochrome and ferrosilica. The company is devoting particular attention to development of manganese deposits, finding it difficult to supply the demand for ferromanganese. Another furnace will be operated on this product as soon as sufficient crude ore is assured. Most of the manganese is coming from points tributary to Hollister, Ukiah, Castella and Livermore. Ore from the Castella district is especially favored, as it is near the plant and means an important saving in freight costs. Deposits near Callahan are considered promising. No attempt will be made at production of pig-iron while the demand for other products remain satisfactory.

Mokelumne Hill.

A bond has been taken on the Sullivan quartz mine in Chili gulch by H. J. Windler, general manager of the Mokelumne group. The property has been opened by a 450-ft. tunnel, which shows a strong ore body 14 ft. wide. The tunnel is being extended and drifts started. The adjoining

Lancell gravel property has also been reopened under bond. The tunnel strikes the noted Stockton Ridge channel.

Angels.

The Angels Camp Deep Mining Co. has installed a compressor and is sinking the shaft with air drills. At a depth of 140 ft. excellent ore is showing, with the vein improving as depth is attained. It is planned to erect a small mill to take care of ore broken in routine work, and to provide a large plant as soon as ore conditions warrant.

Sutter Creek.

A 9000-gal. tank has been installed on the 500 level of the Old Eureka, to take care of water raised to this point from the deeper workings. A centrifugal pump elevates from tank to surface. Unwatering of the 800 level is making good progress and the workings have been found in better condition than anticipated. The management is confident of starting mining early in 1917.

Dutch Flat.

The Rawhide mine has been reopened by the Canon Mines Co., after lying idle 5 years.

COLORADO.

Cripple Creek.

Thirty tons of ore from the Isabella Mines Co. carried a value of \$197.47 per ton, a gross bullion value of \$5,923.50. The ore was mined on company account from the ore shoot under development at the 15th level of the Lee shaft.

A winze sunk 125 ft. below the bottom level of the Cresson Con.'s main shaft has proven ore values continuous to that depth. Work will shortly commence on a lateral to be extended from Roosevelt tunnel directly under the Cresson shaft. A raise will then be carried to connect. The bottom of the winze is 160 to 175 ft. above the tunnel level. This lateral extending in a general northwesterly direction from the line of the drainage tunnel through Raven hill will be important exploitation work.

The shaft on the Little May claim has been timbered by the Cripple Creek General Mining & Exploration Co., and sinking has been resumed. It is expected that the Josephine vein will be cut on its dip in the next 15 or 20 ft., as values are already carried in feeders cut in the shaft. The Little May shaft is equipped with a windlass only. With a depth of 50 ft. an electric hoist will be substituted and a shaft house constructed.

Rico.

Rico shipped 11 cars of ore during September. The falling off in tonnage is due chiefly to the fact that the Rico-Wellington has nearly discontinued its heavy shipment of low-grade and is directing efforts toward the production of higher grades. A new series of ore beds may be encountered at any time as the extensive development operations there proceed. Lead-silver ores now predominate in the output, as was the case in the best days of the camp. September shipments were: Rico-Wellington, 5 cars lead-silver to Leadville; 2 cars copper-sulphide to Leadville; 2 cars lead-carbonate to Durango. Rico-Con., 1 car copper-sulphide to Leadville. W. P. Muncaster & Co., 1 car lead-copper to Durango.

A night shift has been put on at the Rico-Argentine, and a force of 20 men is now employed. Since the installation of the new power drill equipment good headway is being made.

The Rico-Wellington has a record of 684 ft. of work for the month of September. This is a remarkable showing. The mine is reported as being in splendid shape, with ore prospects excellent.

Leadville.

The water level in the Mikado is now down to the 900 level and the shaft has been retimbered to that point. A new and larger station is being cut in the shaft which when finished will be 15 ft. wide, 18 ft. high and 60 ft. long. It will accommodate the main pumping equipment to be installed on surface. The blacksmith and machine shops have been completed. Foundations are being put in for the new hoist

and compressor, which are expected to arrive within the coming week or ten days. The hoist will be of exceptional size.

The Wolfstone shaft has been drained to the 1000 level, being aided by the pumps in the Greenback, which is 230 ft. deeper than the Wolfstone. The Greenback is now pumping the remaining 230 ft. of its shaft. The draining of the Greenback will unwater the greater part of the Pyrene basin to a depth of 1350 ft. It will allow extensive development to be carried on through the Emmet, Wolfstone, McCormick and Greenback, which are located in this section. The developments planned for these properties are the first steps to be taken toward deep mining on a large scale in the district.

The Wyoming Valley Tunnel is being driven under contract to Chapman & Smith to reach some of the well-known producing mines that lay ahead. The next vein to be encountered will be the Niagara, which will be reached in 200 ft., then the Artilleryman, Golden Era, French Flag and Silver Age Extension. When this group is reached, large bodies are expected.

Boulder.

The Cash mine is to again be operated. Compressor, air drills and other machinery have been installed. The policy will be to operate the ground under the leasing system. Several lessees have already taken ground and are now ready to operate.

Telluride.

The Carruthers mill will be ready for operation about Nov. 1 and the tramway between Sheridan tunnel and the mill will be in readiness to bring the ore from the Carruthers vein. The mill will have a capacity of 60 tons. The ore is treated with a ball mill of this capacity, and it is free milling ore of a good grade. In order to conserve the water for milling purpose the management has made three small storage tanks; one is 6 by 8 ft., one 8 by 12 ft., one 12 by 12 ft. Added to this supply is that from Royer creek taken from the hillside above the mill and pumped up from the gulch below the mill with an electric pump. The mill will be driven by electricity.

IDAHO.

Wallace.

The Columbus Mining Co., recently organized, has purchased from Edward P. Gallagher of Philadelphia, Pa., the Columbus group of claims, in the Eagle mining district of Shoshone county. The holdings comprise the Columbus, Mary, Good Hope, Murray, Wampum, Dinero, Plumbum, Argentum, Good Luck, Gallagher, Colonel Bradford, Golden Eagle No. 1 and Golden Eagle No. 2 claims, adjoining the Jack Waite and Samson groups.

Announcement has been made of the sale of 200,000 shares of treasury stock of the Rob Roy Mining Co., which owns and is developing the Rob Roy group. The proceeds of the sale will be devoted to further development of the property, according to O. W. Lewis, secretary of the Rob Roy Co. "For the first 50,000 shares we received 15 cts., for the second 50,000 we got 25 cts., and the remaining 100,000 will bring us 40 cts.," said Mr. Lewis. "The purchasers are eastern men, who already have made the first payment, and the remainder will be paid next week. The money will be used to install a compressor and to carry out a comprehensive plan of development. The tunnel is at the 800-ft. point, and followed the vein part of this distance, exposing mineral. It will be continued 1300 to 1500 ft. The property comprises seven claims and adjoins the mine of W. A. Clark, but is on a different vein."

Shipments will begin from the Rex mine, in the Nine-Mile district, not later than Nov. 10, unless there is further delay in the delivery of equipment that has been ordered for the mill, according to Raymond Guyer, who recently succeeded President M. J. Sweney as general manager of the Rex Con. Co. It was announced several weeks ago that production would begin Oct. 15, but the Riblett Tramway Co. of Spokane, which has the contract for installing the new aerial tram, connecting the mine workings with the mill and the

shipping bins, has been unable to secure buckets for the carrier. "We also are installing two new crushers and a new sorting belt, and part of this equipment has not arrived," said Manager Guyer. "We anticipate having the delayed machinery on the ground not later than Nov. 1, however, and it will require but a few days to place it and get it ready for service. We first contemplated utilizing the old tramway, which had been removed to the Tamarack & Custer mine, when that property was served by the Rex mill, but later we decided to put in an entirely new carrier, and this necessitated postponing the date of beginning shipments. We have had to erect 19 new towers, but these have been completed and the cable strung, so that it will require but a few days to attach the buckets when they arrive. Needed improvements in the mill have been made while we were waiting for the additional machinery, and the plant now is in splendid shape for continued operations." It is stated officially that there is a considerable tonnage of ore broken down in the stopes, ready for immediate extraction, when the mill is in commission, and it is estimated that there is not less than 12 to 18 months' supply for the plant operating at the rate of 200 tons daily. All of the undergrounds that had been flooded during the 5 years that the property was idle have been unwatered and repaired, and there has been a great deal of new development on both the Rex and Okanogan veins. The power house, burned more than a year ago, has been rebuilt and new and larger electric motors installed. Other camp buildings have been repaired and material and supplies for the winter's campaign have been assembled. Manager Guyer states that the physical condition of the property is better than ever before, and he anticipates no delays after production is inaugurated.

Mullan.

Development of the American Commander Co.'s claims is revealing promising conditions in the tunnel now being driven, and the formation indicates the proximity of an ore shoot, according to E. J. Clarke, president. "Several stringers carrying lead have been encountered in the tunnel, and these, we believe, indicate that the bore is nearing the vein," said Mr. Clarke. "The face now is but 300 ft. from a point below the 75-ft. surface shaft that was sunk on the ore several years ago, but, as the vein rakes toward the crosscut, it is probable that it will be encountered sooner than we first estimated. The ore body traverses our ground its entire length, and we will have attained not less than 600 ft. vertical depth when the ledge is reached."

Kellogg.

The directors of the Caledonia Mining Co. on Oct. 24 declared the regular monthly dividend of 3 cts. a share, or \$78,150, payable Nov. 5 to stockholders of record Oct. 25. This will make the disbursements for the current year \$833,600 and will increase the grand total to \$1,716,331. The company is capitalized for 2,605,000 shares at \$1 each, and control of the corporation is vested in the Bunker Hill & Sullivan Mining Co. The company's net earnings in September were approximately \$100,000, according to President Stanly A. Easton, as compared with about \$90,000 in August. There have been no new developments in the Keating tunnel, where search is being made for the faulted ore body, but the work is being continued.

Hailey.

The Wilbert Gold Mining Co., which owns and operates a property in the Wood river district, has declared a dividend of \$10,000, payable Nov. 15. This will make the total payments \$50,000 since disbursements were inaugurated a little over a year ago. In a report accompanying the dividend announcement Manager H. S. Knight states that there are \$43,000 in the surplus fund, and that this is being increased from month to month. There are about 30 men employed in the mine and mill, and in addition to active mining operations the company has inaugurated extensive development.

Burke.

Development of the east vein in the Hecla mine has resulted in opening one of the greatest ore bodies ever encountered in the property, according to reports, and, while official confirmation of the discovery can not be secured, there is little doubt but that the reports are correct. The new ore body is said to practically double the resources of the

mine and to be equally extensive and as rich as the original Hecla vein, from which the company to date has paid more than \$5,000,000 in dividends, besides building up a surplus fund of approximately \$600,000. It has been proven for a distance of 850 ft. on the No. 3 level, from which an upraise has been run 600 ft. on the ore, the most of which is said to be lead-silver, much of it steel galena, with only occasional traces of zinc. The recent exposure was made in the 900 level, which is 900 ft. lower than the No. 3, where a crosscut opened 4 ft. of high-grade ore, and the opposite wall has not been reached.

Osborn.

The new mill of the Silverado Mining Co. will begin operations in a few days, according to C. D. Muxen, secretary-treasurer of the corporation. The plant was designed and construction supervised by W. L. Ziegler, superintendent of the Success Mining Co.'s concentrator, who will be in charge until the equipment is adjusted and operating satisfactorily. The mine and mill are under the management of Dr. W. H. Farrar, who 50 years ago erected the first stamp mill at Warrens, packing the entire equipment on muleback a distance of 120 miles. The Silverado holdings have been developed intermittently for many years, but in recent months the work has been of more permanent and systematic character. The mill and the 2-phase 5-drill Ingersoll-Rand air compressor will be driven by a 75-hp. motor, actuated by current from the Washington Water Power Co.'s nearby transmission line.

LAKE SUPERIOR.

COPPER.

Houghton.

Cherokee is in good copper, better than has yet been found at the depth of 118 ft. A crosscut is being driven to ascertain the width of the lode, and its mineral contents, after about 4 ft. had been blasted off at the top of the ledge, the width was 47 ft., and the metal of heavy grades, quite uniformly distributed. It may be possible that one drill would be set to drifting, but this is not considered likely at the present, it now being the intention of the management, when the crosscut and sump are completed, to continue sinking.

Flint Steel has received a boiler and will get its pump this week and soon begin to unwater its old workings on the Butler lode. A small building is being erected for the men. At No. 6 shaft the water is below the surface about 60 ft. and the workings there give signs of considerable copper.

Michigan, at the distance of 404 ft. from the Butler lode, is in a lode which, from its location and character, seems to be the Evergreen, but the disclosures are rather light and infrequent. The fissure vein that parallels the Ogimah a few feet from it on the hanging-wall side has been entered with good disclosures. As soon as it has been crossed the good streak on the hanging wall of the amygdaloid will be returned to, where the ground was of excellent values when the crosscut was begun.

New Arcadian has arrived at the 1500 level and will begin its two crosscuts about the 27th, one going east 150 ft. to the New Arcadian lode and the other west a few feet to the lode met with behind the shaft about 16 ft. on about all of the levels. The drifts at the 150 level, or bottom, at No. 2 shaft, are displaying a very good quality of metal. The work on the new rockhouse will not be ready for about 4 weeks.

New Baltic is down about 35 ft. with its shaft pit and has yet no sign of the ledge. It is thought that the ledge will be struck within 15 ft.

Mayflower and Old Colony have ended their diamond drilling, as about all the needed data have been obtained. No conclusion has yet been arrived at by the management of the two companies as to the consolidation, which is considered by the friends of each as a necessary preliminary step to a proper development.

Mass is getting quite a large number of men now, and with the completion of the repairs on the crusher at "C" the

output that had fallen off to below 1000 tons daily will be gradually brought back to over 1200.

South Lake has been obliged to proceed slowly with its increase of tonnage, owing to the necessity of installing an aerial tramway to carry the waste rock over the railway track; this will be completed within a few days.

North Lake is driving the crosscuts both ways and has covered a distance of over 500 ft. on each side, finding nothing of promise. This work will be continued, as there are the North lodes of the South Lake to be reached on the north-west side and several lodes found by diamond drilling on the southeast.

Indiana has on the lode supposed to be the Butler reached a depth of 50 ft. and is finding some copper with an occasional piece of commercial grade.

Franklin is gaining slowly in tonnage and is keeping up near the 1100 limit, as there are some more men to be had. The property is earning about \$30,000 monthly and will soon have enough money ahead for improvements at the mill.

White Pine Extension has at the 200 level been drifting for some time, and is ascertaining that the values in the beds at this point are continuing. Only enough work is being done now to prepare for a flotation mill that will be begun early in the spring, the necessary outfit being manufactured during the coming winter. From the experimental work so far done there is no doubt of the success of this system.

La Salle is sending to the Franklin and Ahmeek mills very nearly 500 tons of rock daily, only about 20 cars a week going to the latter. It is sinking below the 19th level at No. 2 shaft and is drifting on each level from the 12th, where profitable values were first encountered, to the 19th, inclusive, no stoping being done at this shaft.

Ahmeek has so far on the 10th level on the Kearsarge conglomerate 110 ft. of drifts that average very good, and the indications of the faces of both drifts are very favorable. After a while another crosscut will be driven to determine the width of the mineralization. The work on the new steel No. 2 shaft rockhouse has been so delayed that it will not be finished for some time on account of the great lack of good surface men. The new fissure at North Ahmeek, shafts Nos. 3 and 4, though it has not been opened enough to make certain of its persistence for any length, is equal in richness to the fissure at No. 2 which, for about 4 years, has been of such great value in increasing the yield of the mine.

Allouez is back again after a small decrease in its tonnage, due to the scarcity of trammers for a short period, and is hoisting daily its normal for the present, about 2000 tons.

Calumet & Hecla is doing much better in the way of daily tonnage than for some time, and is milling 10,600 tons daily. It is thought probable that this rate can be maintained for some time, as undoubtedly more men are coming into the district. This month, owing to increases at the Mohawk and the Calumet & Hecla and some of the smaller properties, the tonnage will be slightly greater per daily average than in September.

Osceola will have about the same tonnage for this month as for September, about 109,000 tons. The last few days the daily tonnage has had a slight increase, but more men could be easily employed at all three of the mines branches.

Mohawk has been doing much better in getting men and swelling its tonnage, and in fact it is now running to its capacity, and was obliged to operate the mill Sunday, the 22nd. It is averaging very close to its normal, which is the highest possible capacity. There has not so far been any increase at the Wolverine, but this mine will probably join the procession in a short time.

Adventure has its bailers running and has drained out the 3rd level, where the old workings have been thoroughly examined and a very fair showing of metal found. It is most likely that other levels will be unwatered before any mining is begun.

Lake has its hoist and shaft now in good condition and the old workings on the Knowlton lode are being gone over and some drilling will soon be started. The copper contents as indicated by the walls of drifts are quite promising.

IRON.**Hayward.**

Proving an iron formation of commercial value in Sawyer has been taken up by the Edson interests of Duluth and drilling has been started east of this city. The work of proving a formation in northern Wisconsin has been started several times, but never completed. Another drill has been started by a syndicate just north of Weyerhaeuser. This same syndicate sank 5 holes east of Murray some time ago, but results were never made public.

Tramp ore steamers in Lake Superior are being gotten together to transport the product late into the season. It is said they are contracted for at twice the usual price of 50 cts. per ton, or \$1. Much iron ore has been contracted for into the spring of 1917. The Atlantic coast furnaces, which heretofore have obtained all of their supply from Cuba and eastern states, are purchasing some ore in the Lake Superior district at present. Estimates for the 1916 season are placed at between 60,000,000 and 65,000,000 tons shipped.

MISSOURI-KANSAS.**Joplin, Mo.**

There was a renewal of the optimism that has been a part of the zinc mining industry for the past year, when this week's ore prices again advanced sharply, registering \$75 base for both first and second-grade ores. All along the line there was a strong demand, and calamine as well as blende profited by the strength of the market. Lead ore prices were equally strong with zinc, and 80% lead brought as high as \$87. At these prices naturally there were heavy sales of ore, and the week saw many bins sold and moved out as rapidly as the smelting agents could move them. In the Miami camp, where so much of the surplus stock has been held, there were especially heavy sales, and as much as 3000 tons of the surplus stock in that camp are reported sold, with rumors of still other heavy sales as yet unverified. If this proves true there will be great rejoicing in the district, for the removal of these stocks at \$75 prices means profitable operation, and greatly improves the local situation from a market standpoint. It is these stocks that have held down the market so strongly, locally, for some time past.

But with these good prices prevailing it would appear that every effort would be made to increase production, and this is true, except that there are many interfering conditions at this time, and conditions that are likely to grow worse instead of better with the coming on of the winter season. The lack of power by the electrical power company is a serious handicap for many of the mines, and there seems very little possibility of this being improved for some time to come. The inability of the company to get deliveries upon new electrical units under a year's time, coupled with already crippled plants, would seem difficulty enough, but on top of this is the serious state of the district's streams, which, owing to the lack of rains, are so low as to cut off a good portion of the company's power from its water power plants. It would seem that the elements are conspiring to thwart a larger ore production from the field, for in addition to the lack of electrical power, is the acknowledged shortage of gas for even domestic use, much less for power engines and under boilers, and this means a total readjustment of power in many of the district mills and mines. The falling back upon coal, while the only alternative, is not altogether satisfactory, for of that fuel there is not a satisfactory delivery nor a surety of supply during the winter months. Every operator is trying to stock up on coal, and has orders in for many carloads, but is finding that his having it ordered is about his only satisfaction, for he is not receiving deliveries in anything like proportion to his orders.

Webb City, Mo.

Hornbrook & Federman of Kansas City have brought the production of the Old Yale mine up to 2 cars of concentrates per week, while in their new mine at Duenweg, which is called the Mahatma, the production has now been brought to 1 car per week. The first property is a sheet-ground mine, well opened up with a mill of very large capacity upon

it, while the second is a soft-ground property, with a smaller milling plant, and it is only in the earlier stages of development.

At this week's regular meeting of the mine operators at Webb City the following delegates to the American Mining Congress were named, and it is believed that there will be others before the meeting is held: W. B. Shackelford, Geo. J. Kusterer and Otto Ruhl were named as the ore producers' delegates.

The Near By Mining Co., holding a lease on a portion of the Center Creek ground at Webb City, has started the construction of a mill, having purchased the L. J. Steverson plant at Porto Rico, and is moving it to the new location. The plant, when remodeled and built, will treat 450 tons of ore per day. Those interested in the new company are W. E. Patton of Webb City, E. S. Williams, L. S. Durham, John O'Keefe and B. L. Van Hoose of Carthage.

The new Yellow Jacket mine at Duenweg has started operations after a shutdown of several months for a prospecting campaign, which has netted them a very promising ore body. The prospecting was conducted by drilling, and five good holes were put down. The drifting has been started to open up the new discovery. N. S. Snow is superintendent of the property.

The Hartford Mining Co. has just started the erection of new concentrating plant on a well-developed 35-acre lease in the Porto Rico camp. The new plant will be a modern 500-ton capacity, and while in part constructed of old machinery, will have new jigs, new tables and very much new material in it. While the mill is being erected the underground development work is being hurried forward. Two shafts are being recribbed and concrete lining is being used. H. H. White of Joplin is the general manager of the property.

MONTANA.**Butte.**

The Ophir mill of the Butte-Detroit Co. will be reconstructed to operate on zinc-silver ores from the Davis-Daly, using the flotation process. Bins have been built at the Davis-Daly, together with a number of chutes, and everything is in readiness for the mining of zinc ore. Above the 1700 level a half dozen faces of zinc ore, each of a width from 6 to 10 ft., have been opened, and assaying from 19.50 to 39% zinc, with from 9 to 15 ozs. of silver and carrying an iron content ranging from 1.5 to 5%. The Ophir plant will start with a capacity of from 100 to 150 tons daily. Test milling runs on the Davis-Daly zinc ores show a recovery at the Callow flotation plant in Salt Lake of 95%, with concentrates carrying 52.75% zinc, about 2 lbs. of oil to the ton being used. Tests made at local flotation plants show a recovery as high as 97%, the concentrates carrying 55% zinc.

Two veins have been crosscut within the past few days on the 1000-ft. level of the Butte & Zenith City, according to Supt. William Gibson. One fissure opened in the south crosscut 91 ft. from the shaft shows a width of 10 ft. of well mineralized ledge material without any sign yet of the other a half of 1% copper, which, while not in itself commercial, is regarded as indicating that the company is in the copper ore zone. The other fissure has been cut in the north crosscut, 135 ft. from the shaft, the breast being in 10 ft. of mineralized ledge material without any sign yet of the other wall. This ledge was cut Saturday and assay returns have not yet been received. The sulphide vein is about 200 ft. south of the shaft and it is expected to reach this fissure about Nov. 1. It will be necessary to go about 400 ft. north before the vein is cut.

Along with the dividend checks of the North Butte Mining Co. there was received here this week the quarterly report of the company for the term ending Sept. 30. The report shows that during the past 3 months there has been 5562 linear feet of development done. The features of the quarter's work have been the proving of the eastward extension of the ore body on the 2200 level of the North Berlin vein. The finding of ore on the 1800 in the same vein and the cut-

ting of ore on the 2000 level of the Adirondack vein. On the North Berlin vein on the 1800 level a crosscut has encountered the vein and drifting has been done for a distance of 47 ft. in ore of an average width of $3\frac{1}{2}$ ft., assaying 3% copper and 8 ozs. silver. On the 2200 level of the same vein development work has been extended to the east, the drift advancing 184 ft. in ore of an average width of 4 ft., assaying 7.5% copper and 16 ozs. silver. The significant feature of this vein is the high silver and copper values of the ore. Crosscuts are approaching the vein on both the 2000 and 2400 levels. It is announced that during the present quarter development work will be pushed on three new levels below the 3000 level from the Granite Mountain shaft and on the North Berlin and Adirondack veins, as well as other veins now being mined. During the quarter there were mined and shipped 128,040 wet tons of ore and 46 wet tons of precipitates and there were treated 124,454 dry tons of ore and 34 dry tons of precipitates, of which ore 17,108 dry tons, or 13.7%, were first-class and 107,346 dry tons, or 86.3%, were second-class. This produced 5,953,685 lbs. of copper, 247,833.14 ozs. of silver and 402.53 ozs. gold. The financial statement shows copper and silver on hand to the value of \$2,298,014.17, while the surplus and reserve amount to \$4,789,369.27.

Troy.

The extensive construction work and development that is being done by the Snowstorm Mines Con. Co. is inducing activity among other companies operating in the region surrounding Troy, and the district is now the center of greater operation than at any time in its history. The Togo Co., Ralph Smith and Robert Larter owners, has started a tunnel that now is in 200 ft., and will be continued 600 ft. to reach a body that is 2 ft. wide at the surface, and contains silver-lead ore of high grade, and no zinc. Some of the ore runs 400 ozs. of silver. The construction of a flume to carry water to drive a compressor is nearly completed. Cabins and a road are being built by the L. & V. Mining Co., a Spokane corporation, in preparation for development throughout the winter. The property is a northerly extension of the vein system of the Big Eight, owned by Harry L. Day of Wallace and the Snowstorm Con. The Silver Tip Co., owned by Robbins & Wright of Spokane, has let a \$9000 contract for 900 ft. of crosscutting that is expected to reach the vein at a depth of 600 ft. The shoot contains silver, lead and zinc. J. H. Ehlers, identified with the Sylvanite, a gold property, 20 miles north of Troy, reports that operations to be started this fall will proceed through the winter. The company has ordered a carload of horses to haul lumber for the establishment of a large camp. Winter quarters have been completed by the Montana Morning, and drifting is in progress. The property is comprised of 12 claims, traversed by three parallel leads opened by several hundred feet of tunnel and two shafts. All of the veins show good values in silver, lead and zinc. Development is being directed by William Hogan of Spokane, who, with Bud Woods of Troy, is the chief owner. The Snowstorm railroad crosses the north end of the group.

NEVADA.

Goodsprings.

The management of the Boss Mining Co. is perfecting details for the new mill. Experiments with the testing plant indicates a high extraction of gold and platinum can be made at a comparatively low cost. The projected plant is designed to treat 10 tons daily; 800 sacks of high-grade platinum ore are ready for treatment. Ore running 25% has been intersected in No. 6 winze and work has begun in No. 4 tunnel to open the vein to advantage.

A 9-ft. vein of rich ore has been encountered in the Oro Amigo, assaying approximately 40% copper, \$25 gold and \$45 platinum. The discovery has stirred considerable interest and is believed to demonstrate the presence of important platinum deposits outside the Boss acreage. Sinking and raising along the vein are proceeding.

A 2-ft. ledge of ore assaying 60% lead and carrying considerable silver has been intersected in the Sweepstakes claim,

owned by J. Madison and Arthur Kunze. Sinking is advancing with the ore body showing strength. Important zinc discoveries are reported from the Anchor, Root and Potosi mines. The latter is owned by the Empire Zinc Co. and was examined last week by Capt. C. J. Brown, western manager for the company.

The Dawn Mining Co. has resumed operations. Some rich zinc ore was lately intersected and work is proceeding to determine extent of the deposit. The property lies on the eastern slope of Potosi mountain, in a promising ore belt. Albert Munzberock is superintendent.

Bert Whitney of St. Thomas has secured a lease on the New Year claim and is arranging for installation of a hoist and building of ore bins. Some excellent ore is exposed. Dan A. Potter and Frank Tursick report a promising copper-silver discovery in the Copper Metal property. Samples assayed in Goodsprings returned 34% copper and 38 ozs. silver.

Searchlight.

This district is showing considerable activity after several years of indifferent development. G. F. Colton has arranged for resumption of work at the Duplex, formerly a good producer. The shaft of the Big Casino is being deepened 10' ft. on a strong ledge of concentrating ore. Considerable new work is going on in the Quartette, and it is understood 100 men will be employed in the near future. The mine recently passed into the hands of a strong New York syndicate. The Searchlight Mining & Milling Co. is preparing for developments along broad lines. Several companies are preparing for work on holdings north and east of the camp.

The El Dorado canyon section of the district is exceedingly lively. A new camp known as Nelson has been established at a point about a mile east of the Wall Street mine, and is growing rapidly. It contains about 50 structures of all sizes and descriptions, including general store, postoffice and lodging houses.

At a depth of 20 ft. in the Carnation property a 40-in. shoot of gold-silver ore has been encountered, assays averaging around \$76 in gold and 28 ozs. silver. Sinking is proceeding with the vein slowly widening. On adjacent ground the same vein has been intersected by the lease operated by Matt Fisher of Las Vegas. The Carnation is operated by a leasing company composed of V. H. Welk, C. O. Spencer and W. A. Kirchner of Goodsprings.

Sinking in the Eldorado Empire is proceeding to tap two cross veins, one being the noted east-west ledge of the Wall Street. C. E. L. Gresh is manager. Other active properties are the Eldorado Nevada, Enterprise-Rand and Cluff-Era. E. P. Jeanes is manager of the Enterprise-Rand Co.

Winnemucca.

A new camp, known as Wallace, has been established about 10 miles southeast of Winnemucca, and approximately 5 miles from the Southern Pacific station of Rose Creek. Two gold-silver veins have been uncovered, and at a depth of 20 ft. a 6-in. shoot of \$200 ore is exposed. Shipments are to be made in a few days. The property is owned by Robert Wallace and Henry Kantewein. Leases have been taken by E. D. Rogers, Hartman & Truitt and Abel & Loinaz.

Goldfield.

The Silver Pick Co. is crosscutting at an approximate depth of 1000 ft. to intersect rich shoots exposed in the two contacts by core drilling. High assays are reported at several points, and within 500 ft. the management anticipates developments of importance.

NEW MEXICO.

Mogollon.

The Oaks Co. milled another lot of ore during the week, taken from development work on Clifton mine.

Socorro Mining & Milling Co. shipped 1800 lbs. gold and silver bullion from operations covering first half of October.

Timbering of new shaft below 500 level has been started at two separate points by Mogollon Mines Co. During the

week 980 tons of ore were treated and 1500 lbs. gold and silver bullion smelted for first half of month.

A representative of the state engineer's office has visited the camp, securing data and inspecting proposed hydro-electric sites. As all these power installations are under the jurisdiction of the state, this move is thought to augur favorably for an early realization of adequate and cheaper power for the district.

OREGON.

Sumpter.

The Cougar mine has been purchased by the United Gold Mining Co., Spokane, and operations will be resumed by Nov. 15. C. C. Robins, secretary-treasurer, says that the old mill is being remodeled and a 2½-mile pipe line is being installed to provide water for power and milling, after which production will begin. The plant has a capacity of 125 tons, provided by two 5 by 8-ft. tube mills and five 20-ft. cyanide tanks. This can be expanded to 250 tons by the addition of tube mills and tanks. About \$150,000 had been expended on development and improvement up to the time we bought the property. About 5000 ft. of work had been done, blocking out 100,000 tons of ore having a value of over \$1,000,000. The engineer who supplied these figures took 176 samples and in measuring the total value he eliminated all assay returns above \$20. It has been calculated that 34,000 tons above the 1st and 2nd levels have an average value of \$14. The calculated cost of stoping and milling is \$3. The shoot is continuous for 1100 ft. and has a back of 390 ft. at its interior extremity. Another \$1,000,000 will be added to the resources by driving a tunnel 100 ft. below the upper block if the ore continues. This tunnel is now in 500 ft. The former operators did not make a success, because the concentrating system was not suited. We have had exhaustive tests of different treatment made, and we have discovered that a satisfactory recovery is possible by finer grinding before cyanidation.

Mrs. F. N. Doty, Denver, Colo., purchased the Tempest mine from Millard and E. E. Bennett on Oct. 16. The price was \$50,000, to be made in five semi-annual payments of \$10,000. The mine includes three claims, the Tempest, the Saturday Night and the Seward. It taps the same system of veins as the Ben Harrison, being but a short distance from the latter. It has been operated for 20 years, but no mill has ever been erected. Ore which ran from \$26 to \$32 per ton was sufficiently rich to ship. There are two tunnels on the mine, one 400 ft., the other 500 ft. long. Ore valued at \$75,000 is in sight. Work is to be begun immediately, shipping as much as possible before winter. Plans for the erection of mill and cyanide plant are still to be perfected.

The Taber Fraction and Rastus mining claims have been sold to James A. Howard and associates of Baker by the Taber Fraction Mines Co. for \$60,000. The company's holdings are regarded as the richest for their size in Oregon, and in the 15 years they were operated before litigation caused suspension about 8 years ago, they were credited with earnings of \$250,000. Activity was resumed a few days ago through the workings of the E. & E. mine, adjoining, at a depth of 800 ft. vertical depth in Taber ground. In the early days of the district there were a number of pockets of practically pure gold discovered in the Taber claims, and more than \$100,000 worth of clean, high-grade quartz is said to have been extracted between the surface and the 200 level, while a vein 3 to 8 ft. wide, carrying from \$18 to \$25 a ton in gold, was opened in the lower workings, the lowest of which has a vertical depth of 1100 ft.

SOUTH DAKOTA.

A compressor for drills and other machinery has been installed at the New Golden West and work is progressing under General Manager Williams. The main tunnel is 600 ft. from the portal. It has penetrated the big ledge for 110 ft., and has not as yet reached the foot wall, which is

supposed to be at least another 100 ft. The ore through which this tunnel has been driven is of excellent grade, but the rich part of the ledge, as demonstrated by the holes which had been bored with core drills before the tunnel was started, has not been reached. Several months ago quite a number of these holes had been sent down on various parts of the ledge and from the cores taken out assays of excellent average value were received. It is the intention to cut this section of the ledge from which the rich ores were taken. At 50 ft. from where the tunnel has entered the ledge a station has been cut and a raise to surface started. It is expected this work will take several weeks, as the rock is very hard. This work, however, will not interfere with the driving of the tunnel. Together with this work the plan of blocking out ore will be pressed.

UTAH.

Beaver.

The working shaft at the Hoosier Boy has been completed to the 800 level. They are now drifting from this station to connect with the lead ores which have been opened on the 200, 400 and 600 levels. They have found ore in place in all the workings where drifts have been sent out from the shaft to make connections. It has been a good grade of ore that could be shipped direct to the valley smelters and it is located in a portion of the camp where ledges of lead ore have been found previously. Ore was found on either side of the shaft in two fissures.

The Paloma shaft is down 635 ft. and the 600 level is now being opened. Here high-grade pockets are coming into the drift to the west. This ore resembles that taken out further up the shaft that sampled 44% copper, 43.6 ozs. silver and 11% lead. In new workings 800 ft. to the south of the main shaft a winze sunk on an ore shoot in a fissure is still showing values. Paloma's deeper workings have been in the limestone with the objective the monzonite contact, but now the work is in the monzonite on the 600 and the drift is making for the limestone. On this contact is the most favorable place for the deposition of ore. It is expected to directly prove that these pockets are from feeders sent out from the main ore bodies in the adjacent contact.

Bingham.

With 500,000 shares, par value 10 cts., the Lucky Six Mining Co. was recently formed to operate a property adjoining the Utah Apex, Jay Gould, Alamo and old Quinn. The first vein has been cut in the tunnel. There is now exposed 2 ft. of shipping grade. It samples 5% copper. A drift has followed the ore for 40 ft. This new adit in Cottonwood gulch is in 150 ft. At 200 ft. the second fissure will be crosscut. Drifts will be sent out to where this north-south fissure intercepts the limestone beddings. These are said to be the same as those in the Utah-Apex, where the ore makes.

Eureka.

It is reported that smelting companies, which some time ago notified mine operators that they could not handle the large supply, have relaxed some and notified mine operators that they can now gradually increase their production until normal is reached.

On the 1700 level Iron Blossom is sending a drift toward the new copper deposit from the No. 1, or main workings. It is a long distance between the No. 1 and No. 3 workings and consequently the face of the 1700 drift is still a few hundred feet from its objective point. The fissure is said to carry occasional bunches and stringers of copper ore. Should the deposit be picked up it will mean that Iron Blossom will have several hundred feet of stoping ground as the ore body was first located on the 700 level and later developed on the 1200.

Eagle & Blue Bell shaft is now completed from the 1832 to the 1925 and some ore saved from this work for shipment. On the 1925 the management started a short drift. After it had gone into ore for 20 ft. the work was stopped and sinking resumed. It is thought that the shaft work will not be stopped again until the 2050 level is reached, when drifting

will again be taken up. In the Eagle & Blue Bell mine water will probably be encountered a short distance below the 2050. On the 1875 level some development work has been done from the new shaft. This station was cut in a lean place in the new ore body. Some fair ore appeared at that depth. At this time a drift is being sent out to get under the winze which followed the ore for 100 ft. below the 1700. This winze was in the high-grade ore the entire distance. About 100 ft. of work should take this drift almost directly below the winze and enable the company to make a connection between the drift and winze by raising from the 1875.

Goldhill.

A railroad to be completed in 90 days is being built in to the Deep Creek district by the Utah Construction Co. It is causing considerable activity among the mining properties. The Wilson brothers have a large force of men working on their properties. They are still shipping considerable scheelite ore from the Seminole Copper ground. This ore is going out by parcel post. On the ground owned by Clarence and Ernest Bamberger a rich strike of copper ore was made recently. The extent of the ore has not been determined, but it is declared that there is an entire face of high-grade material.

Midvale.

The plant of the Midvale Minerals Co. has been completed and the first 2 cars have been sent to the sampler. The lead-zinc concentrates will run about 45% zinc. The new plant was built at a cost of \$100,000, and has a capacity of between 300 and 400 tons of tailings per day, handling the lead-zinc dump of the old U. S. smelter at Midvale, of which there is an amount too large to estimate. The oil flotation process is followed in the plant, in which Janney flotation cells are used in separating the lead from zinc. George Sheldon, mining engineer, is president.

Parowan.

A compressor and other machinery is to at once be installed at the Arrowhead leases, the Mines Development Co. having lease No. 3. The work started last July with an 18-in. vein has widened out until now 7 ft. of shipping ore is in sight. This is 65 ft. deep on the incline from which 2 cars of first-class have been shipped, 2 are on the stock pile and it is estimated that 4 more are in sight. Grab samples made from ore broken in the face gave returns of 39 to 42% lead and 4 ozs. silver. With greater depth other workings in the vicinity show that the leaching has stored up steel galena with a much higher silver content. This is the ore zone that it is proposed to prospect with the new compressor plant to be ordered immediately.

WASHINGTON.

North Port.

The Flanagan property is showing up very good and is now owned and operated by the Iroquois Mining Co. The ledge has been traced through two of three claims and where opened contains 3½ ft. of clean ore, besides the carbonates, which make up a total width of 5 ft. The maximum value in lead is 82%, while the average ranges from 65 to 70%. The vein is distinct and follows a lime diabase dike and a lime contact. Opportunities for economical development could hardly be improved upon as may be gathered from the fact that a depth of 300 ft. may be attained by drifting 360 ft.

Spokane.

The Loon Lake Copper Co., which owns and operates the Loon Lake property, 40 miles north of Spokane, in Stevens county, has authorized the expenditure of \$15,000 in further development, according to Frank G. Crane, secretary-treasurer, who states that the work will begin immediately and will be rushed as rapidly as possible. The mine is to be opened to 300 ft. greater depth, and levels will be run each 100 ft. A 50-hp. boiler and engine, to operate the hoist and pumps, now are being installed, together with a compressor and ventilating system. "When receipts for ore already shipped to the smelter are available we will have

ample funds to complete the proposed development," said Crane. "The work probably will begin next week, when we expect to have the new equipment in operation. We have decided on these plans because of the encouraging showings encountered recently on the 200 level, where a shoot 3 to 7 ft. wide and about 160 ft. long has been stoped to a height of 35 ft. The lowest returns we have received on shipments was 11% copper, while the highest has been 13.75% and the average 12%. We have shipped 6 cars to date this month, and another probably will be forwarded soon. With the 2 cars consigned in the last week of September this will make 9 cars that have been delivered to the smelter in 5 weeks."

WISCONSIN-ILLINOIS.

Platteville.

Deliveries of zinc ore for week ending Oct. 28, totaled 129 cars, 5086 tons. Two cars of lead ore cleared, 70 tons; shipments of pyrites were made as follows: Linden Zinc Co. from Linden, 40 tons; from Cuba, 140 tons; National Separators, Cuba, 366 tons; Mineral Point Zinc Co., 339 tons; Monmouth Zinc Mining Co., crude pyrites, 40 tons. The gross recovery of mine run ore for the week was light, 3692 tons being reported. Shipments to smelter direct were also light, 2804 tons.

The base price of blende advanced during the week, going from \$63.50 to \$65 for standard 60% concentrates. The advance in price gave little stimulus to independent producers, few reporting during the week. Local producers were shut out entirely, the East End mine shipping 1 car, 40 tons. Hodge mine to Cuba, 2 cars, 86 tons.

The Wisconsin Zinc Co. is operating at maximum capacity at all points in the field. Dividend No. 3, 2% quarterly, was paid Oct. 28; eight drilling squads are engaged, one each, at the following prospects: Champion, Monroe-Longhorn, Copeland, Winskill and Raisbeck, in New Diggings district; Harris, at Day Siding; South Cottingham, Millbrig; Calvert, in Benton district. Rich strikes are being made daily. The force at the Champion mine has been raised to 100. The range has been proven for 2000 ft., and the Robbins quarter section to the south and east is being developed.

The Federal mine, one of the Wisconsin Zinc Co.'s producers, has run its course. Another, the East End, has been abandoned and the surface rig dismantled. It is being removed to newly developed producers in the Benton district. The Birkbeck mine, Galena district, is producing 35% concentrates from 8% dirt, but a shortage of labor is holding output down to 100 tons weekly. The Longhorn mine is a new producer on which a new rig is nearing completion, and from which service is expected the 15th. The Skinner Magnetic Separating plant at New Diggings is operating three shifts, and handling 130 tons of concentrates daily, giving an average recovery of 70 tons of 59% blende. Further enlargement of the plant is planned, but no official announcement has been made definitely. The Winskill mine, a Wisconsin Zinc Co. mine, is going double shift with 75 men and making 175 tons of concentrates weekly. The C. A. T. mine, another new producer, is running on a range drilled out for 1500 ft. The dirt runs 15% recovery in concentrates. At all of the zinc ore refineries in the field, a market is now offered all low-grade producers. A Whaley electric shovel in operation at the Champion mine is giving satisfaction. Advantage is shown in furnishing dirt to mill on account of shortage in labor. Official announcement is made that a new 200-ton power and concentrating plant will be built in the spring on the Copeland property in the Shullsberg camp. Uniformly rich strikes are now being made on this property with drilling machines.

Benton.

Frontier mining interests took the lead last week on ore deliveries, shipping 12 cars, 480 tons. New Jersey Zinc Co., Fields Mining & Milling Co. and the Champion mine each 7 cars, total 840 tons. Longhenry, Indian Mound, Grand View and Sally mines contributed a total of 55 cars, 4,392,000 lbs. One car of lead ore cleared 40 tons. Benton Roasters,

high grade ore, to Eagle Picher Lead Co. 3 cars, 100 tons; Wisconsin Zinc Co. from Skinner refinery, to Lanyon Zinc Co. 3 cars 123 tons; Sandoval Zinc Co. 32 tons; Eagle-Picher Lead Co. 4 cars 185 tons.

Cuba City.

Improvement is shown here in shipments of high grade. National shipped 5 cars to Illinois Zinc Co. 196 tons; to Granby Con. 6 cars, 233 tons. Linden Zinc Co. to La Salle 3 cars, 105 tons; to Eagle-Picher Lead Co. 3 cars, 100 tons. Standard Metals Co., Chicago, is sending 1 car low grade to Grasselli Chemical Co. 30 tons; 2 cars to Wisconsin Zinc Co. 65 tons. The G. O. P. Mining Co. has taken over the Big Eight mine and proceeding without delay to provide complete mining and milling facilities. The receipts of raw ore at the National Separating Works, last week ran 20 cars, 801 tons.

Mineral Point.

No returns for the Highland district were shown last week. The Linden camp was light on shipments and strong on crude recoveries. Miffin district shipped 18 cars last week 711 tons. Here the new Senator mine was showing shipments of crude ore in quantity. The Big Tom mine operated by the M. & A. Mining Co. started after extensive development work underground and the completion of a new 200-ton plant. The Peacock Mining Co. an exceptionally heavy dividend payer during 1915 is reporting no dividends at present. The O. P. David mine, at Montfort, operating under the control of the Hump Mining Co. Theo. A. Waech, Supt., is going double shift, with 50 men and making a high grade wet concentrate, assaying 55% zinc. The range mined here for years has veered to the north after trending due east $\frac{1}{2}$ mile. The Mineral Point Public Service Co. is supplying electric power to 20 companies. The total horse power supplied exceeds 4000. A number of new properties are being brought in on the main circuit. The line is now being extended to Cobb and Edmund, two villages on the Northwestern Railway. Receipts of raw ore at the refineries of the New Jersey Zinc Co. were light, only 20 cars coming in for 899 tons. Shipments of high grade finished product to smelter at DePue were 16 cars, 620 tons.

The building of a spur from Strawbridge, a siding on the Galena division of the Northwestern railway, which the officials agreed to put in last spring and which has so far not even been attempted, will be constructed without fail, according to an agreement reached between officials of the New Jersey Zinc Co., Wisconsin Zinc Co. and Vinegar Hill Zinc Co. Other mining corporations deriving benefit from this spur will join in the project. The stub will be 2 miles long, extending to the Skinner Zinc Refinery. A tunnel will be included, 631 ft. long, 14 ft. wide and 20 ft. high. The estimated cost will be about \$80,000. The new outlet will save all the big zinc producers a 4-mile haul overland, and will eliminate hauling ore to and from zinc refinery plants. It is agreed to finish the work of building within 60 days. Incidentally, a most insistent demand from all mining districts to officials of the Northwestern railway that Sunday service be instituted, met with a prompt response, and the service is to be supplied without any delay.

WYOMING.

South Pass.

The Carissa mine, owned by John Spry, Chicago, made a start towards resumption of activities under the management of A. B. Clark, Butte, Mont. Of late Nevada interests have been examining the property with an option to buy. If they do not take the property it will be operated by its owner, with Clark in charge. At present 150 tons of old concentrates that will run around \$125 a ton are being freighted to Lander and shipped. Two cars have been sent out and the rest will be loaded as fast as possible. The present mill will be operated this winter and the work of developing the property continued. Next summer arrangements will be made to increase the capacity of the mill and provide cheaper power. A storage tank for oil which is used in the engines is being built at the mine and everything put in shape for

an all winter's run. While the mill was running this fall the rock averaged around \$40. With high values the property can be operated at a profit despite the cost of power, which is excessive at present owing to lack of fuel.

CANADA.

BRITISH COLUMBIA.

Fairview.

The zinc plant here is being reconstructed to suit the needs of the French Complex Ore Reduction Co. A large electric generator has been ordered from Newport News, Va., and the plant will probably be ready for operation when it arrives. The old roasting furnace has been completely overhauled, a tube mill installed, vats erected and the electrolytic depositing tanks put in place on the site of the old thermo-electric smelting furnace. The cost of reconstruction will not quite reach \$40,000.

Rossland.

An operating profit of about \$10,000 was made by the Le Roi No. 2 mine during August, according to the monthly report, which has just been received from the London office of the company. Shipments of ore totaled 1507 tons. Smelter returns were \$17,380, being payment for 1287 tons. Payment for sundries was \$174, giving a total revenue of \$17,554. Ore production cost \$6000, capital expenditure was \$626, and development, including diamond drilling, was \$7300, making a total of \$7926.

Ashcroft.

President Keffer of the Highland Valley Mining Co. states that a 9-ft. vein has been uncovered at surface. "Returns on the first carload showed a content of 9.6% copper and brought \$1088. The mill, to have a capacity of 55 to 75 tons, will be ready for a trial run within less than a month. Continuance of the surface showings has been proved in part by a tunnel that has attained the 250-ft. point and a depth of 100 ft., where the ore has a width of $8\frac{1}{2}$ ft. Also, it is being proved by a raise near the face of the tunnel and another raise 200 ft. back, which will be used for glory hole operating, and by a winze. The tunnel will be continued 600 ft. Tests have shown an average content of 6%. Twenty thousand tons of ore are available by calculation. Three stringers of good ore have been encountered in driving a tunnel 110 ft. in the Sanson group and while the ore is good the bodies are not large enough to be of value. The Sanson group adjoins and is part of the Highland Valley property, comprised of 11 claims under bond and four we have located."

ONTARIO.

Cobalt.

The Jackson & Jackson interests, Buffalo, N. Y., consist of some 50 properties in both the gold and silver areas of northern Ontario. These have all recently been consolidated. At present all are in the prospect stage.

A drift on the 500 level of Temiskaming shows a 2-in. vein of 5000 oz. ore. The vein has widened out to 5 ins. and the ore is equally rich. An end of a blind, unused drift on the 500 level has been walled off and this place is the storage vault for high-grade. At the present time there is approximately \$100,000 worth of silver in large slabs ready for shipment, stored there.

Raising on the shaft at the Adanac has been completed and the shaft completed to the 325 level. Sinking will be taken taken up immediately to the 425 level. At 408 a level will be established leaving the remaining depth for a sump. When the station is completed a crosscut will be pushed to cut the veins to the west and east, where patches of silver were found on upper levels. This will take exploration down nearer the contact and to a point where the chances of finding ore bodies of some importance are believed more favorable.

At the Peoples mine drifting was recently resumed and the first vein was cut after about 38 ft. of crosscutting on the lower level along the contact. It is being drifted on now while at the same time the crosscut is being continued to cut another vein about 40 ft. ahead.

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See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

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Atkinson, H. J.—*Widening of the Up-cast Shaft at Tinsley Park Colliery, England*. [A paper read before the Midland Inst. of Mg., Civil and Mech. Eng.].—I. & C. Tr. Rev. Oct. 6 1916; p 424; pp 1½*. 35c. Coll'y Guard Oct. 6; p 651; pp 1*; 35c.

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Norris, R. V.—*Coal-Mine Fires*. [Discusses ways for the prevention of the same].—Coal Age Oct. 21 1916; p 666; pp 6*; 20c.

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Williams, R. Y.—*Mine Ventilation Stoppings*. [Costs of construction and maintaining are given with methods of constructing the stoppings, with special reference to Illinois fields].—U. S. Bur. of Mines Bull. 99; pp 30*; 20c.

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—*Mechanical Coal Stage at Dairy-coates, England*. [Drawings and description of the structure are given].—Coll'y Guard. Sept. 22 1916; p 546; pp 1½*; 35c.

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Mingaye, J. C. H.—*The Saving By-Products in Coke Manufacture*. [From the Mineral Resources Bulletin, N. S. W., Dept. of Mines].—Mg. & Engg. Rev. Sept. 5 1916; p 315; pp 3¼; 35c.

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Bearce, H. W.; Peffer, E. L.—*Density and Therman Expansion of American Petroleum Oils*.—U. S. Bur. of Stand. Tech. Paper 77; pp 26*; 20c.

Boulton, W. S.—*Geology and Petroleum Resources*. [Abst. from the presidential address to the Geological Section of the British Assn.].—Petro. World Oct. 1916; p 489; pp 2¼; 35c.

English, Walter A.—*Geology and Oil Prospects of Cuyama Valley, California*. [On the geological structure with respect to oil possibilities].—U. S. G. S. Bull. 621-M; pp 25*.

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McMurray, W. F.; Lewis, James O.—*Underground Wastes in Oil and Gas Fields and Methods of Prevention*. [On the prevention of conditions which reduce production, such as allowing water to enter the sand strata, etc.].—U. S. Bur. of Mines Tech. Paper 130; pp 28*.

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Greaves-Walker, A. F.—*The Operation of a Producer Gas Fired Chamber Kiln*.—B. & C. Rec. Oct. 3; p 595; pp 3½*; Oct. 17 1916; p 711; pp 2½*; 70c.

Huac, A. J.—*Cost Accounting for the Clay Plant*. [Gives forms and description of part of an accounting system].—B. & C. Rec. Oct. 3; p 598; pp 1½*; Oct. 17 1916; p 709; pp 1½*; 70c.

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Gillette, Halbert Powers.—*Handbook of Rock Excavation Methods and Costs*. [Details regarding the different methods used in rock excavation, as drilling, explosives, etc.].—Clark Book Co.; book; pp 835*; \$5.

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III. TECHNOLOGY

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Prospecting

Young, George J.—*Elements of Mining*. [Each of the departments of mine operations, as drilling, ventilation, etc., is considered briefly and separately, giving some details regarding the same].—McGraw-Hill; book; pp 628*; \$5.

Surveying and Drafting

Reeves, Edward A.—*Surveying Past and Present*. [Describes surveying and mapping which was done during the past and present days, being confined mostly to Europe].—Jnl. Roy. Soc. of Arts Sept. 22 1916; p 747; pp 17*; Sept. 29; p 765; pp 14*; 70c.

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sources of District VIII, Illinois. [Detailed description of the deposits and formation surrounding Danville].—State Geol. Surv. Bull 14; pp 68*.

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Gillette, Halbert Powers.—*Handbook of Rock Excavation Methods and Costs*. [Details regarding the different methods used in rock excavation, as drilling, explosives, etc.].—Clark Book Co.; book; pp 835*; \$5.

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Gillette, Halbert Powers.—*Handbook of Rock Excavation Methods and Costs*. [Details regarding the different methods used in rock excavation, as drilling, explosives, etc.].—Clark Book Co.; book; pp 835*; \$5.

Young, George J.—*Elements of Mining*. [Each of the departments of mine operations, as drilling, ventilation, etc., is considered briefly and separately, giving some details regarding the same].—McGraw-Hill; book; pp 628*; \$5.

Shafts and Shaft Sinking

Atkinson, H. J.—*Widening of the Up-cast Shaft at Tinsley Park Colliery, England*. [A paper read before the Midland Inst. of Mng., Civil and Mech. Eng.].—I. & C. Tr. Rev. Oct. 6 1916; p 424; pp 1½*; 35c. Coll'y Guard Oct. 6; p 651; pp 1*; 35c.

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Burrell, G. A.; Robertson, I. W.; Oberfell, G. G.—*Black Damp in Mines*. [Deals with the occurrence of the gas, its effects on various things and methods of sampling].—U. S. Bur. of Mines Bull. 105; pp 88; 20c.

Ventilation

Williams, R. Y.—*Mine Ventilation Stoppings*. [Costs of construction and maintaining are given with methods of constructing the stoppings, with special reference to Illinois fields].—U. S. Bur. of Mines Bull. 99; pp 30*; 20c.

Young, George J.—*Elements of Mining*. [Each of the departments of mine operations, as drilling, ventilation, etc., is considered briefly and separately, giving some details regarding the same].—McGraw-Hill; book; pp 628*; \$5.

Supports: Timbers, Props, Stowing

Crankschaw, H. M.—*Methods of Mining in the Anthracite Field*. [Deals with methods of timbering and running haulage and gangway, etc.].—Coal Age Oct. 7 1916; p 570; pp 5¼*; 20c.

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Lighting

Koch, Richard.—*The Electric Safety Lamp*. [Figures on the cost of upkeep of these lamps].—Coal Age Oct. 7 1916; p 582; pp 1¼*; 20c.

Telephones and Signaling

Hall, Albert E.; McFeely, George.—*Bell and Buzzer Signal System*. [On the installation and operation of the system

in connection with hoisting].—E. & M. J. Oct. 21 1916; p 746; pp 1¼*; 25c.

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Scott, Harry E.—*Safety for Hoisting Engineers*. [Practical experiences in the field].—E. & M. J. Oct. 21 1916; p 745; pp 1; 25c.

Dredging

Payne, Henry M.—*Mining the Frozen Gravels of the Arctic*. [A general account of operations, productions, etc., in Siberia].—Sibley Jnl. Oct. 1916; p 2; pp 4½*; 30c.

Mine Sampling

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Transport

Gillette, Halbert Powers.—*Handbook of Rock Excavation Methods and Costs*. [Details regarding the different methods used in rock excavation, as drilling, explosives, etc.].—Clark Book Co.; book; pp 835*; \$5.

—*Mechanical Coal Stage at Dairy-coates, England*. [Drawings and description of the structure are given].—Coll'y Guard. Sept. 22 1916; p 546; pp 1½*; 35c.

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Fay, A. H.—*Coal Mine Fatalities in the United States in July 1916*.—U. S. Bur. of Mines; pp 28.

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Scott, Harry E.—*Safety for Hoisting Engineers*. [Practical experiences in the field].—E. & M. J. Oct. 21 1916; p 745; pp 1; 25c.

Willcox, Fred H.—*Safe Practice at Blast Furnaces*. [Shows safe and unsafe way of doing things and has notes on some first aid].—U. S. Bur. of Mines Tech. Paper 136; pp 73*; 30c.

Ore and Metal Markets; Prices-Current

New York, Nov. 2, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Nov. 1 were as follows:

		New York, cents.	London, pence.
Oct. 26.....	67 1/2	32 1/2	
27.....	67 1/2	32 1/2	
28.....	67 1/2	32 1/2	
30.....	67 1/2	32 1/2	
31.....	67 1/2	32 1/2	
Nov. 1.....	67 1/2	32 1/2	

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January.....	57 1/2	55 1/2	56.775	48.890	26.875
February.....	57	56 1/2	56.755	48.477	27.000
March.....	60 1/2	56 1/2	57.935	49.926	27.080
April.....	73 1/2	60 1/2	64.415	50.034	31.375
May.....	77 1/2	68 1/2	74.27	49.915	34.182
June.....	68 1/2	62 1/2	65.02	49.072	31.038
July.....	65	60	62.94	47.619	29.870
August.....	67	64	65.50	47.178	31.25
September.....	69 1/2	67 1/2	68.515	48.68	32.18
October.....	.....	.....	.....	49.385	.....
November.....	.....	.....	.....	51.713	.....
December.....	.....	.....	.....	55.038	.....
Year.....	.....	.....	.....	49.690	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Business to a large volume has been done in copper since our last report. Producers and dealers alike state that demand has been very active and buying by both foreign and domestic consumers shows no signs of receding. The situation in copper is unprecedented. Producers have become accustomed to heavy production and consumption, but the fact that a copper buying movement which had its inception early in August still continues brisk as the month of November opens is something without a parallel in the industry. Business is of a nature that indicates the uncovered position of many consumers. Although for many weeks it was assumed that domestic consumers would not be so foolhardy as to allow their requirements over the first quarter of next year to go unprotected, it has been ascertained that several wire drawers and brass makers, all large consumers of copper, have only in the past week bought metal for their December and January requirements and declined to buy beyond the latter month, despite the urgent warnings of the producers. Foreign business has also been very brisk. An inquiry coming from French buyers for 100,000,000 lbs. has been the dominant development. While some well-informed copper factors have been inclined to disbelieve that such an inquiry exists, adequate proof as to its authenticity has been seen. That the allied countries should be in the market for so large an amount after having purchased the enormous total of 448,000,000 lbs. is proof of the greater copper consumption abroad. The new inquiry calls for delivery beginning November, but as these terms are impossible for producers to meet, negotiations are now under way to have the prospective buyers accept later delivery.

Should expansion in refining capacity enable an output of 200,000,000 lbs. a month by January it is likely that some producers will have a few million pounds of copper in excess of their sales. It is observed that producers have not sold up to the full prospective output as the danger of refinery yield not increasing sufficiently still exists. It is estimated that sales already made for delivery in the first half of next year involve fully 80% of the copper that will be produced and with quite a number of consumers adhering to the old policy of covering needs only two months ahead it is manifest that whatever copper remains unsold, or may be produced in excess of expectations, will readily find a market.

The situation in copper exports is peculiar. Since Oct. 1

and up to Oct. 30 exports of only 27,309 tons have been reported from New York, Philadelphia and Baltimore, the three leading ports. Predictions were that exports in the last 5 months of the year would run above 35,000 tons a month, so, therefore, the small shipments in September and also the month just closed are not readily understandable.

A slight easing up in electrolytic at London has been noted since our last report. Standard futures also moved off. However, as the London market is only a nominal affair, subject to government control, the changes fail to exert any repressive influence here.

Quotations for copper per pound at New York for the week ended Nov. 1 were as follows:

		(Four Fourth Quarter Delivery.)		
		Lake.	Electrolytic.	Casting.
Oct. 26.....	28 1/2 @ 29	28 1/2 @ 29	27 1/2 @ 28	
27.....	28 1/2 @ 29	28 1/2 @ 29	27 1/2 @ 28	
28.....	29 @ 29 1/2	29 @ 29 1/2	28 @ 28 1/2	
30.....	29 @ 29 1/2	29 @ 29 1/2	28 @ 28 1/2	
31.....	29 @ 29 1/2	29 @ 29 1/2	28 @ 28 1/2	
Nov. 1.....	29 @ 29 1/2	29 @ 29 1/2	28 @ 28 1/2	

Quotations for copper per ton at London for the week ended Nov. 1 were as follows:

Month.	Standard		Electrolytic.
	Spot.	Futures.	
Oct. 26.....	£124 10 0	£119 10 0	£144 0 0
27.....	124 10 0	119 10 0	143 0 0
28.....	124 10 0	119 10 0	143 0 0
30.....	125 0 0	120 0 0	143 0 0
31.....	124 0 0	119 10 0	142 10 0
Nov. 1.....	124 0 0	119 10 0	143 0 0

MONTHLY AVERAGE PRICES OF COPPER.

		New York—Lake Superior.		
Month.		High.	Low.	Average.
		1916.	1915.	1915.
January.....	25.50	23.00	24.101	13.891
February.....	28.50	25.25	27.437	14.72
March.....	28.25	27.25	27.641	15.11
April.....	30.00	28.50	29.40	17.398
May.....	29.75	28.25	29.05	18.812
June.....	29.25	27.25	27.90	19.92
July.....	27.20	26.10	26.745	19.423
August.....	28.00	25.00	26.320	17.472
September.....	29.00	28.00	28.75	17.758
October.....	.....	.....	.....	17.925
November.....	.....	.....	.....	18.856
December.....	.....	.....	.....	20.375
Year.....	.....	.....	.....	17.617

		New York—Electrolytic.		
Month.		High.	Low.	Average.
		1916.	1915.	1915.
January.....	25.50	23.00	24.101	13.707
February.....	28.50	25.25	27.462	14.572
March.....	28.25	27.25	27.410	14.96
April.....	30.50	28.25	29.65	17.057
May.....	29.75	28.00	28.967	18.601
June.....	29.25	27.25	27.90	19.173
July.....	27.20	26.10	26.745	19.08
August.....	28.00	25.00	26.320	17.222
September.....	29.00	28.00	28.75	17.705
October.....	.....	.....	.....	17.859
November.....	.....	.....	.....	18.826
December.....	.....	.....	.....	20.348
Year.....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

		New York—Casting Copper.		
Month.		High.	Low.	Average.
		1916.	1915.	1915.
January.....	24.25	22.00	23.065	88.008
February.....	27.00	24.12 1/2	26.031	102.760
March.....	27.75	25.50	26.210	106.185
April.....	28.00	26.75	27.70	103.681
May.....	27.75	26.00	26.692	104.794
June.....	25.25	24.00	24.38	94.316
July.....	24.00	23.25	23.80	101.30
August.....	25.50	24.75	24.90	111.100
September.....	25.50	27.00	26.40	116.10
October.....	.....	.....	.....	.....
November.....	.....	.....	.....	.....
December.....	.....	.....	.....	.....
Year.....	.....	.....	.....	.....

Tin.—Buying of tin futures has been very active in the past week, tin plate makers being in the market and taking good amounts for delivery up to and including June. Covering of requirements has followed the filling up of order books of tin plate makers. There still remains a sizable business to be done, but with the east advancing the limits on the active absorption here buyers have temporarily withdrawn from the market. The spot position is very strong and holders are waiting for the October statistics before offering. Other consumers of tin were not in the market to any great extent, but it is expected that when the statistics are announced that buying will be more spread out. Spot Straits tin advanced steadily, touching 42 cts., a price that was predicted early in the month. Spot Banka sold at 41½ cts. On Oct. 1 spot holdings amounted to 3100 tons and it is stated that on Nov. 1 less than 1500 tons tin will be in store here. Arrivals on the Atlantic coast since the first of the month total only 2655 tons and with the country consuming close to 4000 tons a month it is inevitable that spot holdings diminish. Shipments from the Straits are also expected to fall off. Limits from the east for February, March and April shipments were at 40% @ 40½ cts. Straits tin for November delivery sold up to 41½ cts. and as November opened was held at 42 cts. For December delivery sellers did business at 41¼ cts., with January, February and March arrival sold at 41½ cts. London and Singapore have acted irregularly since our last report, but withal prices showed some gains.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Nov. 1 were as follows:

	New York		London.	Singapore,
	Spot.	December.	Straits, spot.	shipments.
Oct. 26.....	42	41½	£182 2 6	£186 5 0
27.....	42	41½	181 5 0	186 10 0
28.....	42	41½	181 5 0	186 10 0
30.....	42	41½	181 10 0	185 10 0
31.....	41¾	41¾	180 15 0	185 5 0
Nov. 1.....	41¾	41¾	180 5 0	183 5 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	62.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.886
September	39.50	38.00	39.00	33.13
October .....	.....	.....	.....	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Demand has been of fair proportions, but there has been nothing in the way of unusual developments. The market has held strong at all times, due to the well sold up condition of producers and the lack of metal in the hands of dealers. The A. S. & R. Co. has adhered to its quotations of 7 cts. New York and 6.92½ cts. St. Louis, much to the surprise of trade factors, who over the entire month were expecting a change. It is stated, however, that these prices were not applied to all business and that many consumers were unable to secure metal at all from the principal producer. Independents are not very anxious to sell for November delivery, having disposed of the bulk of the output for this month, and indications are that a premium market will soon be in full swing. Spot lead was held at 7.20 cts. New York and 7 cts. St. Louis in the outside market. Independents quoted November and December delivery at 7.05 cts. New York and 6.95 cts. St. Louis, but at this writing no business for November can be done at these prices. From a news standpoint the lead situation has little of value, as the conditions obtaining have been detailed here previously. Since Oct. 13 the London market has held unchanged at £30 10s for prompts and £29 10s for futures, a situation that will probably be explained in the mail advices due late this week.

Quotations for lead per pound at New York and per ton at London for the week ended Nov. 1 were as follows:

	New York			London		
	Indpts.	A. S. & R. Co.	Spot.	Spot.	Futures.	Futures.
Oct. 26.....	7.05	7.00	£30 10 0	£29 10 0	£29 10 0	£29 10 0
27.....	7.05	7.00	30 10 0	29 10 0	29 10 0	29 10 0
28.....	7.05	7.00	30 10 0	29 10 0	29 10 0	29 10 0
30.....	7.05	7.00	30 10 0	29 10 0	29 10 0	29 10 0
31.....	7.025	7.00	30 10 0	29 10 0	29 10 0	29 10 0
Nov. 1.....	7.025	7.00	30 10 0	29 10 0	29 10 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London		
	1916.	1915.	1915.	1916.	1915.	1915.
January	High. 6.20	Low. 5.50	Avg. 5.926	High. 5.730	Avg. 31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	22.010
April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	6.75	6.88	5.875	29.760	25.750
July	6.85	6.25	6.37	5.738	28.035	25.611
August	6.70	5.95	6.32	4.750	30.260	22.150
September	7.10	6.70	6.88	4.627	31.25	22.953
October .....	.....	.....	.....	4.612	.....	23.932
November .....	.....	.....	.....	5.152	.....	26.240
December .....	.....	.....	.....	5.346	.....	28.884
Year .....	.....	.....	.....	4.675	.....	23.099

Lead Ore.—Little change was noted in the market of the Missouri-Kansas-Oklahoma district during the week ended Oct. 28. It was firm and prices ranged from \$80 to \$87 as during the previous week. The production for the week of 2,656,855 lbs. was nearly 1,000,000 lbs. more than during the previous week. The total for the year to that date was 86,169,302 lbs., these amounts having respective values of \$13,456 and \$3,571,877.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.60	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	63.50
June	82.50	75.00	76.35	59.00
July	75.00	70.00	71.9875	47.50
August	67.00	63.00	65.625	45.25
September	78.00	65.00	72.50	51.80
October	87.00	70.50	79.875	63.00
November .....	.....	.....	.....	71.375
December .....	.....	.....	.....	63.34
Year .....	.....	.....	.....	63.34

Zinc Ore.—The market during the week was stronger than for some time past and there was a raise in prices, especially during the latter part of the week, when from \$67 to \$75.50 was obtained for ores. The week's production was 18,240,330 lbs. and the total for the year 449,617,820 lbs., which amounts were valued at \$436,286 and \$23,098,824.

Calamine.—The Granby camp in the Missouri-Kansas-Oklahoma district had an exceedingly large production. In all other respects conditions were about the same as during the previous week and prices ranged from \$35 to \$45. There were 4,177,940 lbs. of concentrates produced, making the total for the year 29,889,385 lbs. The value of the week's production was \$83,901 and the year's to date \$919,625.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	116.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	60.00	58.75	60.25
September	65.00	45.00	55.00	76.75
October	75.50	50.00	63.375	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—After galvanizing interests had covered their requirements of spelter over the first quarter of next year, the market subsided, both in activity and prices. As soon as business fell off sellers began to offer at concessions. The variations in spelter are being studied with more than usual interest. It is noted that with the advent of demand the price advances quickly and quite sharply, but following the suspension of buying the reaction is just as rapid and as sharp. Producers disclaim partaking in the fluctuations, asserting that they are holding to their established quotations.

It is noted that dealers are the chief seekers of business and that the lowest quotations are obtainable from them. Spot prime western is now quoted at 10.20 cts. New York and 10 cts. St. Louis, while for first quarter sellers are offering at 9½ cts. and would probably shade to 9¼ cts. on firm offers. Producers report that some important brass makers are shortly to enter the market. Some galvanizers have again been nibbling, but the prices they offered did not attract sellers. Brass special has held steady at 10¼@11 cts. St. Louis for spot. At London the market has had a reaction, carrying spot down to £53 5s and futures to £50 15s.

Quotations for spelter per pound at New York and per ton at London for the week ended Nov. 1 were as follows:

		New York.	London	
		Spot.	Spot.	Futures.
Oct.	26.....	10.30	£54 0 0	£51 0 0
	27.....	10.30	54 0 0	51 0 0
	28.....	10.30	54 10 0	51 0 0
	30.....	10.20	53 5 0	50 15 0
	31.....	10.45	52 15 0	50 15 0
Nov.	1.....	10.55	52 10 0	50 10 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	1916	1915	1916	1915	
	High.	Low.	Avg.	Avg.	Avg.
January	19.42½	17.30	18.801	6.519	39.840
February	21.17½	18.67½	20.094	8.866	97.840
March	20.50	16.50	18.40	10.125	100.720
April	19.37½	17.75	18.76	11.48	98.103
May	17.50	13.75	15.98	15.825	89.507
June	13.62½	11.25	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August	9.75	8.37½	9.11½	16.110	56.00
September	9.70	8.12½	9.22	14.493	51.30
October				14.196	
November				16.875	
December				16.675	
Year				13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Business in quicksilver has been limited with the market holding strong and unchanged at \$80 per flask for spot virgin metal. Sellers report that supplies are none too plentiful, with buying fairly steady. Investigation developed the fact that sellers are not so optimistic as to further price advances. Generally it appears that quicksilver has been pegged at \$80 per flask, a price that sellers and producers are pleased to obtain.

Manganese Ore.—The situation in Cuba respecting manganese ore is similar to that obtaining with tungsten ore producers. High prices months ago induced holders of low-grade properties to begin operations, with the result that the demand was satiated. Prices receded and the lower level of earnings are insufficient for many operators. Latest advices from Cuba state that quite a number of the mines are being closed and that many operators will sustain considerable losses. The demand for manganese ore has been very dull. Sellers here report that no business at all has been taken in the past month. Cuban ore, 40% metal contents, is quoted at 55@60 cts. per unit. Some sellers quote chemical ore at 3½ cts., but others are asking 4½ cts.

Antimony.—The market has again become soft, due to the absence of business. Spot supplies are scarce, but sellers are freely offering December metal. With consumers well covered, the spot scarcity is of little benefit to producers. Spot antimony is quoted at 12 cts. in bond, but some Chinese sellers are asking 12½@13½ cts. duty paid New York. There have been some Russian and Italian inquiries in the market, but nothing has been done on them.

Tungsten.—A sizable business in tungsten has been done during the month of October. The earlier reports of inactivity were obtained from interests who were handling the product of producers who have been holding for more money. Sales of about 450 tons were closed during October at prices ranging from \$16 to \$17 per unit. Quite a little foreign ore figured in the transactions. This week tungsten ores were advanced to \$18 a unit for high-grade containing

very little phosphorus, with other grades quoted at \$17. The Atolia Mining Co., whose plant has been closed for some time past, is expected to resume operations in the near future. Most of the business done has been for spot delivery, but some sizable orders for delivery over all of next year have been booked.

Aluminum.—Sellers report the market as being quiet without any change in the general situation. Prompt virgin ingots are quoted at 64@66 cts., with No. 1 remelted at 60@62 cts. and No. 12 alloy at 47@49 cts. No. 1 virgin ingots for 1917 delivery on contracts are quoted at 35 cts.

PRICES-CURRENT.

Acids —Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06½	to	.06½
Nitric, 40 deg.....	.06½	to	.07
Alcohol —U. S. P., gal., Grain, 190 proof.....	2.74	to	2.75
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.75	to	.80
Denatured, bbl.....	.60	to	.62
Alum —Powdered, lb.....	.04½	to	.04½
Lump, lb.....	.04	to	.05½
Ground, lbs.....	4.10	to	4.12½
Ammonia —			
Muriate, white grain, lb.....	.10½	to	.11½
Muriate, lump.....	.17	to	.18
Arsenic —White, lb.....	.05½	to	.06
Red, lb.....	.62½	to	.65
Barium Chloride —Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.15
Bismuth —Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder —			
Drums, 100 lbs.....	4.50	to	5.00
Borax —100 lbs., car lots.....	7.75	to	8.00
Coke —Connellsville furnace.....	5.00	to	6.00
Foundry.....	8.00	to	8.50
Copperas —Spot, bbl.....	1.35	to	1.50
Ferrosilicon , 50%.....			100.00
Ferrosilicon , 50%.....			85.00
Ferrotitanium , per lb.....	.08	to	.12½
Fuller's Earth , 100 lbs.....	.80	to	1.05
Glaucers Salts , bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore —			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
Lead —Granulated, lb.....	.14½	to	.15½
Brown sugar.....	.11½	to	.11½
White crystals.....	.13	to	.13½
Broken, cakes.....	.12½	to	.13
Powdered.....	.13½	to	.14
Litharge , American, lb.....	.09	to	.09½
Mineral Lubricants —			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 20 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin —High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt , double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum —			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum —Oz. ref.....	90.00	to	96.00
Potash Fertilizer Salts —			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium —			
Bichromate.....	.39½	to	.40
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.65	to	.67½
Prussiate, red.....	2.00	to	2.10
Salt peter —Crude, lb.....	.12	to	.14
Refined.....	.30½	to	.31
Soda —Ash, 48% (43% basis), bbl.....	2.90	to	3½
Strontia Nitrate , casks, lb.....	.32	to	.35
Sulphur —			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin —Bichloride, 50°, 100 lbs.....	.13½	to	.14
Crystals, bbls., lb.....	.28	to	.29½
Oxide, lb.....	.44	to	.46
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid In 1916	Total to date	Latest						Paid In 1916	Total to date	Latest	
						Date	Am't.							Date	Am't.
Acacia, g.....	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.....	Colo.	490,916	\$1	\$.....	\$98,916	Sept. '01	\$0.01
Adams, s l c.....	Colo.	80,000	10	.....	778,000	Dec. 18, '09	.04	Golden Star, g.....	Ariz.	400,000	5	.....	120,000	Mar. 15, '10	.05
Adventure, c.....	Mich.	100,000	25	.....	50,000	July 20, '16	.50	Gold' Con. Fra. g..	Nev.	922,000	1	.....	92,111	Oct. 16, '09	.10
Alhamek c.....	Mich.	200,000	25	2,000,000	6,050,000	Oct. 10, '16	4.00	Goldfield Con.....	Nev.	3,559,148	10	.....	28,999,831	Oct. 31, '10	.10
Alaska Goldfields..	Alaska	150,000	5	.....	403,250	Jan. 10, '15	.16	Good Hope, g.....	Colo.	550,000	100	.....	941,250	Jan. '03	.25
Alaska Mexican, g..	Alaska	160,000	5	.....	3,507,331	Nov. 28, '15	.10	Good Sp. Anchor, z.s	Nev.	550,000	1	33,000	119,750	June 15, '16	.01
Alaska Mines Sec.,	U. S..	600,000	6	.....	90,000	Nov. 1, '05	.....	Grand Central, g.....	Utah	600,000	1	20,000	1,635,250	Oct. 25, '16	.04
Alaska Treadwell, g	Alaska	200,000	25	250,000	15,780,000	May 29, '16	.50	Grand Gulch, c. & s.	Nev.	239,345	2.50	17,799	19,187	Sept. 6, '16	.03
Alaska United, g.....	Alaska	180,200	5	54,060	2,045,270	Feb. 28, '16	.30	Granite, g.....	Alaska	430,000	1	17,200	17,200	May 10, '16	.02
Alouez.....	Mich.	100,000	25	700,000	800,000	Oct. 4, '16	2.50	Gwin, g.....	Cal..	100,000	10	.....	481,500	Feb. '06	.25
Amalgamated, c.....	Mont.	1,538,829	100	.....	103,444,983	Aug. 30, '15	3.77	Hazel, g.....	Cal..	900,000	1	.....	1,114,000	Jan. 5, '15	.01
Am. Sm. & R. com	U. S..	500,000	100	2,500,000	31,833,333	Sept. 1, '16	1.50	Hecla, z l.....	Idaho	1,000,000	0.25	1,250,000	5,005,000	Oct. 20, '16	.15
Am. Sm. & R. pf..	U. S..	500,000	100	2,625,000	57,421,386	Sept. 1, '16	1.75	Hercules.....	Idaho	1,000,000	1	2,250,000	13,300,000	Oct. 16, '16	.20
Am. Sm. Sec. A pf..	U. S..	170,000	100	1,020,000	11,720,000	Oct. 2, '16	1.50	Hidden Treasure, g.	Cal..	30,000	10	.....	457,452	Sept. '00	.10
Am. Sm. Sec. B pf..	U. S..	300,000	100	1,400,000	12,010,000	Oct. 2, '16	1.25	Holy Terror, g.....	S. D..	500,000	1	.....	172,000	Jan. '00	.01
Am. Zinc, L. & Sm	Mo..	192,120	25	2,756,180	3,906,000	Aug. 1, '16	1.50	Homestake, g.....	S. D..	251,160	100	1,632,540	37,339,248	Oct. 25, '16	.65
Anaconda, c.....	Mont.	2,331,250	50	11,656,250	175,914,471	Aug. 28, '16	2.00	Hope Silver.....	Cal..	400,000	1	40,000	5,182,000	June 30, '16	.06
Annie Laurie, g.....	Utah..	25,000	10	.....	439,561	Apr. 22, '05	.50	Imperial, c.....	Ariz..	500,000	10	.....	300,000	June 24, '07	.01
Argonaut, g.....	Cal..	200,000	6	.....	1,685,000	Sept. 25, '16	.07%	Inspiration Con.....	Ariz..	920,687	20	5,454,989	5,454,989	Oct. 31, '16	2.00
Arizona, c.....	Ariz..	100,000	25	521,184	2,124,184	Apr. 1, '16	.....	Intermountain, c.....	Mont.	1,815,820	1	8,076	8,076	Oct. 20, '18	.005
Atlantic, c.....	Mich.	100,000	25	.....	990,000	Feb. 21, '05	.50	Inter'l Nickel, com.	U. S..	1,673,384	25	7,948,574	33,451,414	Sept. 1, '16	2.00
Bagdad-Chase, g. pf	Cal..	84,819	5	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, pf..	U. S..	89,126	100	401,067	5,748,613	Aug. 1, '16	1.50
Bald Butte, g. s.....	Mont.	250,000	1	.....	1,354,648	Nov. 1, '07	.40	Intern'l Sm. & Ref.	U. S..	100,000	100	.....	4,100,000	May 2, '14	2.00
Baltic, c.....	Mich.	100,000	25	.....	7,960,000	Dec. 31, '13	2.00	Interstate Callahan	Idaho	464,990	10	2,092,455	4,649,900	Sept. 30, '16	1.50
Barnes-King, g.....	Mont.	40,000	6	80,000	60,000	June 1, '16	.07%	Iowa, g. s. l.....	Colo..	1,666,667	1	.....	270,167	Dec. 31, '16	.00%
Beck Tunnel Con.....	Utah..	1,000,000	0.10	.....	940,000	Nov. 15, '07	.02	Iowa Tiger, g. s. l..	Colo..	3,000	1	.....	25,179	Jan. 15, '16	.50
Big Four Expl.....	Utah..	400,000	1	100,000	110,000	Sept. 4, '16	.05	Iron Blossom, l. s. g.	Utah..	1,000,000	1	360,000	2,850,000	Oct. 30, '16	.10
Board of Trade, z.....	Wis..	120,000	1	.....	78,000	Jan. 15, '11	.05	Iron Cap pf. c.....	Ariz..	33,481	10	5,422	29,803	July 1, '16	.35
Bonanza Dev.....	Colo..	300,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Clad, g.....	Colo..	1,000,000	1	.....	50,000	Nov. '06	.05
Booth (Reorganized)	Nev..	998,296	6	349,949	349,949	June 25, '16	.05	Iron Silver.....	Colo..	500,000	20	.....	5,050,000	Dec. 31, '13	.10
Boes, g.....	Nev..	408,500	1	.....	40,850	Dec. 10, '11	.10	Isabella, g.....	Colo..	2,250,000	1	.....	742,500	Mar. '01	.01
Boston & Colo. Sm.	Mont.	100,000	25	.....	402,000	Oct. '02	.75	Isle Royale, c.....	Mich.	150,000	25	450,000	604,900	Oct. 31, '16	2.00
Bost. & Mont. Con.	Colo..	200,000	25	.....	63,225,000	May 15, '11	4.00	Jamison, g.....	Cal..	390,000	10	.....	378,300	Jan. '11	.02
Breeca, l. s.....	Cal..	300,000	1	.....	203,315	Sept. 15, '15	.05	Jerry Johnson, g.....	Colo..	2,500,000	10	.....	187,500	Nov. 5, '14	.00%
Brunswick Con. g.	Utah..	100,000	10	.....	2,788,400	July 11, '08	.10	Jim Butler.....	Nev..	1,718,020	1	343,604	515,406	Aug. 1, '16	.10
Bullion-B & Champ	Cal..	200,000	1	60,000	871,000	Oct. 4, '16	.02%	Joplin Ore & Selter	Mo..	400,000	5	62,000	62,000	July 22, '16	.04%
Bunker Hill Con. g.	Idaho	327,000	1	1,397,750	18,162,750	Oct. 5, '16	.20	Jumbo Ext. g.....	Nev..	1,550,000	1	194,000	684,998	June 30, '16	.05
Bunker Hill & Bull	Mont.	76,000	10	844,662	1,054,119	Apr. 10, '16	10.50	Kendall, c.....	Mont.	600,000	6	50,000	1,556,000	Apr. 3, '16	.10
Butte Alex Scott.....	Mont.	260,000	10	.....	125,000	Aug. 1, '10	.50	Kenebec Zinc.....	Mont.	200,000	.....	60,000	60,000	June 30, '16	.10
Butte-Ballaklava, c.	Mont.	260,000	10	.....	4,700,000	Dec. 1, '11	.25	Kennecott, c.....	Alas..	2,790,999	10	11,200,000	16,200,000	Sept. 30, '16	1.50
Butte Coalition, c..	Mont.	1,000,000	15	.....	13,196,758	Sept. 30, '16	6.25	Kennedy, g.....	Cal..	100,000	100	.....	1,801,001	June '00	.06
Butte & Superior, c.	Mont.	272,697	10	7,676,734	1,584,231	Oct. 5, '16	.03	King of Arizona, g.	Ariz..	200,000	1	.....	396,000	Aug. 2, '08	.12
Caledonia, l. s. c.....	Idaho	2,605,000	1	791,500	1,584,231	Oct. 5, '16	.03	Klar Piquet, z.....	Wis..	20,000	1	.....	187,500	Dec. 18, '12	.25
Calumet & Ariz. c..	Ariz..	641,923	10	3,849,522	26,997,377	Sept. 25, '16	2.00	Knob Hill, g.....	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%
Calumet & Hecla, c.	Mich.	100,000	25	5,000,000	134,250,000	Sept. 22, '16	20.00	La Fortuna, g.....	Ariz..	250,000	1	.....	1,200,600	Oct. 1, '02	.01%
Camp Bird, g.....	Colo..	1,750,000	25	112,584	10,243,964	Jan. 1, '16	.17%	Lake View.....	Utah..	500,000	.05	80,000	114,500	June 1, '16	.01
Cardinal, l. c.....	Utah..	500,000	1	375,000	60,000	Sept. 19, '16	.25	Last Dollar, g.....	Colo..	1,600,000	1	.....	180,000	Feb. 23, '03	.02
Carina, g. s. c.....	Utah..	600,000	25	.....	60,000	Dec. '06	.01	Liberty Bell, g.....	Colo..	133,551	6	.....	1,762,795	Jan. 31, '16	.05
Centennial, c.....	Mich.	1,000,000	1	100,000	100,000	Sept. 1, '16	1.00	Lighthouse, g.....	Cal..	102,255	1	.....	331,179	June '08	.05
Centennial Eureka,	Utah..	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Linden, z.....	Wle..	1,020	10	.....	11,200	Dec. 31, '16	3.00
Center Creek, l. z..	Mo..	100,000	10	85,000	750,000	Oct. 1, '16	.10	Little Bell, s. l.....	Utah..	300,000	1	15,000	75,000	Apr. 22, '16	.06
Central Eureka, g..	Cal..	100,000	1	.....	799,159	Mar. 5, '06	.05	Little Florence.....	Nev..	1,000,000	1	.....	430,000	Jan. '09	.03
Century, g. s. l.....	Utah..	1,000,000	1	44,000	392,087	Feb. 15, '16	.06	Lost Packer.....	Idaho	150,000	1	.....	37,600	Oct. 23, '13	.25
Cerro Gordo, l. s. z.	Cal..	1,000,000	1	25,000	25,000	Sept. 23, '16	.02%	Lower Mammoth.....	Utah..	1,000,000	1	.....	67,000	Dec. 16, '16	.01
Champion, c.....	Mich.	100,000	25	6,280,000	16,290,000	Oct. 8, '16	6.40	MacNamara, g. s.....	Nev..	734,678	1	.....	46,800	Apr. 23, '05	12.00
Chief Con.....	Utah..	852,946	1	132,723	453,399	Aug. 2, '16	.05	Magma, c.....	Ariz..	240,000	5.00	360,000	600,000	Sept. 30, '16	.50
Chino Copper c.....	N. M..	869,980	5	5,002,385	11,700,377	Sept. 30, '16	2.25	Manhattan, g. s. c.	Utah..	400,000	.10	60,000	2,390,000	Sept. 30, '16	.06
C. K. & N. g.....	Colo..	1,431,900	1	.....	171,826	Nov. '04	.01	Manhattan Big 4, g.	Nev..	782,400	1	.....	1,189,308	July 28, '14	.02
Chlor, g.....	Utah..	300,000	1	.....	115,000	Feb. 5, '14	.06	Mary McKinney, g.	Colo..	1,309,282	1	.....	93,106	May 1, '16	.07
Chlor, g. s. l.....	Utah..	300,000	1	.....	90,000	Jan. 1, '13	.10	Mary Murphy, g. s. l.	Mich.	370,000	6	25,867	93,106	May 1, '16	.07
Clinton, g. s. c.....	Colo..	1,000	100	.....										

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest Date	Amt.					Paid in 1916	Total to Date	Latest Date	Amt.
Petro, g. s.	Utah	500,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success.....	Ida.	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03
Pharmacist, g.	Colo.	1,500,000	100	.....	91,500	Feb. 1, '10	.00	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Oct. 10, '16	1.00
Phelps, Dodge & Co	U. S.	450,000	100	9,000,000	67,371,527	Sept. 30, '18	8.00	Superior & Pitta, c.	Ariz.	1,499,792	10	.....	10,318,568	Dec. 21, '15	.38
Pioneer, g.	Alaska	5,000,000	1	.....	2,041,526	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	.....	9,420,000	July 23, '07	4.00
Pittsburg, I. z.	Mo.	1,000,000	1	.....	20,000	July 16, '07	.02	Tamarack-Custer.....	Idaho	2,000,000	1	71,050	71,050	Aug. 30, '16	.02
Pittsburg-Idaho, I.	Ida.	1,000,000	1	42,600	291,004	Oct. 2, '16	.04	Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75
Pitts Silver Peak	Nev.	2,790,000	1	.....	840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100	.....	160,000	Jan. 3, '14	.....
Platteville, I. z.	Wis.	600	60	.....	179,500	June 16, '02	10.00	Tomboy, g. s.	Colo.	310,000	5	74,400	3,861,555	June 30, '16	.24
Plumas Eureka, g.	Cal.	150,625	10	.....	2,831,294	Apr. 8, '01	.06	Tom Reed, g.	Ariz.	909,555	1	.....	2,555,934	Sept. 5, '15	.01
Plymouth Con.	Cal.	240,000	5	116,500	289,300	Aug. 10, '16	.24	Ton-Belmont, g.	Nev.	1,600,000	1	750,000	8,393,027	Oct. 2, '16	.12
Portland, g.	Cal.	1,000,000	1	360,000	10,637,080	Oct. 20, '16	.03	Ton-Extension, g. s.	Nev.	1,272,901	1	604,580	1,591,776	Oct. 1, '16	.15
Prince Con., s. l.	Nev.	1,000,000	2	200,000	325,000	Oct. 5, '16	.02	Tonopah, g. s.	Nev.	1,000,000	1	600,000	13,600,000	Oct. 21, '16	.15
Quartette, g. s.	Nev.	100,000	10	.....	375,000	July 31, '07	.20	Tonopah Midway, g.	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.05
Quicksilver, pf.	Cal.	43,000	100	.....	1,931,411	Apr. 8, '03	.60	Tremula	Cal.	200,000	2.50	.....	234,000	Apr. 28, '15	.02
Quip, g.	Wash.	1,500,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,100,000	Oct. 30, '12	3.00
Quincy, c.	Mich.	110,000	25	1,210,000	22,987,500	Sept. 25, '16	4.00	Tuolumne, c.	Mont.	800,000	1	.....	495,535	Apr. 15, '13	.10
Ray Con., c.	Ariz.	1,571,279	10	2,743,748	7,322,000	Sept. 30, '16	.75	Uncle Sam Con., s.	Utah	500,000	1	.....	470,000	Sept. 20, '11	.05
Red Metal, c.	Mont.	100,000	10	.....	1,200,000	Apr. 1, '07	.40	Union Basin, z.	Ariz.	335,350	1	.....	167,070	Nov. 16, '15	.10
Red Top, g.	Nev.	1,000,000	1	.....	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	.....	1,500,000	Apr. 15, '07	.40
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01	United, c. com.	Mont.	450,000	100	.....	612,000	Aug. 6, '07	1.75
Richmond, g. s. l.	Nev.	54,000	1	.....	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	.....	211,527	Oct. 15, '02	.50
Rocco-Home, I. s.	Nev.	300,000	1	.....	162,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Rochester Ld. & L.	Mo.	4,900	100	.....	190,846	July 1, '12	.60	United (Crip. Ck.)	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev.	889,018	1	.....	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	1,173,000	3,749,000	Sept. 30, '16	19.00
Sacramento, g.	Utah	1,000,000	5	.....	308,000	Oct. 22, '08	.00	United Metals Sell.	U. S.	50,000	100	.....	11,000,000	Sept. 23, '10	5.00
St. Joseph, I.	Mo.	1,409,485	10	1,761,830	12,029,729	Sept. 20, '16	.75	United Verde, c.	Ariz.	300,000	10	3,150,000	38,947,000	Oct. 1, '16	.75
St. Mary's M. L.	Mich.	160,000	25	2,720,000	7,520,000	Oct. 14, '16	.20	United Verde Ext.	Ariz.	1,000,000	50	500,000	500,000	Aug. 1, '16	.60
Schenck-Wal'n. z.	Mo.	10,000	10	.....	90,000	Sept. 20, '11	.20	U. S. Red & R. com.	Colo.	59,188	100	.....	414,078	Oct. 9, '03	1.00
Scratch Gravel.	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,458	100	.....	1,776,936	Oct. 1, '07	1.60
Seven Tro. Con., g. s.	Nev.	1,443,077	1	36,076	25,532	Apr. 1, '16	.02	U. S. R. & M. com.	US Mx	351,116	50	1,316,681	7,941,681	Oct. 15, '16	1.00
Shannon, c.	Ariz.	300,000	10	1,665,300	750,000	Jan. 30, '13	.60	U. S. R. & M. pf.	US Mx	485,350	1	15,813,922	15,813,922	Oct. 15, '16	.87
Shattuck-Ariz., c.	Ariz.	100,000	10	.....	4,637,000	Oct. 30, '16	1.25	Utah, c.	Utah	1,624,490	10	13,808,165	46,530,062	Sept. 15, '16	3.00
Silver Hill, g.	Nev.	108,000	1	.....	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	528,200	5	396,154	462,179	Sept. 30, '16	.25
*Silver King Coal'n	Utah	1,250,000	5	750,000	14,334,985	Oct. 1, '16	.15	Utah Con., c.	Utah	300,000	5	876,000	9,825,000	Sept. 26, '16	.75
Silver King Con.	Utah	637,562	1	191,274	1,006,131	Oct. 22, '15	.10	Utah M. & T. f.	Utah	750,000	1	325,000	1,285,492	Aug. 15, '16	.50
Silver Mines Expl.	N. Y.	10,000	100	.....	250,000	June 16, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00
Stour Cons., I. s. c.	Utah	745,389	1	.....	872,106	July 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	207,500	207,500	Apr. 23, '10	.04
Skidoo, g.	Cal.	1,000,000	5	.....	366,000	Oct. 2, '14	.01	Vindicator Con., g.	Colo.	1,600,000	1	225,000	3,487,500	Oct. 25, '16	.06
Smuggler, s. l. z.	Colo.	1,000,000	1	.....	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D.	600,000	1	100,000	619,466	May 15, '16	.02
Snowstorm, c.	Idaho	1,500,000	1	.....	1,189,610	Oct. 10, '13	.01	Wellington, I. z.	Colo.	10,000,000	1	600,000	1,250,000	Oct. 1, '16	.02
Socorro, c.	N. M.	377,342	5	66,599	196,070	Sept. 1, '16	.05	West End Con.	Nev.	1,788,486	1	89,424	625,369	Oct. 24, '16	.05
South Eureka, g.	Cal.	299,981	1	167,920	1,409,754	Aug. 15, '16	.07	West Hill	Wis.	20,000	1	8,000	40,000	June 29, '16	.20
South Hecla, g.	Ida.	500,000	1	39,450	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal.	200,000	10	60,000	190,000	Aug. 25, '16	.01
So. Swansea, g. s. l.	Utah	300,000	1	.....	287,500	Apr. 3, '04	.01	Wilbert	Ida.	1,000,000	1	40,000	40,000	Aug. 15, '16	.01
Spearfish, g.	S. D.	1,500,000	1	.....	165,870	Dec. 31, '07	.12	Wolverine, c.	Mich.	60,000	25	720,000	1,015,750	May 1, '16	6.00
Standard Con., g. s.	Cal.	178,394	10	.....	5,744,408	Nov. 17, '13	.25	Wolverine & Ariz. c.	Ariz.	118,674	15	.....	53,003	Dec. 15, '15	.25
Standard, c.	Ariz.	425,000	1	.....	69,600	Sept. 8, '05	.60	Work, g.	Colo.	1,500,000	1	.....	1,597,686	Apr. 31, '12	.02
Stewart, I. z.	Idaho	1,238,352	1	.....	2,043,297	Dec. 31, '15	.05	Yak.	Colo.	1,000,000	1	190,000	2,197,685	Sept. 30, '16	.07
Stratton's Crip. Ck.	Colo.	2,000,000	1	.....	300,000	Sept. 6, '08	.02	Yankee Con., g. s. l.	Utah	1,000,000	1	.....	167,500	Feb. 1, '13	.01
Stratton's Ind.	Colo.	1,000,000	5	.....	6,028,568	Dec. 23, '06	.12	Yellow Aster, g.	Cal.	100,000	10	28,000	1,200,786	Oct. 6, '16	.05
Str'n's Ind. (new) g.	Colo.	1,000,000	30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine, z. l. s.	Nev.	1,000,000	1	800,000	1,693,006	Oct. 25, '16	.10
Strong, g.	Colo.	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	.....	102,583	July 15, '14	.10

Corrected to November 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest Date	Amt.					Paid in 1916	Total to Date	Latest Date	Amt.
Ajuchitlan	Mex.	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrilas	Mex.	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00
Amistad y Concordia g.s	Mex.	8,600	50	.....	429,358	July 15, '08	1.28	La Roi No. 2, g.	B. C.	120,000	25	.....	1,627,320	Dec. 15, '16	\$0.24
Amparo, s. g.	Mex.	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.05	Lucky Tiger	Mex.	715,337	10	.....	386,281	Oct. 20, '16	.10
Barlo de Medina Mill	Mex.	2,000	25	.....	105,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,692	1	269,724	4,877,492	Oct. 2, '16	.03
Batopilas, s.	Mex.	446,250	20	.....	68,570	Dec. 31, '07	.12	Mexican, I. pf.	Mex.	12,500	100	.....	1,015,750	May 1, '12	3.50
Beaver Con. s.	Ont.	2,000,000	1	60,000	710,000	Apr. 23, '16	.03	Mexico Con.	Mex.	240,000	10	.....	560,000	Mar. 10, '16	.05
Bleed, g.	Mex.	120,000	20	.....	721,571	May 8, '11	6.00	Mexico Mines of El Oro	Mex.	150,000	5	.....	4,478,500	June 26, '14	.96
British Columbia, c.	B. C.	591,709	6	.....	615,399	Jan. 5, '16	.15	Minas Pedrazzini	Mex.	1,000,000	1	.....	497,500	Jan. 23, '11	.06
Buena Tierra	Mex.	330,000	6	.....	160,380	Jan. 30, '16	.24	Mines Co. of Am.	Mex.	900,000	10	.....	4,958,600	July 25, '13	12
Buffalo, Ont.	Ont.	1,000,000	1	.....	2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can.	2,075,000	1	570,625	1,348,750	Sept. 30, '16	.15
Canadian Goldfields	Can.	500,000	0.10	.....	237,099	July 15, '14	.01	Montezuma, I. pf.	Mex.	5,000	100	.....	402,500	Nov. 15, '12	3.50
Cananea Central, c.	Mex.	500,000	10	.....	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex.	500,000	1	.....	100,000	July 20, '09	.04
Cariboo-Cobalt	Ont.	1,000,000	1	.....	295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11
Cariboo-McKinney, g.	B. C.	1,250,000	1	.....	56,250	Dec. 1, '09	.00	Nalca, s. l.	Mex.	100,300	100	.....	3,190,000	Oct. 11, '09	\$283
City of Cobalt	Ont.	500,000	1	.....	138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	200.00	4,050,000	Oct. 20, '16	.50
Cobalt Central, s.	Ont.	3,000,000	1	.....	492,845	Aug. 29, '09	.01	Nipissing, s.	Ont.	1,200,000	5	1,500,000	14,940,000	Oct. 20, '16	.02
Cobalt Lake, s.	Ont.	3,000,000	1	.....	465,000	May 23, '14	.02	North Star, s. l.	B. C.	1,800,000	1	.....	533,000	Feb. 1, '10	.02
Cobalt Silver Queen	Ont.	1,500,000	1	.....	315,000	Dec. 1, '08	.03	Paloma, g.	Mex.	3,000	.....	.....	99,600	Dec. 1, '12	5.00
Cobalt Townsite, s.	Ont.	199,252	6	.....	1,042,259	Aug. 20, '14	.24	Panuco	Mex.	10,000	.....	.....	7,465,000	Nov. 4, '09	6.00
Conlagas, s.	Ont.	800,000	6	400,000	8,240,000	Aug. 5, '16	.25	Pencoles, s. g.	Mex.	120,000	20	.....	5,451,687	Sept. 13, '13	1.25
Con. Mg. & Sm. g. s. c.	B. C.	63,050	100	631,204	2,951,341	Oct. 1, '16	2.50	Peregrina, pf.	Mex.	10,000	100	.....	328,656	Sept. 1, '10	3.50
Crown Reserve, s.	Ont.	1,999,957	1	.....	6,102,408	July 15, '15	.03	Peterson Lake	Ont.	2,401,820	1	126,096	382,319	Oct. 2, '16	.01
Dolores	Mex.	400,000	6	.....	1,374,965	July 24, '11	.22	Pinguilo, pf.	Mex.	20,000	100	.....	780,000	Apr. 15, '13	3.00
Dome Mines, s.	Ont.	400,000	10	600,000	1,000,000	Sept. 1, '16	.50	Porcupine Crown	Ont.	2,000,000	1	240,000	660,000	Oct. 2, '16	.03
Dos Estrellas, (El Oro)	Mex.	300,000	0.50	.....	15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex.	6,000	15	.....	963,360	Apr. 1, '08	1.00
El Favor	Mex.	3,600,000	1	.....	210,000	Apr. 30, '14	.01	Rambler-Cariboo	B. C.	17,600	100	70,000	490,000	Aug. 16, '16	.01
El Oro, g. s.	Mex.	1,147,500	1	.....	9,156,842	July 11, '13	.24	Rea Mines, Leasing	Ont.	200,000	1	.....	12,750	Feb. 20, '16	.06
El Rayo, g. s.	Mex.	200,000	1	.....	140,410	Apr. 24, '11	.15	Rigi of Way	Ont.	1,683,410	1	25,281	569,000	Sept. 15, '16	.005
El Triunfo, c.	Mex.	2,000,000	1	.....	20,000	Aug. 24, '11	.01	Rio Plata	Mex.	374,515	5	.....	344,754	Feb. '13	.03
Esperanza, g. s.	Mex.	450,000	5	.....	12,521,250	Dec. 31, '16	.15	San Francisco Mill	Mex.	6,000	25	.....	445,056	Oct. 15, '08	1.00
Granby Con. c. g. s.	B. C.	149,955	100	749,928	6,350,311	Aug. 1, '16	2.00	San Rafael	Mex.	2,400	25	.....	6,798,260	Jan. 11, '12	2.00
Greene-Cananea, c.	Mex.	474,411	100	2,431,405	6,666,850	Aug. 28, '16	2.00	San Toy, s. l.	Mex.	5,000,000	1.00	.....	540,000	July 24, '13	.01
Greene Con. c.	Mex.	1,000,000	10	3,500,000	13,544,000	Oct. 26, '16	1.00	Santa Gertrudis, Hdgo.	Mex.	1,500,000	6	364,500	2,819,772	June 16, '16	.24
Greene Gold-Silver, pf.	Mex.	300,000	10	.....	194,871	Mar. 28, '07	.40	Sta. Gert'y Guadalupe, g.s	Mex.	60,000	.....	.....	3,960,000	Mar. 27, '09	1.00
Guanajuato Con.	Mex.	540,000	5	.....	600,000	Oct. 8, '06	.07	Sta. Maria del Par.	Mex.	9,600	12	.....	5,606,000	Jan. 2, '13	2.50
Guanajuato Dev. pf.	Mex.	10,000	100	.....	274,356	Jan. 1, '11	3.00	Seneca-Superior	Ont.	478,841	1	861,982	1,783,194	Oct. 14, '16	.20
Guzgenheim Explorat.	Mex.	833,732	25	10,713,456	34,082,769	Apr. 3, '16	11.85	Soledad, s. l.	Mex.	960	20	.....	4,439,840	Oct. 17, '11	8.00
Haleybury, s.	Ont.	50,000	1	.....	60,000	Apr. 5, '11	.50	Sorpresa, g. s.	Mex.	19,200	20	.....	3,979,240	Jan. 5, '11	34.00
Hedley	B. C.	120,000	10	150,000	2,008,590	Sept. 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	600,000	2,300,000	Oct. 10, '16	.02
Hinds Con. g. s. l.	Mex.	5,000,000	1	.....	88,000	Feb. 27, '03	.02	Temiscamung' & Hud. Bay	Ont.	7,761	.....	.....	1,940,250	Nov. 10, '14	3.00
Hollinger	Ont.	4,000,000	6	1,680,000	5,850,000	Oct. 2, '16	.06	Temiskaming	Ont.	2,600,000	1	150,000	1,699,156	Oct. 23, '16	.02
Jimulco, c.	Mex.	10,000	100	.....	975,000	Feb. 27, '11	1.00	Tezuitlan, c.	Mex.	8,000	100	.....	1,955,000	Jan. 1, '09	1.50
Kerr Lake, s.	Ont.	600,000	6	450,000	6,570,000	Sept. 15, '16	.25	Truagh-Oakes	Ont.	531,600	5	255,748	332,187	Oct. 3, '16	.12
La Blanca	Mex.	140,000	20	.....	2,775,700	Mar. 31, '13	.90	Tretheway, s.	Ont.	1,000,000	1	.....	1,061,988	July 15, '14	.05
La Republica, s.	Mex.	400,000	5	.....	110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	.....	656,366	Oct. 20, '13	.05
La Rose Con. s.	Ont.	1,498,627	5	299,724	6,586,844	Oct. 20, '16	.05	Yukon, g.	Y. T.	3,500,000	5	787,500	8,370,610	Sept. 30, '16	.07

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Alaska Has One Up-to-Date Flotation Plant—the Kennecott

HENRICUS J. STANDER.

The writer recently visited the various mining camps at different points in southeastern Alaska. To the mining engineer the chief points of interest in this territory are Treadwell, Thane, Juneau, Cordova, Kennecott, Valdez, Ellamar and Latouche. The workings at the camps around the Juneau bay, namely the Treadwell group, the Gastineau at Thane and the Alaska Gold, certainly impress the outsider with the fact that Alaska is more up-to-date than many people believe. That splendid and extremely modern mill of the Gastineau at Thane will indeed remove any doubt that one may have with regard to southeastern Alaska. Here, however, we do not find any flotation.

With the exception of the work that is being done by the Kennecott Copper Corporation at Latouche, there is as yet no flotation plants in operation in this territory. The Kennecott Copper Corporation has its workings both at Kennecott and at Latouche, but it is only at the latter place that the company carries on flotation work. We are all familiar with that rich high-grade copper ore that this company is shipping from Kennecott, but there are many of us, I feel sure, that are not acquainted with the excellent flotation work this company is doing at Latouche. This property at Latouche was formerly known as the Beatson mines.

The Latouche plant is under the very able management of E. T. Stannard, and the flotation section of the plant has a capacity of 600 tons of ore a day. While I was there, however, they were busy rebuilding, and their capacity will soon be 1000 tons of ore a day by flotation treatment.

The ore as it comes to the flotation machines, assays as follows:

2.20% copper sulphide.
9.60% iron sulphide.
7.0 % magnesia.
9.21% aluminum oxide.
4.69% sulphur.
1.06% lime.
63.43% silica.

The above is a fair average of the daily composition of the ore. And from these figures one would conclude that certain obstacles would be encountered when one tries to obtain a very clean copper sulphide

concentrate. Such is actually the case. The old-type Janney machines are used, and the plant consists of two separate units. Over 90% of the concentrates are taken off by the two head cells respectively.

There are two great obstacles that trouble this company more than they do most, if not all, other flotation operators. These are, firstly, the very heavy freight rate from the plant to the smelter on the concentrates. The Latouche concentrates are to be shipped from the plant to the smelter at Tacoma. Secondly, the steamboat companies refuse to carry concentrates unless they contain moisture below a stipulated amount. This action was taken by the navigation companies, after one boat was lost, due to the fact that a heavy cargo of wet concentrates had shifted. The captains of the Alaskan boats will all tell you that it is impossible to keep an even keel when the boat is loaded with wet concentrates.

This makes it necessary at Latouche to produce as clean a concentrate as is absolutely possible, regardless perhaps of the percentage of recovery, and then to get this concentrate as dry as possible. For the drying process it has been found that the Oliver filter is not enough, but the concentrates after they come from the filter, have to pass through a heating process.

It is the general practice in the United States to think primarily how good a recovery is being made by the flotation process; in other words, almost the first thing we think of is how low the tails run, after they emerge from the flotation machines. The percentage of metal in the concentrates, of course, plays a very important part in all flotation plants; but I feel confident in saying, after having seen almost all the flotation mills in the United States and Canada, that the prime consideration of the flotation operator is that, how low he has succeeded in reducing the sulphide in the tailings. A low tails effects the percentage of recovery proportionately more than a high-grade concentrate. So that when one tries to increase the percentage of metal in the concentrates, one usually decreases the percentage of recovery. At the Latouche plant it is necessary, because of the above-mentioned

two reasons, to give first consideration to the percentage of copper sulphide in the concentrates.

With a view to obtaining a clean high-grade concentrate, this company has done some remarkable work during the past year. No acid is used, and they have not yet decided whether the results obtained with a hot pulp are better than those obtained when the pulp is treated without heating. In the oil mixture they have found that they obtain best results when 60% of steam-distilled pine oil is mixed with 40% of a collecting oil mixture, made up of fuel oil and coal tar.

To show what good results they are getting, the ore as it comes to the flotation machines, runs on an average 2.3% copper; the concentrates assay from 17 to 18.5% copper; while the tails run about 0.28 to 0.3% copper. Anyone familiar with the usual practice in flotation will admit, from these figures, that what little work is being done by the flotation process in Alaska, it ranks fairly high in efficiency, when compared with the flotation work in the west generally.

Many men in the other camps in southeastern Alaska have expressed the opinion to me that it will not be very long before we will hear about some more flotation plants being constructed in that territory.

Decreasing Ore Waste in Metal Mining

E. T. LEDNUM.

In the winning of ores from their natural beds by blasting, physically fine flaky material is not desired and is a source of serious loss to mine operators. Nevertheless metal mining companies are generally disposed to use the higher grade explosives, perhaps overlooking the economical requirements of a blasting explosive.

With the exception of iron, manganese and a few other base minerals, ores which are crushed and concentrated for their metallic values should not be pulverized or shattered to flaky or powdery fines.

The speed of detonation (that is, the speed of action) of the explosive in the drill hole is in proportion to the volume of gas and heat developed in a given time. These are established facts.

High-grade, quick-acting explosives break down the mineral into minute particles, especially in the zone adjacent to the explosive charged surfaces in the drilled hole. There is also no doubt a fusing effect exerted on zinc ores and other easily reducible ores from the softer rocks. This action is decided, especially where holes are drilled and charged in the ore bodies proper.

Explosives exert the disruptive, crushing and disintegrating effect throughout the burden in direct ratio to the action of the explosive. Low-grade, slower-acting explosives will not be as severe, or produce proportionately the resultant physically fine ore from the blasted burden, as will the higher grades and quicker acting explosives. It will be necessary to do

more boulder blasting when using low-grade explosives if the explosive charge in the drilled hole is not sufficiently tamped with "stemming." Dynamite in a drilled hole without "stemming," when exploded, will exert a great deal of its force on the material which holds it, but as the effect of the explosive is in line of the least resistance, the natural result is that the charge in an untamped hole will expend a great part of its energy in blowing back out of the hole. Explosive charges should, therefore, be "stemmed." The reason for this is set forth in the formula:

$$P V = R T$$

in which P = Pressure and V = Volume; R a constant for each Gas and T = Absolute Temperature. If Temperature remains the same, no matter how Pressure or Volume vary individually, their product will be equal to the constant $R T$. If Temperature increases and remains constant, R being already constant, nothing is left but for Pressure to increase in the same ratio as Temperature, and the resultant efficiency of the explosive is increased, as will be shown by the quality of the work done. The quality of mine air will also be much better after the blast.

All boulders should be block holed to reduce vibrations in the mines with consequent bad results. However, there would be much less finely divided material left in the mine, and the ore would go to the mill in better condition to be broken down from hard masses, permitting the mill to perform its proper functions, and less finely divided particles of mineral would be carried off in the sludge water and tailings.

The conservative use of explosives adapted to the winning of ores from their bed will not only prevent losses in transportation—that is, from the ore body to the smelter—but will effect further economies in the installation of elaborate flotation and other concentrating equipments to secure the finely divided mineral particles.

Powdered minerals cannot be satisfactorily separated by gravity and as it is therefore important in designing crushing plants to so construct them to minimize as far as possible the sliming of the minerals, the minerals should not be so produced by blasting in the first winning from their deposits.

Japan as a Source of Tungsten.—Exports of tungsten ore from Japan in 1915 were 85 tons to the United States, 214 tons to France, and 110 tons to the United Kingdom, or 409 tons in all. Estimated shipments to July 20, 1916, are placed at 480 tons, most of it going to the United States. The tungsten output of Japan is reported as 25 to 40 tons of ore per month from the Kiwada mine, 10 to 11 tons per month from the Takitori mine, and 75 tons per month from several small mines. Those in Corea produce between 50 and 60 tons per month. Attempts were made to obtain tungsten from Siam, but the ore contained large percentages of tin, greatly reducing the value.

Safety in Hoisting and Slope Haulage

O. P. HOOD.*

The practice of mining usually requires transportation of men and material in both horizontal and vertical directions. Man has pretty thoroughly accustomed himself to the means of horizontal transportation and the risks of the road and the car are assumed naturally and without fear. Transportation in vertical directions, however, is far less ancient and universal in the experience of mankind and the dread and fear of falling is a primal instinct yielding but slowly to the experience of successful vertical transportation. That man by a universal experience in aerial transportation is to finally become so familiar with the possibility of falling from great heights, that he will assume the risks of the road with the same equanimity as we now cross a crowded thoroughfare or take the night express, may be a possibility, but at present there is an instinctive fear accompanying the lifting and lowering of men that is not present when transportation is in horizontal directions. A man who would never think of examining the coupling arrangements of a railroad train looks with suspicion on the $1\frac{1}{2}$ in. steel rope that is to lower his 170 lbs. of self a few hundred feet into a mine.

Safety in hoisting, as in most other activities, is dependent upon both men and mechanism. The division of the responsibility between these two is the object of this paper. The Bureau of Mines will issue shortly a study by R. H. Kudlich of shaft and slope accidents that have taken place in the coal mines of Pennsylvania, West Virginia, Ohio, and Illinois in the 10-year period from 1904 to 1913. In this safety field, as in most others, the human factor is the main factor. If man had succeeded in controlling himself as well as he has succeeded so far in controlling the mechanism of hoisting, shaft and slope accidents would have been one-third less. Of 1726 accidents, 800 are so reported as to make it possible to locate the blame as between men or mechanism. Of these 800 accidents, 66% were due to human limitations and 34% to some failure of mechanism. In 35% of the accidents the victim was himself responsible. It can be said that of three men injured in these accidents, one had himself only to blame, one suffered because of the failure of a fellow employe, and one suffered because of defective mechanism. The miner, therefore, who is using, or who is about the hoisting facilities of a mine, is equally interested in three factors: First, his own carefulness; second, the carefulness and ability of his mates and, third, the adequacy of the company's equipment. The company interested in reducing shaft and slope accidents will find that there is twice as much need for revision of the habits,

thoughts, and practices of the men as there is of making any change in the equipment.

The kind of accidents in which the injured man is himself more largely responsible are those such as the 10% injured in falling down the shaft; the $6\frac{1}{2}$ % caught between the cage and shaft timbers; the 5% who fell off cages while riding and the 5% struck by slope or haulage ropes. The remedy for these accidents must be found in the general propaganda which teaches men to think safety, together with the elimination of the habitually careless and of those conditions which produce mental and physical subnormality.

Accidents for which a fellow employe is more largely responsible are those such as the 13% caught in overwinding accidents and the 7% injured by being struck by or while riding on runaway cars.

To entirely prevent these accidents requires infallible humanity or the development of accessory mechanism that will prevent the individual from doing the wrong thing and will supplement his ineffective effort. Here again the individual must be at his best physically and mentally. Anything which helps to produce a subnormal condition in a faithful and intelligent employe should receive careful study and be eliminated if possible. This leads the investigator into every field affecting the individual, health, wages, housing, normal pleasures, decent living, diet, the prohibition of artificial stimulants and drugs, etc., etc. It may be too much to hope to produce ideal men and conditions, but it is necessary to face the fact that these human problems are the big end of the problem. Overwinding devices are needed that are reliable and practical and that will not interfere with normal operation. Too often the devices provided are ineffective or disconnected. In large hoists some of them may when operated even wreck the mechanism. Standard recording signal systems should be developed so that misunderstanding of signals will be next to impossible, and a permanent record made of the signals as given.

The kind of accidents where the mechanism is largely at fault are such accidents as runaway cars on slopes, accounting for 9% of the injuries; breaking of ropes, $7\frac{1}{2}$ %; being struck by slope or haulage ropes, $4\frac{1}{2}$ %. Most of these accidents are on slopes. Twenty-five per cent of accidents on slopes or haulage ways are charged to failure of equipment, while in shaft accidents less than 9% are so chargeable. This is probably due to the more severe conditions imposed on slope and haulage ropes, and to the absence of means on slopes of something comparable to safety catches in vertical hoists. To reduce accidents from defective mechanism requires first of all frequent, careful, orderly and formal inspection of all mechanism

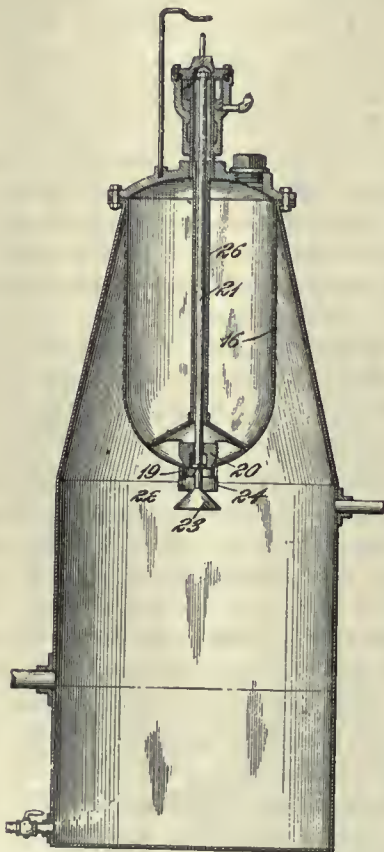
*Chief Mechanical Engineer, Bureau of Mines; published by permission of Director Bureau of Mines.

and, second, the development of standards of condition that can be imparted by one to another. This latter need becomes very evident to any one attempting to obtain from practical men about a mine definite directions for condemning a hoisting rope. The practice in this respect is arbitrary and variable, and only once in my experience have I heard directions so clearly given that an intelligent assistant could inspect a rope and report whether it should or should not come off.

In attempting to reduce shaft and slope accidents it is useful to know the major problems which should demand first and greatest attention. These are shown to be human problems first and can be summed up in the phrase "keeping good men fit." The problems of mechanism are more largely matters of efficient inspection rather than of design or material, although these latter factors are strong minor subjects.

Portable Acetylene Gas Generator.

Oxy-acetylene flame apparatus for cutting and welding is coming to be a necessity around mines. The acetylene gas used in the operation is ordinarily obtained in tanks, under high pressure, which of



PORTABLE ACETYLENE GAS GENERATOR.

course lends a certain element of uncertainty, since, through carelessness, the supply of gas may run out before a new tank is obtained.

To be able to generate the gas on the spot to operate the torch is, therefore, an advantage and a simple

type of apparatus is shown in the drawing, being the invention of Prior F. Willis, St. Louis.

The lower part of the generator contains water, which may be replenished and the sludge drawn off through suitable valve arrangements. Into this water small charges of calcium carbide are automatically dropped, from time to time, out of the container in the top. The carbide, combining with the water, produces the acetylene gas.

To start the operation of the carbide feeding device, the valve rod (21) is dropped by hand to its lowest position, whereby any carbide in the space within the ring (19) will drop into the water. The gas generated will then fill the tank and carbide receptacle, and flow through pipe (26) into the regulator at the top.

If the gas pressure is sufficient to raise the regulator to its highest position, the cone (23) on the end of the valve rod will engage the ring (24) and under side of the flange (19) and close the bottom opening in the carbide receptacle. At the same time the valve (20) will be raised clear of its seat, and carbide will slide down the sides of the container (16) and fill the space within the ring (24) and flange (19).

If the pressure of the gas is insufficient to raise the regulator, the latter must be raised by hand, and then dropped to feed a second charge of carbide into the tank. Hand feeding must be continued until sufficient gas is evolved to raise the regulator to its highest point, after which the operation is automatic.

The regulator will remain in its highest position until the consumption of gas has reduced its pressure sufficiently to let the regulator fall, which allows another charge of carbide to fall into the water, and this operation takes place over and over.

Water Power in Southeastern Alaska.

The streams of Alaska have been important factors in its industrial growth. The success of placer mining in northern and central Alaska has depended primarily on the water available for hydraulicking and dredging, and in southeastern Alaska water power has long been used by mines, canneries, sawmills, and other industries, although until recently most of the plants have been small. Since 1906 the Survey has been making systematic studies. Lack of definite information in regard to the quantity of water available and other physical factors that determine the feasibility of a power site has been one of the principal impediments to development. For this reason a systematic investigation designed to determine the location of feasible water-power sites in southeastern Alaska was undertaken. As an outcome of this later study a report, prepared by G. H. Canfield, entitled "Water-Power." Investigation in southeastern Alaska has been recently published as part of Bulletin 642.

Operations and Methods in Use at the Inspiration Property, Arizona*

The ore in the Inspiration property occurs as disseminated chalcocite in silicified schist and granite porphyry, approximately 90% being in schist. The ore body of which the Inspiration holdings are a part extends from its eastern limits in Miami Co.'s ground to its western limits in the Inspiration-Live Oak ground, a distance of 9700 ft. The ore is continuous for this distance, except where the Keystone ore is parted from the Inspiration ore for a horizontal distance of 1100 ft., due to the movement along the incline of the Bulldog fault. The ore varies in width in

there will have to be driven 13 ft. of ordinary sized drifts, 20 ft. of main raises and 1.4 ft. of haulage ways, making a charge for this account of approximately 20 cts. per ton of ore mined.

For the 5 months' period ending with August, there were mined 18.1 tons for each shift's work above and below surface properly chargeable to the mining department.

Ore Crushing and Grinding.

The mine run ore is crushed first in gyratory



GENERAL MAP OF THE INSPIRATION PROPERTY, ARIZONA.

Inspiration ground from 200 to 1600 ft. and has an average vertical dimension of approximately 150 ft.

Previous to the beginning of stoping in July, 1915, the ore had been developed by 29 1/3 miles of churn drill holes and opened up by underground work as follows:

- 1.2 miles of shafts.
- 7.7 miles of haulage ways.
- 21.1 miles of ordinary sized drifts.
- 21.2 miles of main raises.
- 2.5 miles of "finger" raises.
- 53.7 miles total.

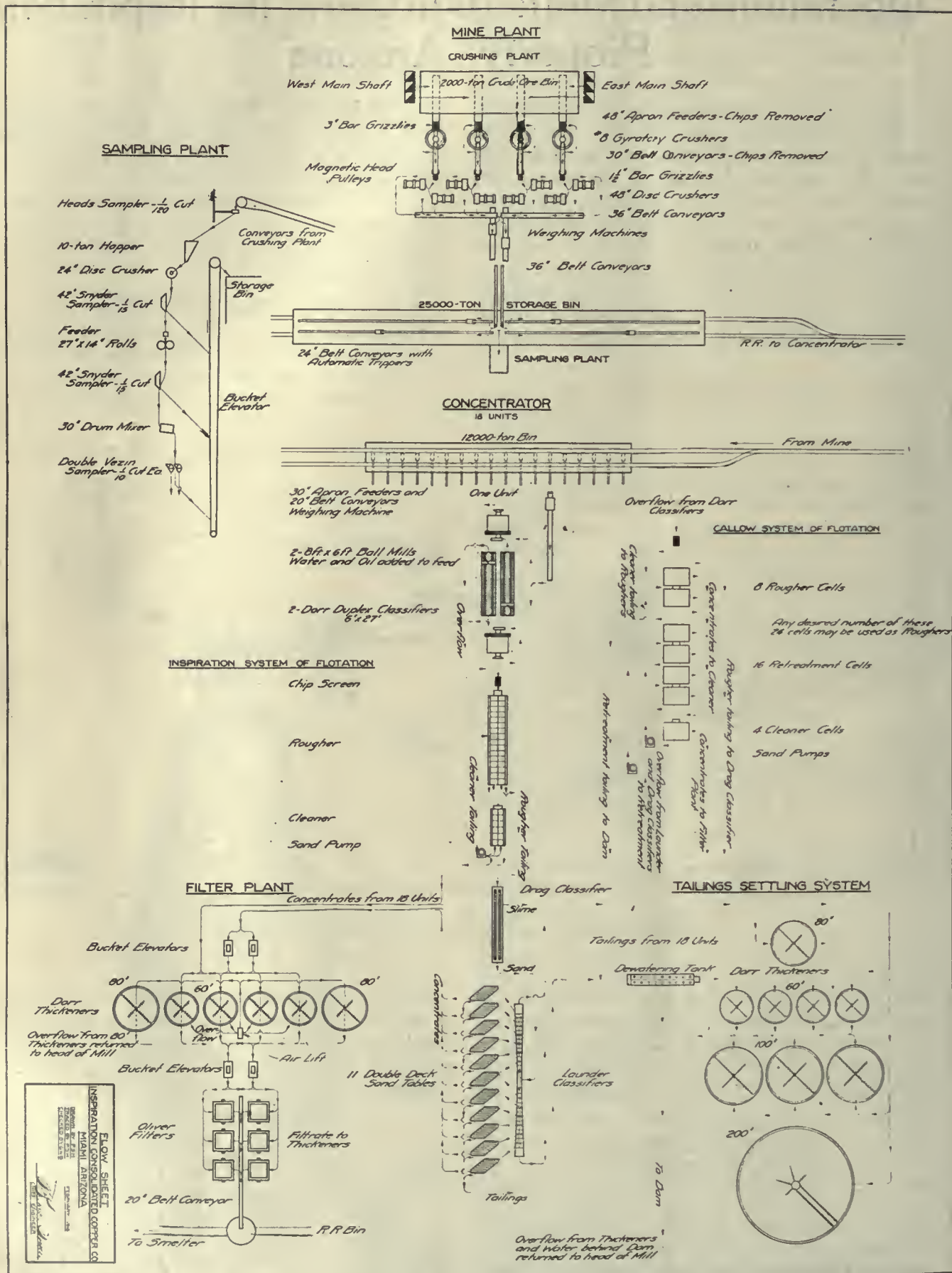
The mining system consists of undercutting and thus caving the ore, which is then drawn off through a system of inclined raises to the haulage ways below. It is estimated that for each 1000 tons of ore mined

*We are indebted to Rudolph Gahl, Metallurgist in Charge of Concentrator, Inspiration Con. Copper Co., Miami, Ariz., for the information contained herein.

crushers having a maximum opening for discharge of 3 1/4 ins.—this product passes through Symons disc grinders having a discharge opening of 1 1/2 ins. This product is finished in Marcy ball mills at the concentrator, as per the table following:

SCREEN ANALYSES.

	Feed to ball mills.	Product.
On 1.5 ins.....	17.7	.....
On 1 in.....	16.5	.....
On 3/4 in.....	24.7	.....
On 3/8 mesh.....	7.3	.....
On 6 mesh.....	7.7	.....
On 8 mesh.....	2.2	.....
On 14 mesh.....	4.8	.....
On 28 mesh.....	3.6	.....
On 48 mesh.....	2.9	.....
On 65 mesh.....	..	7.9
On 100 mesh.....	2.3	12.6
On 150 mesh.....	..	12.6
On 200 mesh.....	1.5	5.8
Through 200 mesh.....	8.8	58.2
	100.0	100.0



FLOW SHEET OF INSPIRATION CON. CO., ARIZONA.

Kilowatt hours required per ton ore in coarse grinding, conveying and sampling.....	.409
Kilowatt hours required per ton ore in fine grinding in Marcy ball mills.....	9.86
Divided thus:	
Power for conveyor, Dorr classifier and cranes..	.18
Power for Marcy ball mills.....	9.68
Total power for crushing and fine grinding, kilowatt hours	10.269
Steel ball (chrome) consumption per ton ground, lbs.....	1.79
Average tonnage per ball mill for 24 hours in August.....	.425
Per cent of product stopping on 48-mesh screen.....	3.1

Mill Statistics.

The following table covers mill operations during the month of August, 1916:

Dry tons milled.....	498,270
Tons per day.....	16,073
Per cent copper in feed, total.....	1.564
Per cent copper in feed, oxidized.....	.392
Per cent copper in feed, sulphide.....	1.172
Per cent copper in concentrates.....	30.22
Per cent insolubles in concentrates.....	31.3
Per cent moisture in filtered concentrates.....	17.67
Per cent copper in tailings, total.....	.417
Per cent copper in tailings, oxidized.....	.325
Per cent copper in tailings, sulphide.....	.092
Per cent copper recovered.....	74.36
Per cent copper recovered, oxides.....	20
Per cent copper recovered, sulphides.....	92.4
Kilowatt hours used per ton milled (includes coarse crushing, but does not include pumping new water).....	16.07
Water used per ton ore, total gallons.....	1,145
Water used per ton ore:	
Reclaimed in tanks at foot of mill.....	249
Reclaimed from ponds.....	514
New water from Kiser pump station.....	382
Average tonnage ore ground per Marcy mill in 24 hours	475
Flotation agents per ton ore (coal tar, 1.12 lbs.; oils, 0.19 lbs.)	1.31

Flotation.

There are four sections equipped with Callow machines, 13 sections with Inspiration machines and one section with Minerals Separation machine—Hibbard type (injects air under stirring paddles).

	Pneumatic flotation machines.	Kw. hrs. Minerals Separation machine.	Total.
Power used—			
Returning cleaner machine tails to primary flotation machine.....	118,240	7,000	.....
For crane over flotation floor.....	450	70	.....
For driving turbo-blowers and foot blowers	1,311,800	10,980	.....
For pumps returning slime overflow drag belt tanks for refotation	13,400	.....	.....
For motors driving Minerals Separation machines .....	.....	114,690	.....
	1,443,930	132,740	1,576,670
Tons ore treated.....	472,242	26,028	498,270
Kilowatt hours used per ton ore in flotation	3.06	5.1	3.16

Flotation oil consumption per ton ore treated:

Coal tar	1.1216
Coal tar creosote.....	.1333
Wood creosote (Cleveland-Cliffs).....	.0023
No. 80 oil (Pensacola).....	.0058
No. 6-11 oil (Oregon).....	.0204
No. 880 oil (Yaryan).....	.0072
No. 9 oil (general naval).....	.0205
	1.3111

Per cent copper in flotation concentrates, 38.11.
Air consumption (approximate), 75,000 cu. ft. per M.

Filtering Concentrates.

The stream of water carrying concentrates from mill goes first to Dorr thickening tanks and then to six Oliver filters, 11 ft. 6 ins. diameter by 12 ft. long.

The stream to the Dorr tanks contains.....	90% water
The feed from tanks to filters contains.....	42% water
The filtered concentrates contain.....	17.67% water

The settling of concentrates is done in five 60-ft. and three 80-ft. diameter tanks having a total area of 29,217 sq. ft.

Power used in August was as follows:

For air compressors.....	32,800 kilowatt hours
For vacuum pumps.....	48,400 kilowatt hours
For Dorr thickeners.....	4,270 kilowatt hours
For elevators	13,220 kilowatt hours
For filters	3,510 kilowatt hours
For concentrate conveyor.....	6,910 kilowatt hours
Total	109,110 kilowatt hours

19,106 tons concentrates were filtered at a power cost of 5.71 kilowatt hours per ton.

Power Consumption.

Mining—Tons mined, 493,900—	Kw.-hrs.	Kw.-hrs. per ton.
Power for machine drills and ventilation 100 lbs. air.....	651,300	1.319
Power for air haulage, 1,000 lbs. air.....	185,790*	.376
Power for ore hoisting.....	358,320	.725
Power for lights.....	9,300	.019
Power for miscellaneous mine department uses	59,760	.121
	1,264,470	2.56
Coarse crushing, conveying and sampling—		
Tons treated, 493,900.....	201,000	.409
Concentrator—Fine crushing—		
Tons treated, 498,270.....	4,914,980	9.86
Flotation	1,576,670	3.16
Tables—	Kw.-hrs. Tons treated. ton.	
Power for tables.....	182,760 245,790 .74	
Power for Dorr belt classifiers, separating sands for concentration	20,430 469,274 .04	
	203,190	.41
Filters—Concentrates, kilowatt hours per ton, 5.71.....	109,110	.22
Tailings disposal—		
Motors for Dorr dewatering tanks..	4,980	.01
Water reclamation—		
Repumping water from settling ponds	941,365	1.89
Sundry power—		
Machine and carpenter shops, incline hoist, etc.	30,950	.06
Lights	25,170	.05
Pumping new water.....	655,485	
Lights	1,320	
	656,805	1.32
Crushing rock for concrete.....	1,000	....
Lights for offices, dormitory, dwellings, etc.	1,410	8,666,630
Total kilowatt hours.....	9,931,100	19.95

	Kw.-hrs. per ton.
Power for mining.....	2.56
Power for milling.....	16.07
Power for pumping new water.....	1.32
	19.95

The average power requirement in August was 0.83 of a kilowatt per ton of daily capacity.

*Average mine haul, 0.475 miles; kilowatt hours per ton mile, 0.796.

Preparation of Industrial Minerals.

McGowan, Hill & Mathewson are operating a plant in Los Angeles, Cal., preparing for the market certain industrial minerals, including pulverized silica, feldspar, pumice, talc, flint, fluor spar, barytes and magnesite. They have deposits of pumice in Inyo county, silica in Riverside county, and obtain these other materials in various places on the Southwest desert. Their plant is equipped with a crusher, three elevators, a pulverizer, several vibrating screens and a tube mill. The noteworthy part of the equipment is the Marks centrifugal impact pulverizer, which is operated at a speed of 2000 rpm., and which has handled 2½ tons per hour of 40-mesh material, reducing it to 100 mesh. The latter product is reduced to flour fineness of about 200-mesh in a tube mill.

The Marks pulverizer is not a grinder, the hard material, such as quartz and feldspar, being pulverized by attrition, due to being thrown by centrifugal force from a central rotary disc against the corrugated white iron lining of the cast-iron housing. The high speed and unusual capacity are maintained with practically no vibration of the iron housing or contiguous parts. This machine, made in Los Angeles by D. O. Marks and associates, is being introduced in ore milling.

A Modern English Colliery Chain Drive

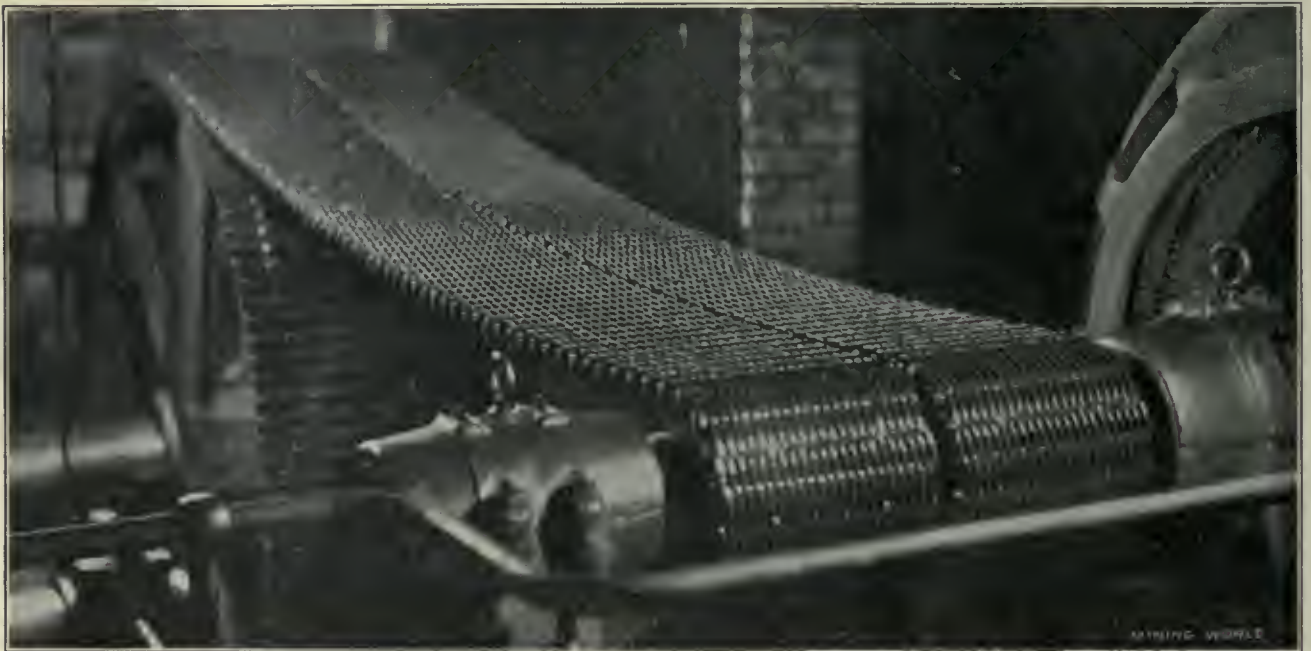
This chain drive to haulage gear at Pease's West Colliery, shown in illustration, was developed at the Burnage Works of Hans Renold, Ltd., at Didsbury, Manchester, Eng. This drive with several other 150-hp. drives is installed at Pease's West Colliery at Crook, Co. Durham.

Originally a 150-hp. drive was designed to be used in connection with a 150-hp. electric motor, but when this particular drive was put into service it was found that it was subject to very frequent overloads of as much as 200%. Naturally the engineer felt rather nervous as to the result, but it ran for about a year and a half when, owing to the overloads, the motor began to develop serious trouble. It was then decided

created a demand for a higher, more durable and more accurate type of chain altogether.

These driving chains for collieries consist of three main types, the silent chain, the bush roller chain and the block chain. The silent chain is for high-speed driving and ranges from 1/2-in. wide, with a breaking strength of 1900 lbs. It is capable of transmitting 3/4 hp. at about 1750 rpm. (17,000 pinion) up to 1 3/4-in. pitch, 12.2-in. wide, with a breaking strength 107,100 lbs. while transmitting 140 to 150 hp. at 450 to 500 rpm. (17-tooth pinion).

Power up to about 300 hp. may be transmitted by using more than one strand of chain. The silent is no doubt the most interesting of all driving chains,



THE 250-HP. RENOLD CHAIN DRIVE TO HAULAGE GEAR IN ENGLAND.

to install a motor on more generous lines, and one capable of handling 250-hp. with ease was ultimately chosen. The life of the chain is unduly shortened with wheels above 100 T, owing to the comparative rapidity with which it wears out of pitch with the large wheel, 3% of wear is permissible with a wheel of 100 T. In this case, however, a chain was chosen similar to that being used on other drives at the colliery, so that though it might have worn out of mesh with a 143 T wheel, it could be used up in single strands on 150-hp. drives with wheels of from 90 to 100 T.

Chains of one kind or another have been for many years past extensively used in colliery work, especially for driving screens, tipplers and washing plant. The kind of chain most commonly in use for these purposes has, up till comparatively lately, been principally of the malleable or cast link pattern. Modern "speeding up" tendencies, however, have latterly

owing to its unique design and action. The link comes into engagement without any rolling or sliding, simply shutting down flat against the wheel tooth. As by this time it is traveling practically at the same angular velocity as the wheel tooth, the action is very quiet. In addition to this, the almost frictionless engagement gives the chain an exceptionally high efficiency, about 98% being obtained. The chain remains silent and equally efficient until worn out, since, when wear occurs at the joints, the links simply gear a little further out on the teeth, but in exactly the same manner as at first. Wear, however, is a very slow process.

Borax is the standard flux for melting bullion as it is in assaying ores. As far as possible, careful melters confine the use of fluxes to borax, because of its rapid liquefaction and protective, rather than corrosive, effect upon the crucible.

Triplex Pumps in the Wisconsin Zinc Mines

One of the large zinc mining companies in Wisconsin, not very long ago, made a radical change in its pumping equipment. All existing pumps in both mines and mill were disposed of. In their places triplex pumps were installed. Then the company officials sat back and checked up the power bills. They found in due course that they were saving over \$1000 per month on power alone. Not only will this saving, in a comparatively short time, pay for the complete installation, but, like interest on a mortgage, it piles up month after month—a handsome sum available for other improvements in the matter of reducing operating expense.

It is significant, also, that other operators in the Wisconsin district have been converted to the triplex pump—to the extent of some 25 installations by a single manufacturer—and most of these companies will vouch for the fact that the saving in power has returned the first cost of the pumps in from 5 to 6 months.

That the triplex pump has not in the past been more extensively employed in mine work, has been due largely to the matter of first cost. And this seems particularly to have been the stumbling block in the case of the zinc mine operator. Until recently the price of spelter has been so low that his margin of profit has been very small. Although the saving in power which more efficient apparatus could make was undoubtedly attractive, the more or less hand-to-mouth existence forced upon him seemed always to set ahead indefinitely any radical changes which meant spending money out of hand.

Conditions have now changed in this field. Prices for spelter have advanced and money is now available for some of the improvements long considered, but never made. At this time, then, new power-saving equipment can well be considered and improvements made if they are ever going to be made.

Look over a number of zinc mine installations of the old order and it will be found that the habit prevails of pumping *all* water to the highest point. No matter if only a small amount is required by the rolls and trommels to have this head; it all goes there. This requires power, and power costs money.

The main power-saving idea is therefore to have the pumps do no more work than is necessary. It is summed up very aptly in these two suggestions by the Aldrich Pump Co.:

(1) Belt from line shaft to triplex pump pulley, and pump the larger amount of water to the top of the jigs only (this head in the Wisconsin field rarely exceeds 27 ft. from pond located outside of mill). This pump usually requires about 12 to 20 hp. according to the size of mill.

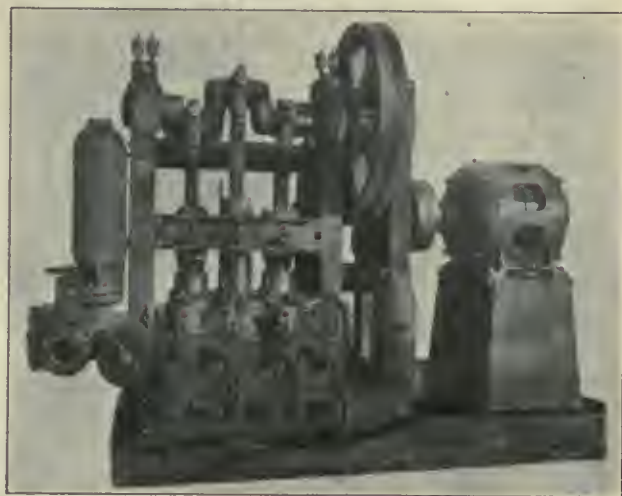
(2) Install a small triplex booster pump, and belt from mill line shaft, this pump to handle the small

amount of water required to operate rolls and trommels, usually from 100 to 150 gpm., and heads from 45 to 60 ft. This pump requires never more than $3\frac{1}{2}$ hp. at pump pulley.

This arrangement is coming to be the popular one in the zinc mining field, because the mills are generally driven by an independent motor with underload rating. This motor usually has enough reserve capacity sufficient to drive the triplex pumps.

It is quite often the case that the mine makes enough water to operate the mill. In this case one triplex pump can be made to do two jobs; that is, pump the water out of the mine and at the same time supply it to the mill—one unit for the whole service. By placing a gate valve at the top of the shaft, the mine water can be discharged at this point when the mill is not running.

That the triplex type of pump is wonderfully effi-



ALDRICH TRIPLEX PUMP FOR ZINC MINE, EQUIPPED WITH FAWCUS HERRINGBONE GEARS. CAPACITY 750-GPM. AGAINST 300-FT. HEAD.

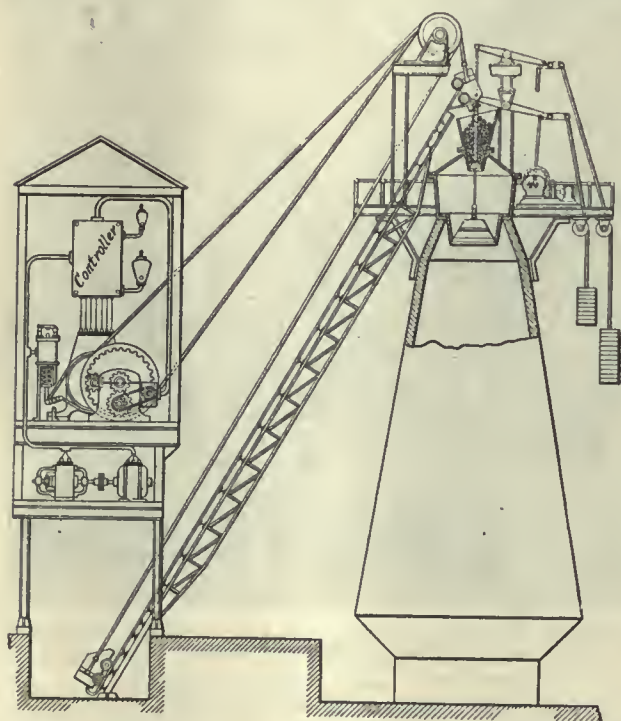
cient under the tough conditions of mine service seems to have been proven by numerous specific cases. In one large mine in Missouri, for instance, a triplex was installed, throwing 1900 gpm. at a total working head of 30 ft. It did this on 20 hp. at the pump pulley, a remarkable showing when it is considered that a 75-hp. motor was slightly overloaded in operating a pump previously installed to do the same work.

Chilean nitrate exports to the United States in March, 1916, were 2,338,534 quintals (1 quintal equals 101.4 lbs.), against 1,835,803 in March, 1915, and 1,155,351 in March, 1914. For the 9 months ended March 31, 1916, the exports to the United States were 14,020,225 quintals, against 7,048,848 and 7,544,483 for the same period in 1915 and 1914 respectively. The increase to the United States is therefore about 100% in each case.

Operating Skip Hoist by Alternating Current.

In a furnace or skip hoist, the motor must necessarily be of large size, owing to the very heavy unbalanced load, which load often amounts to several tons. This load must be carefully handled, particularly at or near its limits of travel, so as to insure that the skip will come to rest directly over the furnace bell, in position for dumping, regardless of the load or speed of the motor. This result may be affected more or less satisfactorily when the hoisting motor is a direct-current machine. But where the hoist is to be operated by an alternating current motor, the result is much more difficult to attain.

In slowing down and stopping a direct-current motor the dynamic brake effect supplied by the motor itself is utilized, the motor operating as a dynamo.



OPERATING SKIP HOIST BY ALTERNATING CURRENT.

But with a standard type of alternating current motor, this brake effect is lacking, since such a motor will not act as a self-exciting generator.

In a new type of hoist, a direct-current generator is coupled to an alternating-current hoisting motor. Then this generator is separately excited by current supplied by a motor-generator. The alternating-current hoisting motor is controlled by means of electro-responsive devices operated exclusively by the direct current generated by the two sources above mentioned.

By this method it is possible to control the main motor in accordance with its load and speed, and to overcome the many objectionable features inherent in practically all electro-responsive devices operated by alternating current.

The accompanying illustration shows the general

arrangement of the elements. Those interested in following the electrical switching mechanism and connections will find them disclosed in a patent recently issued to David Lindquist of Yonkers, N. Y.

Good Roads in Arizona.

An important factor in the mining industry that is everywhere apparent in Yavapai county, Arizona, is the system of good roads being established for the purpose of bringing the outlying mines and camps into touch with the county's main business center at Prescott, and with each other. Much has already been accomplished along these lines; and as a result this county can now justly lay claim to some of the best-graded roads in the West. Notably the Copper Basin road which has put that city in easy transit communication with the copper areas of that section; the Groom Creek road which serves a like purpose for the camp of Senator; the Lynx Creek road connecting with the smelter at Humboldt and the mines of that locality, and the Cherry Creek road that gives access to Jerome, Clarkdale and the mines of the Verde valley country. More recently the distance from Prescott to Phoenix has been appreciably shortened by reconstructing the old government trail through Black canyon. This piece of road building has put the Tip Top and other mines of the district in touch with these cities, and has added appreciably to the pleasure of travel by auto as well. The Groom Creek road is being extended beyond Senator to tap the rich mineral-bearing Crown King country and other portions of the Bradshaws, and consideration is being given by the county commissioners to a plan for shortening the road between Prescott and Jerome.

Fluorite.—This mineral, chemically fluoride (Ca F), has been imported into this country principally from Derbyshire, England, where the largest deposits in the world are located, though it is also produced in many districts of the world including Saxony, Germany. In 1910 there were about 42,000 tons imported against 70,000 tons produced. By 1915 the import figure was reduced to 7167 tons with 136,940 tons produced in this country. During 1915 Illinois, Kentucky, New Hampshire, Colorado and New Mexico were the producing states, but recently South Dakota has entered the list. The mineral is used considerably for fluxing in the metallurgical industry, particularly iron and steel. Now that this metal is in exceptional demand so also is fluorite. This, together with the fact that imports from Europe have been cut off, has affected a change in the prevailing price of about \$5.50 for 1915 and the ore is now bringing prices ranging from \$10 to \$12 per ton.

In the treatment of gold from retorts or from precipitates, iron is frequently present in considerable quantities.

The Tonopah Extension Mines in Nevada

W. A. SCOTT.

The main pump station at the Tonopah Extension mines is on the 1540-ft. level at the Victor shaft. The equipment consists of an Aldrich quintiplex 150-gal. pump, and a Gould duplex, 120 gals., both electric driven. These pumps were submerged nearly a year, caused by the opening of a vein on that level which carried a large volume of water, filling the lower workings. It required almost a year to dewater that part of the mine, and this was accomplished by bailing, operating a station pump at the 1200, and by the use of sinkers.

The Victor shaft has been retimbered to the 1540-ft. station, where an electric hoist will be put in position; and soon the work of sinking this shaft 300 to 500 ft. deeper will begin. Three compartments will be maintained as sinking proceeds. An important feature of development lately consisted of sinking a 3-compartment underground incline shaft from the 950 to the 1350-ft. levels. Much of the ore is now brought up this incline to the 950-in., 2-ton, self-dumping skips, which discharge into loading pockets on that level, being used. This incline runs close to the vein on its dip.

Drills used comprise Denver dreadnaughts for cross-cutting and drifting; and for stoping, the valveless Waugh, and Ingersoll-Rand's butterfly type are used. Two underground electric tramways are employed for one haulage—one on the 950 and the other on 1540. The ore is hauled to the shafts in mine cars, in which it is hoisted to the surface. The ore tonnage of the mine is hoisted in about equal quantities from No. 2 shaft and Victor shaft. A trolley line is used for hauling ore from the Victor to the mill. In the haulage line between shaft No. 2 and the mill the current is carried by a third rail, but it is claimed this is unsatisfactory, and that a trolley line will be erected and the third rail dispensed with.

The mill, which takes 300 tons of ore per day, began July 1 to treat all ore by cyanidation, to the exclusion of table concentration. The cyanide treatment is by means of leaching tanks, Trent agitating tanks, Dorr thickeners and Butters filters. The ore from Victor shaft enters the mill in 1½ to 2-in. sizes, that from No. 2 shaft 2 to 3-in. These ores are fed to the ten 5-stamp batteries, having 3-in. screens, and are crushed in cyanide solution. The next step in pulverization is by five tube mills; three of them are 5 by 16 ft., and two are 5 by 18 ft. Each tube is operated by a 50-hp. electric motor, connected thereto by a Morse chain drive. These drives give a positive and steady motion, and are much used on tube mills and mill pumps. In this mill the 25 solution and slime pumps are driven by motors connected to them by Morse chain drives. Some of them used here have been in service 5 years.

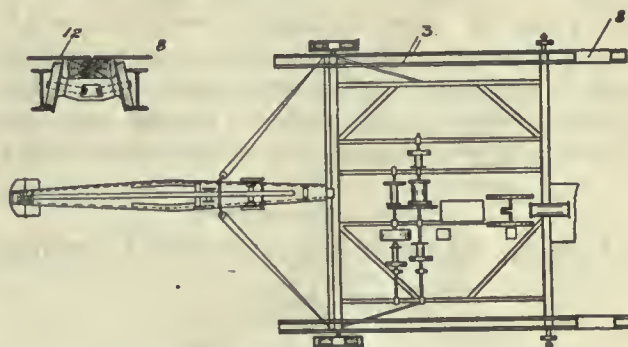
The disuse of concentrating tables in this mill may or may not be a permanent change. It is understood

a test is being made with cyanide treatment exclusively. In the meantime, tests by oil flotation are being made in the mill in a 1-ton experimental plant, equipped with Callow cells.

A time-saving device has been produced and put in use at the assay office of this company, where 175 to 180 assays per day are made. It consists of patent moulds used in pouring, the slag being poured from the crucible upon a hot steel plate, and as the metal appears it is poured into a truncated, cylindrical steel mould, 15 of which were made in a steel bar 18 ins. long. It requires some skill in pouring to turn the hot slag in one place and the hot metal, which makes up the button, into another; but by skillful handling the slag is poured separately, and the pure metal turned into the mould. When the 15 moulds are filled, a metal plate is placed on top, as a lid, and the bar containing the moulds is reversed, the clean metallic buttons dropping out. They are now ready for cupellation. The process dispenses with the pounding of the buttons to free them from slag. This device was the joint invention of Wharton Anderson and W. B. Roundree of Tonopah Extension assay office, the latter being chief chemist. They state that this method has been checked up on control assays and found to have no defects.

Dredge with Track-Section Carrier.

When a dredge is operated from a track, which is moved along ahead of it in sections as the work progresses, considerable hard work and delay are encountered in carrying these sections forward from the rear. This may be lightened by the track-carrier arrangement here shown. On each side of the dredge



DREDGE WITH TRACK CARRIER.

frame, just above the wheels, are two pairs of I-beams (3) projecting somewhat to the front and rear, as shown in the plan view. On these beams travel a little carriage (8) shown in detail. This carriage carries the table (12). In moving a track section forward, all that is necessary to do is to lift one end and place it on the carriage, pushing it along the front of the dredge.

A Portable Vertical Electric Air Compressor.

Illustration shows a novel vertical electric air compressor. This high-speed vertical compressor is a simple, practical and economical machine. It has an enclosed crank-case, keeping out the dust and dirt and automatic splash lubrication, so perfect that not a grease cup, oil cup, or oil hole is necessary. There are no stuffing boxes nor cross-heads and the light sheet-steel valves are said to be practically indestructible, seating without any wear on the cylinders, insuring noiseless operation and the valves are of large



PORTABLE ELECTRIC AIR COMPRESSOR.

areas and very flexible. It has small floor space mounted on a steel frame with four wheels. There are few parts and absence of intricate mechanism which makes it ideal for places where the best mechanical skill is not available. The compressor's light weight makes it particularly desirable for portable units, the high speeds permitting the use of high-speed motors on these combination units.

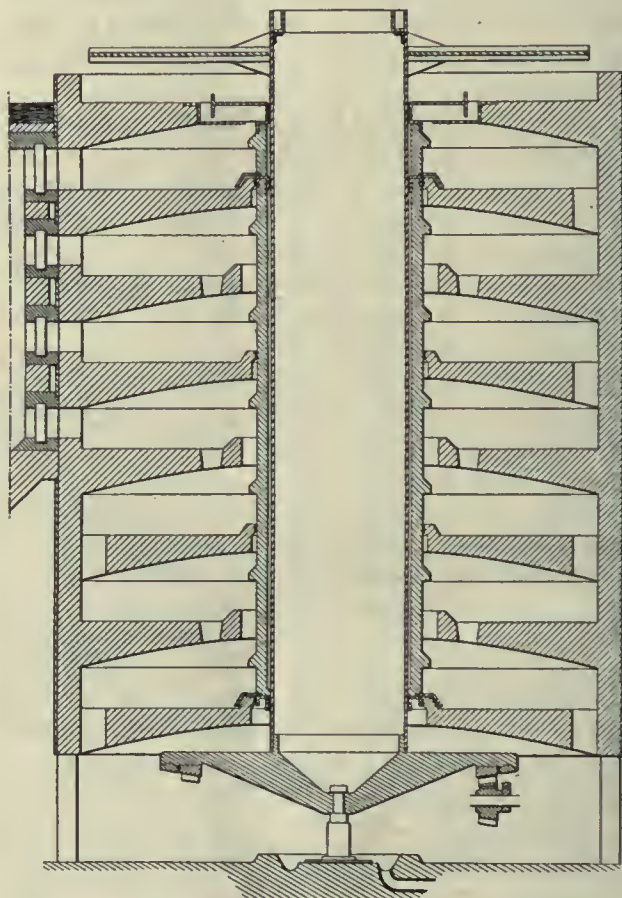
Multiple Hearth Furnace for Treating Lead Matte.

Roasting lead matte in a single hearth furnace is an operation easily performed, but wasteful of fuel. To do the roasting in a multiple hearth furnace is more economical, and many forms of such furnaces have been tried. But there is one objection which has arisen in using the multiple, superimposed type. The gases accumulate heat as they pass in succession over the superimposed hearths, and as a consequence the upper chambers reach such a high temperature that the

incoming supply of matte soon becomes so sticky that it cannot be stirred or moved over the hearth by the rabbles.

Utley Wedge, of Ardmore, Pa., has devised a furnace in which he is able to maintain a lower temperature in the upper portion than in the lower. The matte passes downward from chamber to chamber in the usual way, and the temperature in the different chambers is maintained just sufficient to effect the desired sulphide elimination, but not high enough to effect sintering, or cause the matte to become sticky.

Heat is applied directly in the lower portion of the



MULTIPLE HEARTH FURNACE FOR TREATING LEAD MATTE.

Wedge furnace, where a high temperature is necessary to carry the elimination of sulphur from the calcine to the desired point; and then, instead of allowing all of the hot gases to pass through the chambers above in series, part is permitted to escape. This is effected preferably from several regulable outlets in each of the chambers, so that the higher fuel economy may be attained by using all of the heat that can safely be used in the lower portion of the furnace, applying the same to the upper treating chambers of the furnace but abstracting such portion as may be necessary to avoid reaching the sticky or sintering temperature in any chamber of the furnace.

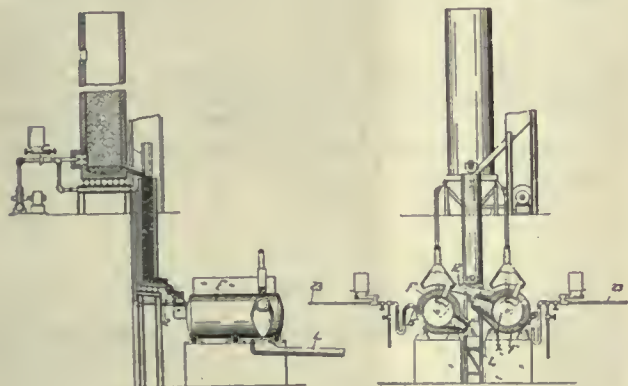
Anode mud obtained in the electrolytic refining of copper is treated for the recovery of silver and gold.

Refining Copper from a Cupola Furnace.

In the refining of impure copper such as blister, black, cement, scrap, etc., it would simplify the operation to be able to use a cupola furnace operating on regulated quantities of a given charge. In this way the operation of oxidizing, or flapping, to produce set copper, could be rendered easier and under more perfect control.

Ulysses A. Garred, New York, describes a copper refining apparatus which he has designed along these lines. By means of this apparatus he is able to get away from wood poling, substituting blast poling, and giving better permeation of the reducing agents through the bath, and reducing the time required.

Side and end views of the apparatus are shown in the diagram. An ordinary cupola furnace is shown, which is provided with a chambered offset opposite the spout. Into this, offset fuel (pulverized coal) is sprayed from a nozzle, this being accomplished by



REFINING FROM A CUPOLA FURNACE.

pumping air through the nozzle in the manner usual in coal burners of this type.

This same air system is continued by a pipe down into the poling furnace (F), so that sprays of fuel may be discharged into them. These furnaces are of the rotary or tilting type, with the usual pouring spout. One furnace discharges while the other is poling or blowing, the poled copper being poured into a launder (L).

As the charge in the cupola settles down past the offset chamber, the pulverized fuel projected from the nozzle and previously ignited, impinges against the bottom portions of the descending column of copper, the flaming particles and highly heated products of combustion melting the charge, which settles on the hearth. The air supplied to the nozzle is so regulated as to bring about the necessary flapping or oxidation of the melted portions of the charge.

From the launder (12) the copper runs into the receptacle of either one of the other of the poling furnaces. The temperature in the poling furnace is maintained sufficiently high to keep the copper in a molten or fluid condition, this temperature being brought

about by the burning of the powdered fuel. Should the charge in the poling furnace require flapping or further oxidation before it is subjected to the blast poling, this can be accomplished by blowing air through the nozzles (15) beneath the charge. The metal being in condition for final poling, the operator directs hydro-carbon or equivalent reducing gas under pressure from the pipes (23) at the same time feeding a proper complement of powdered charcoal. The charcoal laden gas is thus forced beneath and through the molten charge, the level of which is indicated by the dotted line (x) in the right hand furnace, and every particle of oxidized copper is thus reached and reduced to the metallic state.

Argonaut Co.'s Tailings Dam.

The new \$25,000 mill-tailings impounding dam of the Argonaut Mining Co., Jackson, Calif., has been completed. It will be put in use as soon as the new 60-stamp mill has been completed.

The dam is one of the largest of its type in the state. It is 500 ft. in length, 40 ft. high and has 13



THE ARGONAUT TAILINGS DAM.

arches. Tons of old hoisting cable were used in reinforcing the concrete. It is of the Eastwood arch type and at its present height will back up tailings of the 60-stamp mill for 25 years. Water will be backed up a half mile.

The dam is of such construction that it will stand an additional raise of 30 ft. when needed. It was constructed by Eastwood Bros. of Los Angeles, Calif., with F. Livingston in charge.

No branch of metallurgy has in recent years received more attention than the concentration of copper ores, nor has results to investigators yielded more satisfactory returns.

The supply of selenium is obtained almost wholly from reworking the residues of electrolytic copper plants and the flue dust in sulphuric acid chambers.

What the Mining Companies are Doing

The Porphyry Copper Production.

The production of the porphyry copper companies in September, comparing with previous months, is given in the following table:

UTAH COPPER.

	1916.	1915.	1914.	1913.
January	11,999,910	8,009,646	10,649,036	7,560,521
February	11,849,972	8,202,467	9,492,898	7,819,900
March	12,714,651	10,203,882	12,704,220	8,504,040
April	14,557,282	12,015,148	13,133,779	9,834,894
May	15,950,215	14,053,765	13,616,993	10,312,695
June	17,877,432	14,730,912	13,268,106	11,637,949
July	20,302,228	14,641,009	13,768,958	9,849,043
August	20,315,440	15,966,543	8,245,520	10,620,981
September	20,462,256	14,159,289	6,672,194	11,817,428
October		16,004,607	7,765,396	10,236,575
November		13,722,723	6,668,049	11,121,078
December		14,497,485	6,795,567	10,762,490

NEVADA CONSOLIDATED.

	1916.	1915.	1914.	1913.
January	6,157,862	3,069,919	5,791,122	5,169,708
February	6,533,412	3,210,569	4,598,243	4,798,537
March	6,565,559	4,535,192	5,218,227	5,555,320
April	7,716,101	4,710,684	4,880,043	5,650,608
May	7,723,148	5,271,756	4,959,589	5,933,275
June	8,651,772	5,124,480	4,483,175	6,344,863
July	8,537,231	6,292,413	5,477,313	5,403,919
August	7,688,014	6,201,858	3,062,637	5,989,973
September	8,360,180	6,021,850	2,718,471	4,441,671
October		5,880,083	2,801,507	5,898,046
November		5,495,487	2,612,071	5,443,047
December		6,201,247	2,651,658	5,343,862

CHINO COPPER.

	1916.	1915.	1914.	1913.
January	5,316,975	3,563,618	6,131,840	3,440,274
February	4,617,220	3,722,803	5,769,948	4,018,789
March	6,333,255	4,446,087	5,566,819	4,602,809
April	4,496,270	5,027,548	6,109,888	4,046,813
May	6,359,294	6,442,977	5,666,881	4,067,486
June	7,243,618	6,984,977	5,656,102	3,876,533
July	6,883,403	6,650,429	5,087,750	4,893,325
August	6,326,116	6,640,923	3,165,501	6,650,867
September	7,397,204	5,254,286	2,957,704	4,435,873
October		6,319,194	3,060,000	4,914,944
November		6,939,006	3,047,694	4,402,909
December		6,302,045	2,827,891	4,525,792

RAY CONSOLIDATED.

	1916.	1915.	1914.	1913.
January	4,263,440	4,053,147	5,705,000	3,869,006
February	5,767,087	4,830,553	5,600,000	4,007,918
March	6,379,581	5,579,513	6,223,617	4,422,872
April	6,294,033	5,303,213	6,277,693	4,514,565
May	6,278,611	5,016,048	6,495,719	4,405,217
June	6,598,594	4,205,119	6,226,536	4,392,612
July	6,834,492	4,352,571	2,962,000	2,526,000
August	6,597,032	5,581,734	3,300,000	4,401,566
September	6,250,937	4,997,083	3,180,000	4,470,551
October		5,894,441	3,278,348	4,871,566
November		5,576,083	3,196,457	4,900,994
December		5,725,009	3,126,538	5,232,167

North Butte Co., Mont.

The report of the North Butte Mining Co. for the quarter ended Sept. 30, 1916, shows a production of 5,953,685 lbs. of copper, 247,833 ozs. of silver and 402 ozs. of gold.

Surplus and reserve Sept. 30, 1916, was \$4,789,369, compared with \$4,524,445 on June 30, 1916, and \$3,882,417 on Jan. 1, 1916.

We compare copper, silver and gold production as follows:

Quarter end.	Tons ore treated.	Copper, lbs.	Silver, oz.	Gold, oz.
Sept. 30, 1916	124,488	5,953,685	247,833	402
June 30, 1916	146,190	6,074,742	264,400	442
Sept. 30, 1915	123,500	5,672,890	265,855	305
June 30, 1915	87,000	4,490,324	239,512	270
March, 1916	131,071	5,740,193	244,976	365
Dec. 31, 1915	113,000	5,713,745	256,695	365
Total, 1915	377,500	19,234,969	941,630	1,120
Total, 1914	337,415	18,421,761	1,092,300	1,167

During the quarter ended Sept. 30, North Butte development work totaled 5562 ft.

The features of the development have been the proving of the eastward extension of the ore body on the 2200 level of the North Berlin vein, the finding of ore on the 1800 level

on the same vein, and the cutting of ore on the 2000 level of the Adirondack vein.

A plant has been installed and active development of the East Side properties has commenced.

Shattuck-Arizona Co., Ariz.

The following is a summary of mine and smelter production and costs of the Shattuck-Arizona Copper Co. for the quarter ending Sept. 30, 1916:

	Copper Ore.	Lead Ore.
Dry tons mined	43,818	2,757
Dry tons shipped	43,951	2,467
Dry tons smelted	44,013	2,162
Pounds copper recovered	4,663,466	
Ounces gold recovered	1,243	
Ounces silver recovered	79,995	
Pounds lead recovered	661,034	
Net operating cost per pound of copper	9.05 cts.	
General office expense and taxes paid	15 cts.	

Total net cost per pound refined copper 9.20 cts.

Earnings for the quarter are as follows:

Gross value of ores	\$1,274,126.74
Miscellaneous receipts	672.02
Interest received	1,091.46
	\$1,275,890.22
Operating expense	\$527,778.30
General office expense and taxes paid	6,914.38
	534,692.68
Net earnings	\$ 741,197.54
Rate per share per year	8.47
Rate per share per year for year to date	8.43
Total net earnings for the 9 months ending Sept. 30, 1916	\$2,212,000.00

During the quarter, dividends amounting to 12½% were paid, as follows:

No. 16—July 20, 1916	\$175,000
No. 4—July 20, 1916	262,500

Wellington Mines Co., Colo.

The company reports for the 6 months ending May 31, as follows:

Concentrate sales—Zinc	\$507,559.38
Concentrate sales—Lead	20,723.73
	\$528,283.11
Interest earned	1,436.70
Transfer fees	36.07
	\$529,755.88
Gross income	116,421.06
Mining, milling and other operating expenses	
Net income	\$413,334.82
Balance on hand Dec. 1, 1915	105,943.36
	\$519,278.18
Dividend paid March 15, 1916	\$200,000.00
Dividend paid July 1, 1916	200,000.00
	400,000.00
	\$119,278.18
Depreciation reserve	\$ 23,014.55
Surplus	50,000.00
Tax fund	2,500.00
	75,514.55
	\$ 43,763.63

Granby Consolidated.

From its two smelters at Anyox and Grand Forks there was produced in September by the Granby Con. Copper Mining Co. a total of 3,440,035 pounds of copper.

A comparison of Granby's production for the first 9 months of the past 3 years follows (pounds):

	1916.	1915.	1914.
January	3,122,879	2,170,139	1,793,840
February	2,690,265	1,793,373	1,661,212
March	3,555,411	2,793,692	1,775,852
April	3,950,469	3,071,337	2,132,869
May	4,727,929	3,684,115	2,443,294
June	4,011,361	3,626,822	2,706,595
July	4,268,846	3,889,397	2,214,089
August	3,218,847		
September	3,440,035	4,119,387	

The Granby Co. has been experiencing a bit of hard luck during the past 2 months as shown by production of

less than 3,500,000 lbs. in each of these periods as compared with better than 4,000,000 lbs. each for the 3 months immediately preceding. There was insufficient fuel for a time at Grand Forks by reason of a strike at the source of supply, while local difficulties accounted for the falling off at Anyox. Output by months follows (pounds):

	September.	August.	July.	June.	May.
Anyox	2,180,476	2,394,890	3,092,274	2,799,540	3,383,230
Grand Forks....	1,259,559	823,957	1,176,572	1,211,821	1,344,693
Total	3,440,035	3,218,847	4,268,846	4,011,361	4,727,929

Chief Con. Mining Co., Utah.

The following report of the company's operations for the 9 months of 1916, ending Sept. 30, has been issued:

	Feet.
Drifting	15,791.3
Raises	1,566.0
Shaft	593.0
Total	17,950.3

The total shipments of ore were 62,006 tons, yielding net, after the payment of smelting, transportation and sampling charges, \$1,153,000.83.

Metal contents:	
Gold, ozs.	6,461
Silver, ozs.	1,321,966
Lead, lbs.	13,549,935
Copper, lbs.	1,795
Zinc, lbs.	730,249
Assay values:	
Gold, ozs. per ton	104
Silver, ozs. per ton	21.37
Lead (on lead ores), % per ton	13.08
Copper (on copper ores), % per ton	1.95
Zinc (on zinc ores), % per ton	30.5
Average gross value per ton	\$31.38
Smelting, freight, sampling, etc.	12.78
Average net value	18.60

The net profit after the payment of all charges was \$474,247.35.

Disbursements were as follows:

Operating costs	\$ 502,141.70
Machinery and equipment	11,274.14
Construction	14,135.06
Mining claims	153,594.97
Houghton expense	2,664.63
Dividend No. 7	44,033.80
Dividend No. 8	44,148.15
Dividend No. 9	44,149.55
Due for labor	52,112.33
Oct. 1, 1916, balance cash on hand	446,970.07
	\$1,315,224.40

Big Cottonwood Con. Co., Utah.

The balance sheet of the company as of Sept. 30, 1916, shows as follows:

ASSETS.	
Fixed Assets—	
Mining claims	\$300,500.00
Compressor plant	2,407.38
Powder magazine	25.05
Sundry mine buildings	897.88
Miscellaneous mine equipment	449.37
Small tools	183.02
Mess and bunk house equipment	141.67
Office furniture and fixtures	6.00
	\$304,610.37
Current Assets	
Cash on hand and in bank	\$ 1,701.03
Accounts receivable	10.11
	1,711.14
Deferred charges to operations—	
Exploration	\$ 5,156.73
Promotion and organization expenses	2,538.50
General and administrative expense	896.77
Victor tunnel excavation	11,763.32
	20,355.32
Suspense	778.36
Total assets	\$327,455.19

CAPITAL AND LIABILITIES.

Capital stock issued and outstanding—1,000,000 shares.....	\$250,000.00
Donated working capital	\$100,000.00
Less discount on treasury stock	36,228.87
	63,771.13
Capital derived from stock assessments.....	6,875.26
LIABILITIES.	
Notes payable	\$ 5,000.00
Accounts payable	1,808.80
	6,808.80
Total capital and liabilities	\$327,455.19

Miscellaneous Company Reports.

The Franklin Mining Co. produced 740,000 lbs. of mineral during October, against 479,000 lbs. in October, 1915, and 656,000 in September, 1916, and 710,000 in August of this year.

Referee in bankruptcy, Stanley W. Dexter, has ruled that stockholders' protective committee, represented by the North American Liquidation Co., shall be permitted to redeem and take over property and estate of Ohio Copper Mining Co. Trustee's deed will be delivered to committee after court fixes amount due. Hearing has been fixed for Nov. 13. Unsecured creditors are to be paid in full.

We are advised by the Consolidated Mining & Smelting Co. of Canada that directors of the company have ordered an increase in the share capital by one-quarter. Mining operations are being extended and will be further extended. An option has been taken on a copper property on Vancouver Island and other properties are being examined. Each shareholder as of Oct. 21st may subscribe at par for one share for every four shares held.

October production of the Shannon Copper Co., 757,000 lbs., was an increase of about 13,000 lbs. over September, but both months were considerably below normal. August was 925,000 lbs. and July 968,000. In May production got up to over 1,000,000 lbs. The reduced output in October is accounted for by the fact that the furnaces were operated only 25½ days. They were forced to close down on the 13th for 4½ days, owing to the flood in the Clifton district. In September also some trouble was experienced with furnaces because of leaky jackets.

At the Granby Con. property operations are back to normal, a condition, however, which should be more fully reflected in November than in the October results. The August and September copper yield dropped below the 4,000,000-lb. mark. A strike at the Crow's Nest Pass coal property, in which Granby owns a minority interest, during the summer months created a fuel shortage at Granby which made full operations impossible. This situation has improved with the result that both Anyox and Grand Forks smelters have again been tuned up to top speed.

The Greene-Cananea Copper Co. will have distributed \$8 per share to its stockholders during 1916, with the payment next month of another \$2 dividend. Taxes and super-taxes have been levied upon mining companies, which now operate in Mexico, to such an extent that under what were once normal copper prices profitable operations could not now be conducted. The extraordinary levies imposed on Greene's copper production amount to fully 3 cts. a pound indicating an average cost of production of close to 13 cts. a pound. Despite this cost Greene must be showing profits of about \$700,000 per month.

With the consummation of plans, now under consideration, the Miami Copper Co. will during the coming year get its productive capacity up to 75,000,000 pounds per annum. The 1916 output will run between 50,000,000 and 55,000,000 lbs. turned out at an average cost of not far from 9½ cts. a pound. The new production will come from a combination of improvements and enlargements at the mill and mine. The mill capacity will probably be increased through the addition of another section or two, for which provision was made in the original layout. Metallurgical improvements will also play an important part in increasing production.

The American Zinc, Lead & Smelting Co. will, without doubt, report earnings of over \$9,000,000 in 1916. This, of course, includes profits from the recently acquired Granby property. This is equivalent to \$45 per share on the common, after \$6 is paid on 80,000 shares of preferred outstanding. At the present time the company is earning about \$500,000 net a month. Prime western spelter is selling for about 10¼ cts. a pound, and on the company's high grade Mascot prices range all the way from 14 to 20 cts. a pound. On the basis of monthly profits of \$500,000, or \$6,000,000 a year, American Zinc common is today earning \$30 per share on its 193,000 common shares.



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*Illustrated.

Copper Reaching Toward Higher Prices.

The real bull market in copper has arrived. During the entire period of extreme activity in the red metal the upward course of prices was conservative. Now with the clearing up of the odds and ends, with consumers who have been dilatory, seeking to cover, a premium market for copper is rapidly developing. A sale of 1,000,000 lbs. of December copper has been made at 30 cts. Sales of spot electrolytic have been made at 31 cts. For the first quarter of next year business has been closed at 29½ cts. and for the second quarter at 29 cts. Casting copper has advanced to 29½ cts. for spot and 29 cts. for December, Lake copper is practically unobtainable. Throughout the copper market is difficult to quote. Prices on all deliveries up to the end of the first half are subject entirely to negotiations.

The upward movement in prices since our last market report has been sharp. The end is not yet in sight. The interruption to trade caused by election day did not stop the reaching towards higher grounds. Copper is rapidly shaping into a runaway market. Business has been tremendous.

The insistent and large demand for nearby copper is proof of the statement made in our market reports that numerous domestic consumers failed to protect requirements. Since our last report dealers and producers have sold fully 150,000,000 lbs. of copper. Nearby metal prices give promise of attaining levels predicted by leading authorities. It is stated that spot copper will sell above 35 cts. by the end of the first quarter. Dealers who held large lines of spot metal at 30 cts. found buyers extremely desirous of taking over this metal and while a considerable amount of this speculative copper has been sold it is ascertained that dealers still retain control of sizable blocks of the red metal. A million pound lot of February copper sold at 29¼ cts. Several half million pound orders for March were closed at 29 cts. With producers almost entirely cleaned out of first quarter metal the dealers are beginning to reap the harvest.

A Resourceful Mine Manager.

If the history of the prospector, and of that class of canny individuals always on the job where a good lease is to be had, is ever written, it will be sadly incomplete if not replete with the stories of many ingenious makeshifts. To get the ore out at the least possible cost, with the utmost speed and leave the property opened up in a workmanlike manner, such necessity is often the mother of invention.

In Utah there has been formed a corporation that has for its purpose the leasing, bonding and operating of blocks of ground or entire properties. It is known as the Mines Development Co., is a close corporation

and has no stock for sale. Perhaps the following is one reason:

Its manager is a man whose life to date has been spent in prospecting and leasing. Recently the company took a bond and lease covering a period of 3 years on four claims located 25 miles from Lund, Utah. The group is in an unorganized mining district with all that that implies.

Before leaving Salt Lake City for the property the manager ordered a hoist shipped to the property, and was informed that he would get the same according to schedule. At the property a few days later the teamsters delivering supplies gave the manager a message informing him that it would be impossible to deliver the hoist for at least 2 months. There were the usual excuses, but what raised misgivings in the manager's mind was a note added by the secretary to the effect that all of the machinery houses were behind on orders and that the outlook was dark.

After thinking it over the manager decided that a whim was entirely too slow, the haul from the railroad meant high prices for horse feed if he installed the old type of whim—he was right then having his troubles getting hauling done—and for awhile he was in a quandary. The principal value in the ore was lead and lead might begin to drop in price at any time.

And then he thought of the automobile. So he immediately started building a roadway from the shaft. When it was leveled up he attached the cable to the rear end of the automobile, passed it under a sheave wheel at the collar of the shaft, over the sheave wheel at the top of the headframe and down the shaft where the bucket was attached.

It does the hoisting in a rapid and efficient manner at a very small cost, and he is getting out the ore faster, he says, than he could by hoisting it.

Chemists to Supply Urgent Need of Nitrates.

Of all chemical products the nitrates are undoubtedly the most important to our country's welfare and prosperity. Not only do the nitrates form a most essential constituent of fertilizers but in all explosives and gun powders nitrates and compounds derived therefrom form the basic principle. Were we entirely deprived of nitrates, ammonia and other nitrogen complexes not only would our country be absolutely defenseless, but our crops would suffer and our people would undergo a slow process of starvation.

For years we have been depending upon Chili for the supply of nitrates (Chili saltpeter), but the deposits are calculated not to last more than 50 years at the present rapid rate of consumption. And if by some hostile power the importation of Chili saltpeter were entirely cut off, our country would be placed in a very embarrassing situation.

Electro chemists, foreseeing a possible calamity of

this kind, have come to the country's rescue. It is well known that our atmosphere contains 80% nitrogen gas and the problem was to transform this inert and practically useless gas into valuable compounds such as nitrates and ammonia. Our country may be justly proud of the fact that the first plant for the manufacture of nitrates was erected here at Niagara Falls. With the aid of electricity the nitrogen of the atmosphere was chemically "fixed" into compounds to be used in fertilizers and gun powder.

Going to the Mining Congress?

This year try not to miss the things you had particularly wanted to see. You've done it before, because you were rushed, and didn't have a set plan.

There are going to be new things among the manufacturers' exhibits.

Post yourself in advance on the ones you want to be sure to see and study.

The place where you will find this advance information is in last week's issue.

It was out thus far in advance so that you can go through its advertising pages, leisurely; now, while at your desk.

And as you are doing it, make memorandums of the things you really mustn't miss. You'll see them there, and you will find them exhibited at the Congress, or at least men will be there who can tell you all about them.

Pencil and pad; that's the idea.

The war tax on Canadian mines will cost the industry of that country a considerable sum of money, based on the taxes fixed by the Canadian government against the Dome Mines Co. For the period ending March 31, 1916, this company has been called on to pay the government \$27,502. This is at the rate of a little less than 7 cts. a share. When the announcement of a war tax was made in February, the stocks of nearly all Canadian companies dropped heavily, Dome shareholders suffering a loss of about \$6 a share, or nearly \$2,500,000 in value. The tax affects all companies in Canada having capital in excess of \$50,000 or over and demands 25% of profits over 7%. In the case of precious metal mines the capital is computed on the basis of 5 years' profits, and that depreciation at the rate of 10% a year will be allowed. This is to be deducted from the yearly profits before allowing the 25% tax on excess profits.

Producing nowadays at a rate of 1,000,000 lbs. of copper a day, Anaconda Copper Co. enjoys the distinction of being the world's largest copper producer. The main consideration these days has been to get out as much copper as possible with but little effort being made to lower production costs. With costs of producing around 11 cts. the company is earning, basing production on 300,000,000 lbs. annually and a 25 ct. market, no less than \$18 per share annually. Out of this dividends of \$8 per share are being paid.

PERSONAL.

L. D. Ricketts, mining engineer, New York, is in Butte, Mont.

D. Crevling, mining engineer, New York, is at Prescott, Ariz., examining properties.

Alfred Frank is now in charge of operations at the Butte-Duluth mine, Butte, Mont.

Theodore J. Hoover, mining and metallurgical engineer, London, E. C., is in New York.

Edward Durham is superintendent of construction for the Mammoth Copper Co., Kennett, Calif.

Frank R. Corwin has been made assistant superintendent of the International smelter at Miami, Ariz.

J. Parke Channing, consulting engineer, New York, has been in Spokane, Wash., and left for Butte, Mont.

Forbes Rickard, mining engineer, Denver, Colo., has returned from Arizona and left for Lovelock, Nev.

George Nordquist, Chicago, is in Salt Lake City, Utah, and has been examining properties in Beaver county, Utah.

H. W. Aldrich has been made superintendent of the blast furnace and briquetting plants of the Anaconda Copper Co.

Pope Yeatman, consulting mining engineer, New York, is in Salt Lake City, from which place he will return to New York.

Fred W. Bradley, president of the Bunker Hill Mining & Concentrating Co., has returned to Kellogg, Idaho, from San Francisco.

H. B. Paull of New York, auditor for the Calumet & Arizona Co., is now at the main office of the company at Calumet, Mich.

Harry Vivian of the Calumet & Hecla engineering staff, accompanied by Mrs. Vivian, is making a trip to Warren and other Arizona points.

W. W. Wishon has been appointed consulting engineer for the Big Casino Mining Co., of Philadelphia, Pa., with mines near Searchlight, Nev.

Henry V. Snell, general manager of the Warrior Copper Co., Globe, Ariz., has been made general manager of the Miami Copper Co., Miami, Ariz.

Robert A. Brown, former superintendent of the Centennial-Eureka Co.'s mines, has resigned to become superintendent for the Alta Con. Co., Alta, Utah.

F. K. Brunton, formerly with the American Smelting & Refining Co. at Garfield, Utah, is now assistant superintendent of the Consolidated Arizona Smelting Co., Humboldt, Ariz.

Charles W. Newton, manager of the Consolidated Interstate Callahan Mining Co., Wallace, Idaho, has been appointed by Gov. Alexander, a delegate to the Mining Congress at Chicago from the state of Idaho.

W. J. Roberts, vice president of the Traylor Engineering & Manufacturing Co., Allentown, Pa., who has recovered from an attack of pneumonia, while on a western trip, has returned east. On his arrival in Chicago a couple of weeks ago, he could proceed no farther, and was with relatives during his illness.

Thos. F. Cole is at Calumet, Mich. He has just resigned from the presidency and directorate of the Greene-Canea Copper Co. and as a director for the Inspiration Con. Copper Co. It is understood that Mr. Cole will gradually retire from active participation in companies with which he has

been identified and will make his home in the west. He still retains the presidency of the North Butte Mining Co.

H. Foster Bain was in Chicago last week on his return from a visit to various mining fields which included the Rand and British Columbia. The announcement is made of his retirement as editor of *The Mining Magazine*, London.

Geo. H. Hawes, who established safety and rescue departments for the Oliver Iron, Calumet & Hecla and other large companies later joined the Bureau of Safety of Chicago and has now opened an office for it at 202 Torrey building, Duluth. From that point he will supervise work for various mining companies that are clients of the Bureau.

OBITUARY.

Edward Meader, an operator in the Mogollon district, New Mexico, died at his home near Silver City, N. M., on Oct. 30, 1916. He was 56 years of age and was born in Missouri. In 1879 he came to New Mexico.

L. C. Stevenson, mining engineer, recently passed away in Baltimore, Md. He was 33 years of age and until recently spent much of his time in the vicinity of Sumpter, Ore. Here he managed the Taber Fraction, Golden Chariot and Buffalo mines during various times and was associated in considerable work with W. W. Elmer, mining engineer. About 1911 he left that district and since then was superintendent for the Virginia-Maryland Coal Co., Newberg, W. Va.

SCHOOLS AND SOCIETIES.

Texas School of Mines.—The buildings of this institution, which is affiliated with the University of Texas, were burned with an estimated loss of \$50,000.

American Chemical Society.—At the meeting of the New York section on Nov. 10 the following papers were on the program: "The General Problem of Public Service Training," by Prof. Chas. A. Beard; "The Status and Compensation of the Chemist in Public Service," by Prof. F. E. Breithut; "The Chemist in Public Service," by Dr. Harvey W. Wiley; "The Chemist in the Service of New York City," by Dr. Otto H. Klein.

COMMUNICATIONS.

[This department is for the exchange of ideas bearing on all branches of the mining and metallurgical industries. Mining and Engineering World will not be responsible for the statements made nor opinions expressed by correspondents.—Ed.]

Machine Placer Mining.

The Editor.—In your issue of Sept. 16th is an editorial headed "Placer Mining of Today," which "hits the nail on the head."

There are large deposits of gravel where water is scarce but values are good that are receiving no attention for reasons set forth by you.

I have worked a small machine, of my own invention, on gravel in Nevada where I could get but 9 gals. of water per minute for 6 hours per day, and still I washed an average of 32 yds. per shift, 8 hours. I am now operating such a machine in Placer county, California, washing a creek bar—sand and pebbles—at the rate of 10 cu. yds. per hour, using (as per rating of pump by manufacturers) 65 gals. of water per minute.

Possibly this information may be of interest to others of your readers having similar ground.

J. B. GIFFEN.

Rocklin, Cal.

NEW PUBLICATIONS.

Spirit Leveling in New Mexico. By R. B. Marshall. Washington; D. C., U. S. Geological Survey. Bulletin 638; pp 112.

The location and elevation of all the bench marks in the state are given and classified according to the quadrangle in which they are located.

Abstracts of Current Decisions on Mines and Mining. By J. W. Thompson. Washington, D. C., U. S. Bureau of Mines. Bulletin 126; pp 90.

The decisions include those which were reported between January and April, 1916. Legal phraseology is entirely left out, the abstract being simply a description of what the finding of the court with respect to controversies regarding mining laws.

Lime in 1915. By G. F. Loughlin. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. II:19; pp 20.

A general review of the industry with respect to the whole United States is first given and includes data on production. Lime as used in different industries is treated separately for each industry and some information is given on the use of fuels in burning lime.

Methods of Sampling Delivered Coal. By George S. Pope. Washington, D. C., U. S. Bureau of Mines. Bulletin 116; pp 64; illustrated.

Details of methods and equipment used in the sampling of delivered coals are given. Different methods of sampling are given for several different classes of sampling and other information bearing on the same is supplemented. Complete details regarding specifications for the purchase of coal for the government are reproduced.

Tin Ore in Northern Lander County, Nevada. By Adolph Knopf. Washington, D. C., U. S. Geological Survey. Bulletin 640-G; pp 14; illustrated.

Wood tin is the form in which the ore is found and though to date the deposits have not been opened to a great extent the nature of the mineral as given in this report would seem to warrant the same. The contents for the greater part is a description of the country and the geology of the formation and deposits.

Bauxite and Aluminum in 1915. By W. C. Phalen. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. I:7; pp 16.

Besides reviewing the production and conditions of the industry by states in the United States some space is given to reviewing it in foreign countries. The uses of bauxite are taken up, principal among which is metallic aluminum and other aluminum products. The sources other than bauxite for aluminum are given and a brief is contained on methods of making aluminum from bauxite. The general aluminum market during the year is then discussed and the common uses of the metal given.

Cosna-Nowitzna and Ruby-Kuskokwim Regions, Alaska. By H. M. Eakin, J. B. Mertie, Jr., and G. L. Harrington. Washington, D. C., U. S. Geological Survey. Bulletin 642-H; pp 56; illustrated.

The first named district to date has not been found of any noted importance so far as gold or other mineral deposits are concerned. It is treated on but briefly principally with respect to the geography of the country, though some information is given on its economic geology. Gold, both placer and vein, is the principal mineral of importance in the other district. The geology and geography of the country is described in general for the entire area and brief separate descriptions are given of operating properties and the smaller sub-districts.

TRADE PUBLICATIONS.

Chain Drives for Power Transmission. Morse Chain Co., Ithaca, N. Y. Publication 14; pp. 20; illustrated.

The chain, its construction and uses are described briefly in detail though for the greater part the publication consists of views showing installations in plants of the company's Chain and each view is accompanied with a short description.

Briquetting, Magnetic Separating and Sintering Equipment. The American Grondal Co., New York. Pamphlets; illustrated.

In these three pamphlets the Grondal briquetting, magnetic separators and concentrates made by Grondal separators sintered by the Greenawalt process are discussed. Each subject is considered in a concise manner with some details.

Machinery for the Mine, Mill and Smelter. The Morse Bros. Machinery and Supply Co., Denver. Catalog; pp. 42.

Every class and kind of machinery used about the mines, mills and smelter for power of all kinds, drilling, concentrating, etc., are included. Each class of equipment is under a separate head and these are included in a well gotten up index in the front pages. This catalog includes all of the second-hand equipment which the company now has ready for immediate delivery.

Wooden Pipe. Redwood Manufacturers Co., San Francisco. Catalog VIII; pp. 109; illustrated.

A general detailed description is first given on the method of manufacture of the pipe, its uses, strength, etc. Drawings showing the way in which the pipe is constructed and put together on the ground are reproduced. A table and reproduction of letters from users of the pipe are given, with tables of use in constructing lines and also some of general use in hydraulic work. Costs, prices, etc., are also given as also are layout drawings of various installations.

Air-Compressor Condensing Intercooler. MacCamy Air Cooler & Condenser Co., Salt Lake City. Pamphlet; pp. 8; illustrated.

Letters from users of this type of intercooler are reproduced and the advantages of the equipment are spoken of. Water in the compressed air is a well known source of considerable trouble especially when used to operate rock drills. The intercooler as described in the text of this pamphlet can be installed with any kind of air compressor and will tend towards eliminating the greater portion of the water in the air while passing from the low to the high compression cylinder.

INDUSTRIAL AND TRADE NOTES.

The Carbo Corporation has removed to Chicago Heights, Ill.

O. E. Thaleg, who has been connected for some time past with the Austin Mfg. Co., was recently appointed district manager of the power and mining department of the Worthington Pump & Machinery Corporation, with offices at 825 Old Colony building, Chicago.

Executive control of the Moore Filter Co. has again passed into the hands of Henry B. Haigh and several associates, who have plans for carrying on the business on a much broader scope, the details of which they are not prepared to give at this time. Mr. Haigh assumes the office of president of the company, which position he held for a long while with the old company, and under his experienced handling the business should progress to the best interest of all concerned. Their new offices will be located at 43 Exchange Place, New York.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

The ore deposits of the Prince William sound region may be grouped broadly into two classes—copper deposits and gold-bearing quartz lodes. The mineral associations in both gold and copper deposits are in general the same, so that the copper mines produce large amounts of gold or silver or both, and copper sulphide is present in small amounts in many of the gold quartz veins. The known productive mines on Prince William sound in 1915 include four copper mines and five gold mines. A much larger quantity of copper ore than of gold quartz was mined and treated, and the total value of the metals produced from the copper ores was about five times that obtained from the gold quartz ores. The value of the total mineral production of the Prince William sound region in 1915 was \$1,340,000 as compared with \$1,200,000 in 1914. The above information, as well as a detailed description of the mines and prospects visited, is contained in a report entitled "Mining on Prince William Sound, Alaska," by B. L. Johnson, recently issued by the Survey as Bulletin 642-D.

Kennicott.

With D. K. McDonald, president, and M. E. Hay, vice president, Spokane, Wash., a company was recently formed to take over the Josevig-Kennicott claims. It is building a road from the Bonanza mine to the property. The road extends 6 miles across the Kennicott glacier, and three miles on the mountain-side from the end of the glacier to the workings. The company is now shipping in supplies and a large crew will be put to work next spring.

It has already shipped 3 tons from open cuts on the vein which it is estimated will run from 40 to 45% copper. Mining engineers estimate that there are 600 tons of 40 to 50% copper on the surface.

Valdez.

Developments are showing good results on the 210 and hoist levels at the mines of the Granite Co. This is made authentic by recent reports of President B. F. Millard, who further states that assays show on the hoist-level 10 ins. of \$71.10 ore, 8 ins. of \$295.58, and 14 ins. of \$166.19. This also holds on the 210 level. We are getting high-grade there, and have had a continuous shoot for 250 ft. On the 350 level we are getting 41 ore. Starting at 50 cts., it is getting better all the time as we go in, and I believe when we get over to catch the shoot of rich ore on the 210 level we will have it as good on the 350. The average of the 210 level for month of August was \$16, and the vein averages 38 ins. wide. The hoist level on the granite side is showing up rich. We followed the fault on the slate end of the 350 level 80 ft. to the right and picked up the vein with milling values. This gives us ore on three levels and no doubt it continues from one level to another. I still hold that our best ore will be found going into granite and perhaps on the upper side of the dike. We have had trouble getting good miners and had to fill up with black men. Developments at the Black Diamond group are encouraging and plans are being made to operate through the winter. The Black Diamond covers two veins. One is the same that runs through the Three-in-One. The other is a parallel vein several hundred feet away. Both of the veins have been traced the full length of the claims. Considerable development work has been done. This work has demonstrated that the ore in the lead crossing the Three-in-One carries the same values on the Black Diamond as in the former property. On the parallel vein, where work is at present being done, it has been demonstrated that this vein carries ore equally as rich as the other. Frank Kampfer, in

charge of operations, expects sufficient ground will be blocked out by spring to warrant a mill.

Unga.

With eight men, Engineer A. H. Bradford is opening up two quartz veins near here. Outside capital is backing the enterprise and are Messrs. Deming, Smydecker and Scottem, big owners in the National mine, Nevada. There are two ledges that can be traced for over 2 miles. One lead is 200 to 250 ft. wide and the other 100 ft. In one ledge assays have shown \$2 to \$14. The other assays from \$1 to \$4 have been returned.

Nome.

An area which created excitement 6 years ago has again come to light. A strike has been made in the district around Fort Davis on the second bench-line. Jensen located the pay at a depth of 20 ft. Development so far accomplished is slight but is said to be sufficient to show that the strike is of more than passing value. The streak is 2 ft. thick. According to statements it pans as high as \$7.

Development at the property of the Pioneer Mining Co. is progressing and gives promise of blocking out sufficient ore to keep up production next season. During this season about 15 tons of high-grade was produced.

ARIZONA.

Ray.

Ray Hercules Co., it is said, has purchased nearly \$1,000,000 worth of materials and machinery. One order being for a head frame, structural steel and corrugated iron, which was awarded the El Paso Bridge & Iron Co.

This will provide materials for all the buildings required at the property. An order was placed with McIntosh & Seymour for a Diesel engine.

On account of the congested conditions the contracts provide for delivery in from 5 months to a year, and include material for a mill, hoist, compressors, crushers, ore bins and such buildings as are necessary for the offices and the accommodation of the employees. Callow flotation machines will be used in a system similar to that of the Inspiration and Magma companies. Two shafts have been sunk. The main one is 750 ft. deep. About 150 men are employed. Bodies, running from 6 to 10%, have been encountered. Regular shipments of carbonate are being made to the El Paso smelter. In the main shaft native copper was encountered between the 600 and 700 levels. Three shifts are working continuously. Churn drills are being employed in prospecting, some having penetrated to a depth of 600 to 1500 ft.

Globe.

A complete system of development is to be started at the Iron Cap Copper Co.'s property through the Iron Cap and Williams shafts. The equipment at these shafts will allow a depth of 1500 ft.

The old Iron Cap shaft, 400 ft. deep, has been enlarged to 3-compartment shaft and sunk to the 800 level. A cross-cut was started at 600 ft. As soon as the station at 800 is finished crosscutting will begin at that level. The shaft is to go down to the 1000 or 1200 level and the area north of the shaft explored. The shaft is situated 1000 ft. from the east workings of the Arizona Commercial on the Copper Hill lode, which is 30 ft. wide and averages 6% copper. Indications are that the lode crosses Iron Cap ground 300 ft. north of the shaft and extends $\frac{3}{4}$ of a mile through the property. The crosscuts at the 600 and 800 levels should reach the sulphide vein in a few months. At the Williams shaft a

double drum hoist is being installed. They will sink from the 900 to 1000 level. The vein on the 800 proved large and rich in both copper and silver. Almost continuous shipments of ore have been made from that level for 3 years. In the winze sunk 90 ft. from the 900 level rich ore was found. It is 7 ft. wide. Three feet is bornite, which assays over 30%. The equipment at both shafts is adequate for development to the 1500.

Oatman.

The great lode system which traverses the central portion of the district, and upon which are located the Tom Reed United Eastern and Big Jim mines is an immense lode. Recent developments on the easterly extension of the Tom Reed which covers fully $1\frac{1}{2}$ miles both to the east and west of its main, or Ben Harrison workings, have given further and most interesting proof of the importance of this great lode system.

From the extreme western point in which the United Eastern has developed great bodies of pay ore, to the extreme eastern point at which the Tom Reed has developed large bodies of pay ore, is almost 2 miles. Here seems to be a practically continuous ore body, held in two enormous veins on either side of a strong dike system. These veins average more than 15 ft. in width, and have been developed at various points to depths ranging from 200 to 1400 ft., and show pay ore to the greatest depth, and up to within 50 ft. of the surface. In addition, along this great zone, about 1 mile to the west of the United Eastern, the Tom Reed is opening pay ore at 100-ft. depth in its Rhine gold claim. When it is considered that this ore body is free milling, showing no sulphides, from top to bottom, that it is more than 15 ft. in width, and that average values seem to be well above \$12, the characterization of the lode as "amazing" seems to be justified. During the past 2 or 3 years, the ore extracted from the Tom Reed's main workings has given values of more than \$20, figuring averages year by year. There seems reason to believe that the above estimate of \$12 per ton is far too low.

The longest ore shoot in the main workings of the Tom Reed mine is less than 300 ft. There are three practically parallel shoots in these workings, which have enabled the payment of some \$2,555,000 in dividends to date, and this when mining and milling costs have been very high. The new easterly workings of the Tom Reed, in the Black Eagle, Aztec Center and Bald Eagle workings have opened a continuous ore shoot at 400 ft. depth which is known to be more than 800 ft. in length, and which gives promise of being 1100 ft. in length. Conditions indicate that foot for foot, these new workings rival and will continue to rival, under development, any like footage in the old workings. In other words, Tom Reed seems to be entering upon a new era of life. It also seems tenable to believe that the new workings will result in a much larger mine than the old mine of the company. Supt. Edwin Rabb, who made such a success of the Tennessee mine in Chloride, and who was field man for Phelps-Dodge in Mexico before the revolution, states that he believes these big bodies of free-milling gold ore in this district should be mined and milled at a cost of much less than \$4, and he is making plans in this direction. He has already materially reduced the costs of mining and milling Tom Reed ores.

The United Eastern has its new 200-ton mill more than 80% complete. Housing is about completed, and all machinery is on the ground and is being installed. The new main working shaft is now being connected with the lower level of the old workings, at 665 ft. depth, or 750 ft. depth in the new shaft. It is anticipated that the mill will start operations in December. Ore reserves are estimated at more than \$12,000,000, and that average values are well in excess of \$15.

The Big Jim, the property of which cuts into the central section of the Tom Reed ground immediately to the west of its main workings, is also developing into a splendid mine. Ore has been developed from a depth of about 60 ft. below surface to 485 ft., and for a lateral length of more than 650 ft., proving a continuous ore shoot. The vein averages more than 20 ft. in width, and all its content will be sent to mill. Careful mine sampling seems to indicate that average mill

returns will be in excess of \$12 and possibly close to \$20. Careful inspection, measurements and sampling indicate that there is now in this property an actual ore exposure of 290,000 tons, and that work in progress should within the next 60 days expose another block 200 ft. in length, 345 ft. in height and 20 ft. in thickness, or 115,000 tons additional.

In the Black Range section of the district the Nellie, at a depth of 350 ft., has encountered its main vein, and sampling showed 17 ft. of ore, with the foot wall not yet in sight. The vein filling is calc-spar, blackened by manganese oxides, and replaced with adularia quartz to fully 50% of its entire bulk. This is the condition which, in this district, is necessary before deposition of metals is expected. The entire crosscut panned well, and the first 9 ft. showed average values of better than \$12. The remainder has not been sampled at this time. When the vein is completely crosscut, work of drifting to the east, under a rich ore shoot which shows at surface, will be started.

The Ivanhoe is now pumping out its workings, having installed a powerful compressor plant, and work on the 500 level will soon be resumed. When the miners were flooded out, a full face of adularia quartz was showing which was really commercial ore. This seems to be at a point where the feeder vein which the drift has been following, joined the main vein. The water which came in prevented the discovery from being followed up to prove its importance. Engineer Keating, who has made such a success of the Big Jim, is now also in charge of the Ivanhoe, and expresses his opinion that it will make into a mine.

The Adams, in this same section, will soon begin lateral work, and as its surface showing is spectacular, interesting developments are expected when its vein is crosscut at 400 ft. depth.

The Black Range is working on an old shaft, 150 ft. deep, near the Nellie Endline, and on the same vein, about 800 ft. to the east of the Nellie shaft. Some ore better than \$20 is being encountered.

Chloride.

The management of the Georgia Mining Co. received orders to put on three shifts and sink to the 300 immediately; may have to install compressor and air drills account bad ground.

Black Jack has exhausted ore sack supply, compelling suspension ore shipments; breaking of ore in mine continues; high grade copper ore is found in upper tunnel.

Silver Hill announces mill construction to be commenced immediately. Fifteen thousand tons of ore are on its dumps and big reserve in old workings; may add custom department.

Representatives of Grasselli Chemical Co. of Cleveland are here looking over the field for ores, and with a view to installing sampler for the company.

The head of Western Ore Purchasing Co. is on the way here to survey the field for another sampler.

F. M. Steffy is coming to start work on new 250-ton custom mill.

Robert Mead Martin, of Los Angeles, is in camp superintending construction 150-ton reduction plant on Copper Age property.

Schenectady, contiguous to the famous Tennessee, opened 2 ft. shipping ore on 175 level.

The Emerson started up with five men; old workings are being cleaned out; good values are being found, as represented by old timers.

Santa Fe railroad will put motor service on to Kingman to accommodate inrush of people.

Power line is within half a mile of town. Plans of the company have been enlarged three times since construction began, due to unprecedented growth of town and mines.

Tennessee mine is adding counter-weight to shaft equipment to make ready for new double-deck cage. The force of miners will be increased as soon as raise from 1400 level reaches surface.

Rich ore has been found by Frank Braly more than mile from camp, on flat. Enlarges known mineral zone in that direction.

CALIFORNIA.

Jackson.

The strike situation is gradually improving, and hopes are entertained for capacity operations at most mines before the end of November. Work has been resumed at the Bunker Hill with 60 men, and the management expects to have fully 100 on the payroll soon. At the Kennedy 120 men are employed, and the Argonaut has over 100. The Plymouth Con. is working a large force and maintaining a heavy output. The South Eureka Co. has established a guarded camp at its property, and is quietly arranging to resume work at an early date.

Since the strike began fully 500 miners have left the district, including a large number of the most hostile agitators. Attempts to settle the trouble by arbitration have been defeated by the companies, which contend that there is nothing to arbitrate. To grant the wage increase asked would mean the forced idleness of many properties, and no other provision than the demanded scale would be accepted by the miners.

Several old properties in this district are being examined with a view to resumption of activities. Among these are the Mammoth, Mitchell and St. Julian. It is reported a sale is being negotiated for the St. Julian, the prospective buyers being James S. Rear and T. M. Woode of Vancouver, B. C., owners of the Columbia mine and other important California properties.

The elevated tramway from the ore bins of the Argonaut shaft to the new mill is nearing completion. It will be approximately 800 ft. long and provided with double tracks, the descending car aiding to balance the one ascending. Construction of the mill has been practically completed. In addition to the equipment of the old 40-stamp plant, the new mill will be provided with 20 heavy stamps and special gold-saving devices.

Sutter Creek.

Unwatering of the Old Eureka mine is proceeding rapidly. A powerful double-drum hoist, capable of raising a 15,000-lb. load from a depth of 3000 ft. is being installed and a centrifugal pump has been placed in position to elevate water to surface from the 9000-gal. tank on the 500 level. Unwatering of the 800 level is proceeding steadily. The miners are beginning to find numerous charred timbers, mute evidence of the fire that forced the closing of the mine more than 30 years ago.

Kennett.

Construction of the electrolytic zinc plant is proceeding rapidly, and the management expects to start ore treatment within a few weeks. Frame work is in position and considerable machinery has been installed. The plan represents an expenditure of \$300,000 and will treat custom ore in addition to treating flue dust from the baghouse of the Mammoth smelter, and zinc ores from the Mammoth mine. It will also probably handle a heavy tonnage for the Bully Hill smelting people.

In the Arps group a 6-ft. vein of gold-silver ore assaying around \$70 has been intersected. The vein also carries some copper and is developing well. The owners of the Shasta Belmont are arranging for early operations. The lower tunnel will be extended 160 ft. to intersect the main ore zone, and an engine and blower installed. The camp will also be enlarged and the road repaired preliminary to shipping to custom smelters. In the upper tunnel some good ore has been blocked out. The zinc ores will probably be treated in the new Mammoth plant. W. E. Casson, of Carson City, is manager.

Sonora.

The Confidence mine has been acquired by the Confidence Gold Mines Corporation, capitalized at \$600,000. There are 1000 preferred shares, and 5000 common. The directorate is composed of Warren B. Hunting of New York, and E. S. Bolen and W. A. Stratta of Richmond, Va. Comprehensive operations are to be commenced immediately. The Confidence was long one of the most consistent producers of the Sonora district and has produced upward of \$5,000,000 in gold but idle 10

years. It contains wide bodies of medium-grade quartz in the lower workings and has been opened to a depth of 1100 ft.

Rich ore has been opened in the Gem mine, for the past 4 years worked by J. F. Wulzen. The ledge ranges from 3 to 4 ft. wide and was struck in a winze recently started from the end of an old adit. Considerable free gold shows and the strike is considered one of the most important made on the East Belt in years.

Morris Ravine.

Machinery is being installed at the Bumble Bee quartz property, controlled by Ford brothers. Large quantities of electrical equipment is being installed at the Banner mine, and the management expects to start large-scale operations early in December. Good ore is showing on several levels, particularly in the main workings of the South Banner claim.

Angels Camp.

The Estelle Gold Mining Co. has been formed by Denver capitalists to operate a group of claims in this district. The property lies near the Gold Cliff, Angels, Utica and other large producers, and comprises a merger of numerous holdings of great promise. Machinery has been purchased and it is planned to start active operations within 30 days. Ralph M. Jones is president; Felix B. Tait, vice-president; Estelle Sibbald, secretary-treasurer; Daniel F. Mackay, general manager. All are residents of Denver.

Downieville.

The buildings and headframe of the Finney mine have been enclosed and roofed in preparation for the winter. A new hoist is in position and sinking on a goodlooking ledge is making fair progress. It is intended to continue work all winter and to provide reduction facilities in the spring if ore conditions remain satisfactory. George Morse is superintendent.

It is reported the Rock creek section will be supplied with electric power in the early summer. A preliminary survey for the transmission line has been made from the North Fork mine to the Wisconsin, and it is said branches will be extended to all the principal mines.

Tuolumne.

Unwatering of the Columbus mine has been completed and mining will be resumed with the least possible delay. It is one of the oldest properties in California and in its early years yielded much rich ore. Strongly-financed eastern people recently became interested, and a vigorous campaign of development work has been outlined. The Buckeye mine has passed into the hands of New York people and is to be re-opened within 30 days.

Nipton.

The Copper King group of nine claims, belonging to G. H. Hamstadt of Nipton, has been bonded by W. W. Wishon and H. B. Sharps, representing Philadelphia interests, and their examination in the next 60 days will determine the sale. They have four assistants in making the examination now on the property.

COLORADO.

Silverton.

The Pride of the West Mine has been leased by C. W. Byrd and associates. Production will be kept up during the winter. The ore is now being shipped to the Silver Lake customs mill, but will later be treated at the Old Green Mountain mill, which is now being remodeled, including the addition of flotation machines.

Cripple Creek.

The Albert-Beacon Gold Mining Co. is operating the Beacon mine under lease with the privilege to purchase. An electric hoist has been installed at the old Beacon shaft. Just as soon as the old sump is cleaned out, men will go to work in the old levels. Other miners will start sinking the Beacon shaft from its present depth of 360 ft. an additional 300 ft. Two shifts will probably be put to work.

Associated with J. D. Purcell, president of the Dearborn Chem. Co., Chicago, Matt. Korf has taken a lease on the Victor mine from the Smith-Moffat Mines Co. Under the

lease conditions Korf is given permission to operate the Victor through the Lee shaft of the Isabella Co., on whose ground he is now leasing, and with this favorable concession from both companies, the drift on the Cheyenne, at the 500 level of the Lee shaft, will be extended through into the Victor ground.

Georgetown.

In the 5th and 6th levels of the Mid-Colorado mines good ore is being worked. In the Moline tunnel level at a depth of about 1000 ft. a 6-ft. vein of lead-zinc has been opened. It is being contemplated that the company's mill will be remodeled. The plans include a Symons disc grinder to replace the rolls, also a double deck Deister table and flotation unit. It will be necessary to provide either aerial tram or otherwise transportation for ore now being mined in the Moline tunnel to the mill. The present tramway has its terminal above this level.

Crosscutting is in progress at the Onondaga mines to get the footwall of the vein from the 180 level. Three separate veins have been encountered in this work. Two of the veins are solid enough to pay, the ore being mostly galena. There is a good body of ore in No. 3 raise, which is now up to the 180 level, but quite a distance south of the main workings, thus making four veins running through the lode. When the footwall is reached by the crosscut it is expected that a large body will be opened. At present no ore is being mined, and there will be none until development now under way is completed.

Silver Plume.

The Smuggler mine, which is now operated by the Hollingsworth Mining Co., is producing 500 tons of lead-zinc-silver ore per month, as against 100 tons at the first of the year. The shaft is down 400 ft. with 5 levels. The 5th level is out 600 ft. from the shaft, and a stope 300 ft. long is being operated, though the last 100 ft. has only just been timbered. The ore averages 20 ins. wide. There is stoping ground to surface at the further end of the level. In the bottom of the 5th there is a 20-in. body showing for 400 ft.

Leadville.

At the Bartlett mine, operated by the Prince of Wales Leasing Co. water has been encountered in quantities causing much difficulty. At present, work is being carried on from the bottom of the interior shaft. Drifting from the winze has gone out 50 ft. One big shoot of silver was mined through the Bartlett several years ago and it is the continuation of this vein that present operators are striving to reach. It is believed that the flow will rapidly decrease as soon as cold weather prevails, making it possible to continue work without the necessity of enlarging the pumping capacity. Enlarging the pumping plant, however, is contemplated for the spring if the vein is encountered in the meantime.

The vein opened in the ground of the Fidelity Gold Mining Co. is now proving to be persistent and is acting as an incentive for the beginning of operations of many other properties in the district during the coming season. The company expects to add considerable to both its plant and number of employees.

Idaho Springs.

Good ore is showing in three places on the 130 level in the property of the Consolidated Mines & Dev. Co. One drift showing 6 ins. of smelting ore, assaying \$60 and 1½ ft. of mill dirt, which assays \$10 gold and 5 ozs. silver. The raise being driven in three compartments and a timber slide to afford a method of getting timbers into the mine, has cut into the surface shoot of ore and has a 2-ft. streak from which \$16 to \$30 gold and about 8 ozs. silver are returned. The other heading on the level has 5 ft. of \$10 mill dirt, with a small streak of smelting ore on the hanging. The company has completed a new building at the portal of the lower tunnel, consisting of change room and shop, and will start this level with two shifts Nov. 1. The level will be driven under the Silver Moon vein, which is now worked on the upper level, cutting the vein at a depth of 3000 ft., and on through to the Gold Quartz vein, a distance of 500 ft. from the present heading, which is 575 ft. in. Preparations are being made for the installation of a compressor and machine drills. Later it expects to erect a mill at the portal of this level.

GEORGIA.

Dahlonega.

The Barlow and Briar Patch placer mines are being operated by leasers. The power plant at the Pyrite mine is being installed by John Sargent.

Tonson and Cowan are carrying on a series of mill-run tests, handling the ore from the Smith shaft, and also the saprolite ore from the tunnel. Cyanide tests are being made on all the ores with satisfactory results. The shaft being sunk on the Johnson vein has opened a good body of ore, at a depth of 24 ft.

The Crown Mountain mill is running 20 stamps on ore from the Wallace sand vein and hope soon to be running 50. The Crown Mountain Mining & Power Co. is working a regular force of 12 in the upper Wallace shaft and tunnel, sinking the incline shaft and driving the tunnel west. Both headings are in ore of good grade, and it is being sent to the mill. It also has some men opening the lower Wallace and soon expects to have that vein sending ore to the mill. It is making some mill-run tests of 20 tons each from the sand vein in the Columbia cut. A. H. Head has charge of them and is making tests of all ores milled and mined, to determine the actual percentage of recovery by amalgamation, in order that subsequent treatment of the tailings by cyanide or flotation can be installed when necessary.

IDAHO.

Wallace.

The ore reserves in the ground above the No. 4 level of the Interstate-Callahan mine, the third largest zinc producing property now operating in the world, have been materially increased by development the last few months, according to D. F. Haley, consulting engineer for the company, and that the mine never was in better physical condition, and the outlook for further profitable development is decidedly promising. Drifts have been extended 300 ft. on both levels above the No. 4, the main hauling level, and are still in ore. The addition of 300 ft. exposes the body for 1000 ft. in all, whereas we had calculated on but 700 ft. Conditions suggest that the body may prove to be as long as on the lower levels, where it has been followed for 1300 ft. It is 7 to 15 ft. wide, and 18 ft. wide in places on the upper levels. Ore struck recently on the 700 level, where the depth is 1600 ft. has been drifted on for 400 ft. It is 7 to 30 ft. wide and its average quality is as good as the rest of the mine. The mill feed has been running 28% zinc and 6% lead the last 18 months. On the 500 level, which is 425 ft. above No. 7, we have installed 43 chutes and have ore in the face of the drift. This provides a continuous stope 1300 ft. long in the richest ore we have had. Plans and the organization have been completed for the flotation plant, the construction of which will occupy but 2 to 3 months. Impounded tailings will be removed from the dump to the plant by an automatic drag. The expense of handling by this method is but 8 to 10 cts. a ton in other places. The tailings will be ground in a tube mill and passed on to the flotation section. We have 250,000 tons that range in content from 4 to 7% and figure that an even 4% can be handled with profit. When the flotation plant is in operation we expect to recover 93 to 95% of the zinc values and to increase the saving on lead considerably. Operations have been started on the Nipsic mine, where we expect some developments of importance."

Wardner.

The Stewart Mining Co. is negotiating for properties adjoining the Stewart, and also is seeking the right, under lease to develop and extract ore beneath the streets and alleys of Wardner, and under private property in the mining town. The lease is to run for 25 years, under payment of 5% royalty gross. Mayor B. Flaig and the board of aldermen have signed the lease for the city, and practically all the owners of private property have signed. The leases

are made in the name of William A. Beaudry, managing director of the Stewart Co., and his activities in this regard have caused considerable speculation. It is understood that Beaudry has first chance at the Slavonian property, adjoining the Federal and Bunker Hill holdings at the upper end of Wardner. Rumors are also current that he is negotiating with the North Bunker Hill Co. for a control of that property, which covers a part of the Wardner townsite. It is reported that a shaft is to be sunk 1000 ft. below the Main street level, and that an effort will be made from that depth to reach the main leads crossing between the Bunker Hill and Stewart veins to the south of the Osburn fault.

Kellogg.

In a report to stockholders, covering the last year's operations at the property, President W. W. Papesh, of the Highland-Surprise Mining Co., states that conditions now are better than at any previous period of the corporation's existence. He says: "Important new ore bodies have been opened by development during the period, and a successful treatment method has been devised for the mill, enabling us to make a much better metal recovery than formerly. The changes in the plant were made on the recommendation of the mill superintendent of the Federal Mining & Smelting Co., who is a recognized authority on concentration and flotation of lead-zinc ores. We now are producing 20 to 22 tons daily of high-grade concentrates, and we intend to install additional equipment to increase the output. The outlook for having the property on a paying basis soon is exceptionally good. The O. W. R. & N. now has two crews of surveyors establishing a route for a branch line up Pine creek, and there is a settled belief among men in touch with the situation that the road will be built early next year. This will bring transportation right to our property, enabling us to increase our production and reduce operating costs. It also will prove a boon to other companies operating in the districts, including the Constitution, Douglas, Nabob and several others that are developing their holdings."

LAKE SUPERIOR.

COPPER.

Houghton.

Allouez's management has filled the vacancy caused by the resignation of its head captain by the appointment of Albert Watters, who has been shift boss there for some time and who has had ample experience there and at the Champion.

Mayflower and Old Colony have agreed on a consolidation by which one share of new company to be organized will be issued for a share of each of these companies. An assessment of 50 cts. a share will be called on the stock of the Old Colony so as to bring its treasury funds up to those of the Mayflower, making about \$100,000 as the working funds of the new company. The first work will be the sinking of a shaft.

Michigan is now in the lode supposed to be the Evergreen, with the main crosscut having a width of about 36 ft.; the 12 last ft. have laid bare considerable heavy copper with a little of stamp grades—almost enough to be of commercial values. After the crosscut has been driven far enough so that the work will not interfere, some drifting will be undertaken as commercial ground according to the character of these lodes should soon be met with. The work on the hanging wall of the Ogimah amygdaloid is somewhat poorer ground; that at the western drift of the Butler lode is still in broken ground and is yielding but little copper, which is of stamp grade; the eastern is still pushing on up towards the 5th level encountering some of the stamp grades.

Isle Royale has a daily output of 3000 tons and had the highest tonnage in its history in October. In August and September, because of the scarcity of men, it fell off somewhat; but for the 10 months previous it had been gaining each month. This increase is only the beginning, as the northern end has not been mined to any depth, and that at only one shaft, No. 2, and only to the depth of the 30th

level—No. 1 being down about 1600 ft., No. 4 to the 17th level, No. 5 and 6 still shallower, and No. 7 only to the 7th. There will be one and probably two more shafts sunk to the south.

Cherokee has, counting the width of the shaft, over 35 ft. of the best ground yet disclosed in the crosscut driven to find out the width of the vein. The copper is of the same heavy grade and comprises much small mass and barrel as encountered in the blast made across the lode at the top of the ledge. President W. A. Hodgson, who is managing the property for the directors, says that as soon as the width is ascertained sinking will be resumed.

New Baltic has carried its shaft pit down to 40 ft., and although it has its timber already, it has not found it necessary so far to put them in, and probably will not have to as boulders are now being met with—an indication of the nearness of the ledge which should be met with according to the diamond drill cores within 50 ft. of the surface. In a few days the ledge should be uncovered, and then the timbering will be set up and drilling begun.

The Powell-Anderson-Jones lands north of the eastern end of the White Pine are being explored by the E. J. Longyear Co. after a thorough examination by their own geologist. Two drills are in operation and the work will be pushed. By many who have inspected these lands, the possibility of their carrying paying grades is considered most promising, as it is thought that the White Pine beds or those similar will be encountered, the formations seeming to favor deposition.

New Arcadian on the southern drift of the No. 2 shaft which is located on the old Arcadian lode, is finding values fully equal to those found by the crosscut from No. 1, though the northern is in somewhat poorer ground. The work of sinking is somewhat slow at No. 1 shaft, as the old engine cannot be used below the 1250 level and since the work of finishing the rockhouse has been interrupted. But in 3 or 4 weeks everything will be ready so that the new hoist can be used to the bottom, when much more development can be done, as it has been difficult to hoist while the construction of the rockhouse was in progress.

Hancock will have an output of over 25,000 tons for October, with a prospect of a further increase for November; the figure for September was nearly 23,000. A few men are being taken on and the stoping correspondingly increased.

Franklin has been for the past 15 days forwarding over 1300 tons daily to its mill. Its mechanical haulage system, comprising a compressed air engine with ropes, on the 29th level, is in successful operation in a rich stretch of ground, so that the yield as well as the tonnage will be benefited from the improved method of haulage.

Algoma has had its boiler on the ground for about 2 weeks, and as the same building will be ample for it, and as the foundations are being laid, it will not be long before the sinking of the shaft from about the depth of between 400-500 ft. will be resumed.

Houghton Copper is getting from the Superior lode on the 4th level and the 6th, about two loads of rock daily, which aid considerably in caring for the exploration expense. This rock is said to run at the Winona mill between 15 and 17 lbs. a ton.

IRON.

Ironwood.

It is now anticipated that the Munro mine will commence sending ore to the Escanaba docks by Nov. 15. This depends upon the speed attained in erecting the new shaft-house and in repairing the machinery.

Republic.

The Kolman mine has been leased to Mr. Hymens, who is now dewatering the underground workings. His exploration work will be centered mostly on exploring for deposits at some depth since surface deposits were drilled for some year ago without success by the Cleveland-Cliffs Co.

Since the Republic mine has been operated by the Cleveland-Cliffs Co. the two shafts which are now operating the No. 9 and Pascoe, have been pushed down to the 2220 and

2120 levels respectively. The mine has shipped to date about 220,000 tons and will keep its steam shovels active until the close of navigation, sending down better than 225,000 tons before the close of the season.

Ishpeming.

The Hoose & Person Construction Co. have contracted with the Cleveland-Cliffs Co. for the stripping of a large territory at the east end of the old Lake Angeline mine. Cleveland-Cliffs is building a new flume that is to take the water of the east end of the old lake basin out by way of the Salisbury mine, and leading it away from its former course which finally led to the Holmes mine locality.

Ashland, Wis.

A law, it is expected, will be placed before the Wisconsin legislature at the next session making a state tax of 10 cts. per ton on iron ore mined in Wisconsin and an additional tax of 2 cts. per ton on iron ore shipped through the docks at Superior and Ashland, the 2 cts. per ton to go to the cities. In informal talks it was pointed out that the ore is mined in the state at little expense; shipped east and there handled in manufacture at a further expense of about \$10 a ton; comes back in the form of a finished product from which the manufacture derives as high as \$350 per ton; that under present conditions the exploitation of the iron resources is similar to the conditions under which the pineries were denuded a few years ago.

MISSOURI-KANSAS.

Joplin.

October has been one of the strongest in market conditions since early summer. November opens with an equally strong position for all classes of ores produced in the Joplin field. With a rush, zinc prices went up to \$85 for the week, which is on a par with lead ore prices during the past few weeks. With such strong prices prevailing there has been a steady decline in the stocks of ore, and strenuous efforts on the part of mine operators to bring their production up to the maximum while prices are so good. The only feature inimical to the district's welfare is the power situation and the failure of rain sufficient to supply surface water for milling. The continued drought into the fall months is becoming more and more of a problem, and about all the expedience for temporary relief has been exhausted. This week sees a number of new mines forced into idleness on this account, and the continual lowering of water in the rivers is decreasing the power output of the electric power company to such an extent as to lower the number of mines operated.

This week came the announcement of the entrance of Chas. T. Orr's mining companies into the smelting field. Arrangements were completed for the building of a 5-block smelter at South Ft. Smith, Ark., where the city has donated a smelting site, and a very cheap contract for natural gas was secured. Approximately \$200,000 will be expended in the erection of the plant, the contract being let to the United Iron Works of Joplin.

Orr controls a very large output of zinc concentrates in the Duenweg and Webb City camps, he being the manager and one of the principal owners in the properties of the Athletic Mining Co. with two plants, and the Bertha A. Wingfield mines north of Webb City. He also owns personally the Big Six fee and lease, upon which there has been considerable production during the past year. The new plant will doubtless handle all of these properties, together with ore purchased in the Joplin field.

A prospecting company made up of W. H. Walker, Joe Walker, K. H. Warren, J. C. Warren, and J. F. Brewer, all of Joplin, have secured a lease southeast of Joplin, and are drilling it. Three holes have been put down, two of which showed good ore below the 100 level. The drilling will be continued until the entire lease is prospected.

On the Taylor land northwest of Joplin the Big Run Mining Co. has opened up a very rich deposit of ore at the 140 level where a 14-ft. face is being worked.

On a 42-acre lease of the Playter-Glover land west of

Joplin, the Sparkler Mining Co. has driven two prospect drifts into some excellent disseminated ore which is considered the best yet opened up by the company. Owing to the difficult power conditions now prevailing, the company has to operate its mine during the day and mill its ores at night. This company has one of the largest plants in the Chitwood camp. Those interested in the company are O. W. Sparks of Galena, Kan., E. Wilkerson of Joplin, W. F. Scott, R. O. Larson of Kansas City. The Lead & Jack Mining Co. has undertaken to drain the old Porter land on East 7th St. and has installed a 12-in. centrifugal pump which is gradually lowering the water. Efforts are being made to drain the tract to at least the 100 level, and efforts are being made by sub-lessees to work a deposit known to exist at the 80 level. Present operations are being conducted at the 33d level, and with the gradual lowering of the water it is expected that many sub-lessees will resume operations on this old tract.

Spencer & Co. are starting the erection of a new sludge mill at the No. 3 A. W. C. Mine west of Joplin. The company contemplates the installation of at least eight sludge tables and it will be so built that the capacity may be doubled. Those interested in the company are J. S. Spencer and W. W. Holmes of Webb and Don Molloy of Joplin.

Aurora, Mo.

The Aurora Con. Mining Co. is erecting a new 200-ton plant on its lease at Aurora. The framework of the mill is up and the installation of the machinery is well under way. The company is installing electric power and expects to be able to start its plant within the next 30 days.

The Daisy Bell Mining Co. is electrifying its plant which is producing about a carload of silicate ore each week.

The Old Baldwin mine sub-leased from the Old Contract, has opened up a fair deposit of ore which was sufficient to encourage the operators to erect a concentrating plant, and plans are now under way for this work.

Galena, Kans.

Work has been started on the erection of a plant at the Double Lew Mining Co., which has developed a mine on a 12-acre lease of the Paige land just south of Weyland mine. The company expects to get its plant in operation within the next 60 days.

On the B. M. Robinson tract of ground northwest of Cave Springs, extensive prospecting work is now under way by the Century Zinc Co., which is testing out a 10-acre tract and reports from the drilling indicate the 35-ft. face of ore at the 125 level. B. M. Robinson is also sinking a shaft on the same tract and is now taking out ore at the 130 level, but is sinking the shaft down to the 200 level; and prospecting has shown the existence of a very rich deposit of ore.

MONTANA.

Butte.

Bidding \$673,717.42, the minimum price stipulated by the court in the dissolution proceedings in which the directors of the Atlantic Mines Co. asked permission to dispose of assets and dissolve, the Anaconda Mining Co. has become the owner of the Lexington and a score of other claims in the Walker-ville district. The Lexington and some of the other claims sold at one time belonged to the La France Copper Co., a Heinze holding. Three years ago they were taken over by the Atlantic Mines Co. and the present proceeding is a formal step in the disposition of the assets of the dissolving company. The property has for some time been in the hands of the Anaconda under what virtually amounted to a purchase, which now is confirmed by the legal sale. It is expected that the perfecting of title to the property by the Anaconda will open up the road for a more aggressive development of the properties and with the present high price of silver, the consummation of the sale presages stimulated activity in the Walker-ville district.

From a bid-price in the neighborhood of \$3.50 per share, the shares of Butte & Zenith City have doubled in the past 6 weeks and sales at above \$7 were reported last week. Supt.

William Gibson, who has just returned to Butte from a business visit east, states that development of the property is progressing in a manner most gratifying to the management. Two of 10 known veins have been cut within the past few days and no drifting as yet has been done, the two fissures of well mineralized ore being intercepted in the cross cutting. These veins were cut on the 1000 level and are found to carry copper values of from $\frac{1}{2}$ to 1% copper, with in excess of 2 ozs. of gold and slight traces of gold.

Anaconda's output of copper for October was 31,500,000 lbs., an increase of 2,100,000 over the September record. This mark is within 1,800,000 of the total established in April of this year when the greatest amount of copper in the history of the company was produced. October figures bring the total for the year to 265,400,000 lbs. The production by months was as follows: January, 23,200,000 lbs.; February, 23,300,000; March, 26,500,000; April, 33,300,000; May, 30,000,000; June, 28,100,000; July, 28,200,000; August, 28,800,000; September, 29,400,000; October, 31,500,000; total, 265,400,000 lbs.

The Anaconda payroll for October in Butte will total approximately \$1,672,264.23, which is \$112,264 in excess of the amount paid in wages for September. This company pays slightly more than half of the total mining payroll of the district and estimates place the total at close to \$2,500,000.

Figures are not available for the independent mines, but it is believed that these will average higher than for any other month of the year. The Clark properties will distribute as wages in excess of \$70,000 from the 6th to the 10th of the month. The Butte & Superior paid approximately \$267,000 on 10th. North Butte on 8th distributed \$166,169. East Butte will pay this month about \$150,000, pay day coming on 15th. Smaller companies in Butte will distribute approximately \$60,000 more. The October payroll is figured on the basis of a wage of \$4.50 per day in accordance with the sliding scale and this rate will prevail as long as copper is above 25 cts.

Unofficial figures of the Butte & Superior show that the October production was substantially larger than for September and that both zinc and silver values are considerably in excess of the yield for the preceding month. The two months are compared as follows:

Tons of ore milled, 54,450, Oct.; 50,150, Sept.; Zinc concentrates, tons, 14,800, Oct.; 13,650, Sept.; Zinc in concentrates, pounds, 15,600,000, Oct.; 14,500,000 Sept.; silver, ounces, 320,000, Oct.; 300,000, Sept.; recovery, 94.5, Oct.; 94, Sept.

NEVADA.

Goldfield.

The improved flotation plant of the Florence-Goldfield Co. is operating on 200 tons of copper-gold ore daily and effecting a highly satisfactory recovery. Practically all the copper is recovered, and from 85 to 90% of the gold and silver. Experiments are being conducted in expectation of increasing the gold extraction. The company is preparing to install additional machines of the Jones-Belmont type. In the southern part of the mine, at a depth of 530 ft., splendid ore is being opened and some of this is going to the flotation unit.

Sinking at the Silver Pick is proceeding rapidly and as soon as the quartz-zone has been penetrated extensive lateral work will be pushed. For about 200 ft. the shaft has been in this great mineralized zone, although occasional horses have intruded. It appears that a huge quartz channel has been intersected, and occasional high assays in gold and silver encourages the belief that the western end of Goldfield is destined to produce heavily. But until more development has been completed it will be impossible to determine the importance of recent disclosures.

The vein uncovered lately in the Jumbo Junior at a depth of 880 ft. is showing excellent ore, and the discovery is considered highly important. It has been opened for 60 ft. by drifts and is the full width of the workings. Assays

on the last few feet range from \$16 to \$30. A winze has been started in ore and values are steadily improving. It was in adjacent ground that the Jumbo Extension uncovered a deposit that yielded over \$2,000,000.

A new and promising vein has been uncovered at a depth of 700 ft. in the Blue Bull mine. It was tapped in a crosscut about 700 ft. east of the shaft and gives encouraging assays. Some water is showing but the pumps are easily taking care of the flow. Manager D'Arcy is arranging to extend drifts and raises on the ledge.

Groom.

This district, near Pioche, is evincing much activity and several companies are actively exploring and working new and old properties. The ores are largely silver-lead and of excellent grade. Several Ford trucks have been placed in operation, also Holt caterpillar tractors, for the hauling of ore from various mines to Indian Springs, from which point consignments are forwarded to smelters. The James Kelly property has passed into the hands of Utah people and shipments will be started shortly.

The Groom Southend Co. has been organized to work a promising group of claims in the south-end section of the main field. Work is to start at once and before the close of December the management expects to be shipping regularly. Several other properties are about to enter the shipping class.

Jarbridge.

Progress in the camp has been steady for the past few months, but without much outward show except in the town, where the tents are rapidly giving way to frame buildings. About 150 men are working in the mines and some 50 are working on buildings in the town.

A local company is being organized to pipe in the water from Bear creek for fire protection; less than a mile of pipe will give a pressure of over 200 ft.

The Long Hike Co. is opening up a large ore reserve. It has built a gasoline power plant on the river, and is putting in an electric hoist on the winze in the lower tunnel, which will be sunk to a depth of 500 ft. A boarding and bunk house is to be built near the tunnel. An inclined surface tramway is being built to take up supplies for the mine and boarding house, from the river. A Fulton Iron Works gasoline hoist is being installed at the top of the frame. A Delco electric light plant has been established at the office to furnish lights for the company buildings in the town.

Hedges & Donaghue have bonded the Ajax group of claims at the head of Bonanza creek to Tacoma parties, and are now busy packing in supplies for the winter work.

Las Vegas.

Another strike was made in Eldorado Canyon last week, when James German, Mike Fisher and Chas. Herman, leasers on the Lombard claim, side lining the Carnation, upon which the big strike was made recently, uncovered ore which it is believed will run as high as the ore taken from the Carnation claim. At a depth of about 20 ft. ore from the Carnation claim assayed \$3500 in gold and silver.

The machinery, consisting of compressor, drills, etc., for the Eldorado Empire Gold Mining Co., has been shipped from Los Angeles, C. E. L. Gresh having bought the equipment while there. Reports from the Empire state that the ore is getting richer as development proceeds. It is generally conceded that another big producer will soon be added to the list when development on the Empire proceeds a little further.

E. P. Jeanes arrived from Los Angeles last week, where he has been for the past 10 days on business connected with the Eldorado Enterprise Co. The management of the Enterprise Gold Mining Co. has been looking over the property with a view of installing machinery to further development.

A lease on the Lucky Jim mine has been given to Frank Hoine and Ike Allcock, who are planning to push development and resume blocking out ore which has already been exposed.

Rapid progress has been made by the Cliff-Era Co. during the past few weeks. The main working shaft has already reached a depth of 155 ft. with water still in evidence. It

is the intention of the management to carry the work on to the 200 level and cut the large vein which runs through the Cliff-Era property over 4000 ft.

Recent communications from prominent mining men in San Francisco indicate that an excursion is being planned to Eldorado Canyon in the near future. Interest is growing in mining circles and San Francisco stands ready to furnish financial assistance necessary to exploit the properties in the Eldorado district.

W. A. Scott, representing the Mining & Engineering World, is in Eldorado Canyon preparing matter for an article soon to be published. This number will include illustrations of interesting points, and portray activities, progress and development in this fast growing mining district.

It is announced by the Enterprise Gold Mining Co. that application for listing the stock on the San Francisco Stock Exchange has been made. It is the intention to have the stock called within the next few weeks.

NEW MEXICO.

Santa Fe.

Of the 78,485,760 acres of New Mexico nearly half is public land and 14,000,000 acres state land. Ranches cover 12,000,000 acres, somewhat less than 2,000,000 acres is cultivated, and less than 600,000 acres is irrigated. Of the irrigated area 200,000 acres belong to individuals or partnerships, 50,000 acres to commercial organizations, 300,000 acres to co-operative or community organizations, and 30,000 acres to Indians. The remainder is irrigated under government reclamation, and the area so served will be considerably increased when the lands below the Elephant Butte dam are utilized. One of the greatest mineral resources of New Mexico is coal, which occurs in the large fields west of Raton, at places near Cerrillos, about Gallup, and in several other areas. There are also valuable mines of gold, copper, silver, lead, and zinc. The total production of these metals in 1915, according to the Geological Survey, had a value of \$19,279,468, of which \$13,437,961 was copper, an output that gives New Mexico considerable prominence as a copper producer. The output of gold was \$1,461,005. The value of the coal mined in the state in 1915 was \$5,481,361.

Mogollon.

At the Pacific mine the haulage cable for aerial tramway to Socorro Co.'s mill was placed during week and the traction cable is now being installed. A good vein has been encountered in north drifts from 500 and 600 levels. The territory south of shaft will be opened later as present underground activities are up to limit of hoisting equipment.

The slime-carrying flume being built by Mogollon Mines Co. has been completed from Last Chance mine to the Maud S property, a distance of about 1 mile, and is now in commission. This will eventually be extended about 4 miles farther down canyon to present tailings impounding dams.

There are practically no idle men in camp and from different quarters comes the report of a scarcity of labor of all classes to a greater extent than has been noticeable for some time past.

OREGON.

Granite.

Algernon Del Mar is now mill superintendent at the Cougar mine. The wooden pipe line, for the camp's water supply, has been completed and is now conveying water from Granite Creek to the property.

The Independence mine is to be unwatered for examination. The shaft is 200 ft. deep, and it will take 2 or 3 days to pump out the lower level. The examination is being made with a view of selling.

The Taber Fraction mine has been sold for \$60,000 to J. A. Howard of the Oregon-Idaho Investment Co., Baker, Ore. John Arthur in charge of the mine has a force getting the mine ready for operations.

SOUTH DAKOTA.

Custer City.

Through investigations and the direction of Prof. Dove, the Slavonian mine is now a financial success. Except for 4 or 5 men the property will be closed down during the winter.

In the Two Bit district there is considerable activity at both gold and tungsten properties. Leasers on the Monarch have opened good ore and are getting a shipment ready. Sasse and Wolfe are also getting ready to ship from their tungsten property. Among other properties which are being operated are the Wiswell, Brensahan, Buffalo, Gilt Edge, Smart, Washington, and the Zipp. At these mines both development and production is being carried on.

TEXAS.

El Paso.

The mineral exhibit at the recent International Soil Products Exposition held here attracted much attention on the part of visitors. Collections of ore from many of the mines of the southwest and Mexico were on exhibition. One of the features of the mining department was a modern assay office that was in actual operation by students of the Texas State School of Mines and Metallurgy. A large collection of ore samples, including many rare minerals, was also embraced in the State School of Mines exhibit. F. H. Seamon, head of the chemistry department of the school, and Prof. H. D. Pallister of the geological department were in charge of the exhibit.

There was also shown in this exhibit a framework of timbers that was placed in the mine by the Spaniards and which is still in perfect condition. The timbers are less than 4 ft. in height as the shafts driven by the Spaniards were only high enough to permit a man to crawl through them.

Included in the mineral display that was made by Grant county, New Mexico, and which was in charge of M. W. Porterfield of Silver City, were ore and water buckets of buffalo hides, used by the Spaniards in operating mines near Silver City in 1785. These ancient relics were discovered in the deepest workings of the mines of the Chino Copper Co. at Santa Rita, N. M. The buckets were used by the Spaniards when they worked the mines 131 years ago. They are not of rawhide, as rawhide is known today. They are shrunken and of a greenish color from the copper ore. The hair is still on the hide.

Burnet.

The Texas Graphite Co. has under consideration the enlargement of its mill, situated near here. It has enough graphite in sight to keep a mill of much larger capacity than the present one in constant operation. Dan McFarland, manager, returned to the property recently from California.

Terlingua.

The lower workings and mine equipment of the Chisos Mining Co. here which were recently damaged by fire, has delayed operations of that quicksilver property somewhat. Orders were immediately placed for new equipment and it is expected to be installed in a short time. The furnace of the company was not damaged by the fire.

UTAH.

Monticello.

F. F. Sanmon has charge of a group of claims north of here for Salt Lake interests which are producing radium. Calyx drills are being used to further explore the formation. A force of 15 men has been busy throughout the summer and during that time about 5000 sacks of ore, carrying 2% or better, have been piled. This ore is now ready for shipment.

Quantities of lower grade have been exposed by development which has been in progress for several months.

N. C. Christensen is installing a mill at the Big Indian Copper Co.'s mine for the treating of low-grade carbonate ores. It will have a capacity of 300 tons. The process provides for the leaching of the copper through the agency of a solution of sulphur dioxide. The metallic values freed from the waste rock are thrown out of solution when the sulphur dioxide gas is driven off as the sulphur is heated. The entire details of the process as well as the plans for the mill were completed in the metallurgical department of the Univ. of Utah before going on the property of the Big Indian company.

American Fork.

The main tunnel at Belorophon is 300 ft. in and a drift has been sent north, following ore. A distance of 50 ft. out the face shows 6 to 18 ins. of high grade. This is 100 ft. vertically underground. The ore is found along a shale-quartzite contact. The past few days some copper has been coming in. It is a black oxide speckled through the rock. The work now is in the big fissure.

The Miller Hill Exploration Co. has contracted for power and placed an order for machinery with which to drive their tunnel with increased speed into the mountain between the Dutchman and Pacific mines.

The tunnel is now in 670 ft. and has 800 more to go to cut the fissure.

The Alberta Mining Co. has been incorporated to work a group in Deer creek and Silver Fork. The officers are Ammon Mercer, president; S. H. Roundy, vice-president; who with M. F. Cowley, Nelson McCarty and David Davis form the board of directors. James L. Mercer will act as secretary. Mercer has had a force working all summer, and now has a 135-ft. tunnel that is nearing the contact which in the upper workings showed good values in gold, silver, copper and lead. In one of the workings a fine body of molybdenum was opened. Preparations are being made to continue work all winter. The company is capitalized for 600,000 shares, one-half of which is treasury stock.

Alta.

At Michigan-Utah in the Alta mine the crosscut from the Grizzly tunnel to the contact between the white lime and porphyry has encountered a body of copper-silver ore which will run \$75. When this ore was first struck it was 2½ ft. wide. The present face is 8 by 9 ft. and going down strong on the contact. The ore is being followed on the level. As soon as the dip of this ore is determined work will be commenced in the lower tunnel.

Beaver.

In a crescent from the drift on the 200 level of Beaver combination a good showing of ore was encountered. Buildings for the miners have been completed, a compressor installed, the winter's supplies laid in, and something like \$12,000 expended in the preliminary work in order that there may be no handicap during the winter in prosecuting developments. The miners will now drift both ways on the vein from the 200 level, while the sinking of the shaft will be continued.

Park City.

The Silver King Con. mill has been completed and is now in operation and the 10,200-ft. aerial tram will be ready soon. The new Thaynes tunnel is now in 800 ft. It has 14,000 ft. to go before it reaches its objective. The mine has several hundred tons of ore stocked.

Judge Mining & Smelting has opened ore on the 900 and will proceed to open ground between the 900 and 1200 levels in the Back vein. Ore was first opened up on the 1200 level. It has been followed along the strike 300 ft. Raises were run on the ore to the 900 level. Here the ore continues up. It is a high grade milling ore, much of the value being in zinc. The ore varies in thickness from 15 ins. to 15 ft. About 4000 ft. from the shaft a body of ore is being developed above the 1200. This has been followed 250 ft. Preparations are being made to extend the shaft to the 1900 level. At present it is down 1650 ft. It is the intention to raise from the 1900, which is open through the Daly West workings. All the steel work is completed and the machinery

is being installed at the mill. The electric equipment has been shipped and will arrive soon. The management is hopeful of completing the work by Jan. 1, 1917.

Eureka.

Smelters are now accepting 100 tons of siliceous ore daily from Iron Blossom. From the 1300 level of the winze in the north end of the mine a drift is being sent out for the copper deposit which has already been opened on levels above the 1300. It is the intention to drive to the ore at this point and then continue the work of sinking the winze, going down to the 1400. Within the next week or ten days the 1300 drift should be in the ore.

By Nov. 30 it is expected that Tintic Milling will be handling 300 tons. Six roasters have been added to the plant and two more are on the ground awaiting installation.

WASHINGTON.

Spokane.

The activity of the Anaconda Copper Co. in the Coeur d'Alene district has revived rumors that the corporation is contemplating establishing an electrolytic zinc reduction works in or near Spokane, and it is said that representatives of the Anaconda interests have been investigating the old smelter site three miles down the Spokane river with a view to purchase. C. Kelly, vice-president of the company, with members of his metallurgical staff was here several weeks ago investigating conditions, and they were here again recently checking their original preliminary survey of the situation.

The Anaconda has the Douglas mine, a complex lead-zinc property in the Pine Creek region of the Coeur d'Alenes, under bond for \$256,000, and the Douglas stockholders have extended the time of payment of the installment now due until March, 1917. It also has had ore buyers in the field for some time, endeavoring to secure contracts on zinc ores from other Coeur d'Alene companies. The Douglas group is extensively developed, exposing large bodies of commercial ore, and shipments now are being made regularly to the Anaconda's electrolytic plant at Anaconda.

The old smelter site on the Spokane river is regarded as an ideal location for an electrolytic plant. Transportation can be provided easily by extending the lines of the different transcontinental railway systems operating through Spokane, or by an independent electric system connecting with the steam terminals here. Current is available from the Washington Water Power Co.'s local plant and a big power station at Long lake, one of the greatest producers of electric energy in the west, and it is said that a satisfactory rate for energy has been agreed upon between the Washington Water Power Co. and the Anaconda officials.

An electrolytic plant here would not only draw from the zinc producing mines in the Coeur d'Alenes, but it also would result in greater development of zinc properties in different parts of northern Washington, the most of which now are dormant because of lack of treating facilities. The different railways radiating in every direction into the surrounding regions are easily reached from the numerous zinc holdings, and it is conceded that no better point could be selected for the establishment of such an enterprise.

Loon Lake.

Heavier machinery is being installed at the Loon Lake Copper Co.'s mine with which to carry on further development. For this work \$15,000 has been set aside. In speaking of the company's intentions Frank G. Crane, secretary-treasurer, says: "It is proposed to add three lifts of 100 ft. and to run out drifts on each level, starting the lateral work at the end of each 100 ft. A depth of 500 ft. will be attained. Encouragement for this work is given by the response of the shoot and its tendency toward expansion at the 200. The ore body is 50 ft. long above the level and 160 ft. on the floor, where a radical change in its form occurred. The shoot has a width of 3 to 7 ft. and has been stoped to a height of 33 to 35 ft. throughout. No return of less than 11% copper has been received on a shipment. The highest has been 13.75% and the average 12%. Six carloads of ore

have been shipped this month and another will probably be moved before the month ends. With 2 carloads shipped late in September 9 cars will have been sold within five weeks. New installations include a 50-hp. boiler, engine and a pump. The power to be generated will operate a 15-hp. hoist, the compressor, pump and ventilating system. It will be sufficient for a long period of prospective operation and was provided because the former plant was inadequate. Completion of development to the 500 is expected by spring."

Walla Walla.

B. Coyle, president of the Guelph Co., states that his company has purchased \$6000 worth of new machinery. "We have bought a 5-drill compressor and a hoist that will be efficient to a depth of 800 ft. This plant and an electric motor will be installed at a shaft in which a depth of 100 ft. has been attained by hand drilling. We expect to strike ore at the 200 point. The collar of the shaft is 250 ft. lower than the tunnel in which considerable work was done. Seven men are employed and two shifts will be engaged throughout the winter. Provisions for five months have been taken to camp.

WISCONSIN-ILLINOIS.

Highland.

No shipments of zinc ore have come from this camp in two weeks. Several large plants, however, are fully occupied and a fair tonnage of zinc ore lies piled up awaiting the buyer.

Linden.

Milwaukee-Linden Development Co. has disposed of 1000 tons of zinc concentrate to local buying concerns. This cleans up about the only reserve ore in this section. Fourteen cars of concentrates were delivered to separating plants last week, 537 tons. The Spring Hill Mining Co. with a new rig began operations the first of this week. Strikes of zinc ore are reported on the Gilman, Glanville, Optimo and Weigel properties.

Cuba City.

National Separating Works have been receiving raw zinc concentrate in quantity, 41 cars being delivered to the plant last week, 1716 tons being the best week's business yet reported for the plant. Shipments of high grade were normal, 9 cars in all, 343 tons. Locals were out of the running. Several new mills are being built in this section.

Mifflin.

Poor management and failure to connect with ranges has resulted disastrously for the M. & A. Mining Co. operating the Big Tom property. Coker mines are running strong on strikes in new ground on both the Sunrise and Sunset lands. Stopes are being carried 74 ft. high. Shipments last week ran 10 cars, 9 going to the Mineral Point Zinc Co. and 1 car of high-grade to DePue. The Senator mine is shipping heavily under new management. Finishing touches are going on a new plant on the Yewdall lease for the Vinegar Hill Co. Drills have been successful for the Grunow and Lucky Six Mining Cos. Locals delivered 1 car of ore, mixed lots, to the furnace at Mineral Point, 38 tons. Montfort reported 1 car high-grade 55% wet concentrates from the O. P. David mine and a strong range on a turn to the north after going ½ mile on a due east and west range.

Platteville.

Deliveries of zinc ore to track for the week ended Nov. 4 totaled 163 cars, all grades, 6508 tons; two cars of lead ore cleared, 77 tons. Shipments of pyrites fell off considerably, 828 tons clearing for the week. The gross recovery of crude ore for the week showed a gain, reports coming in for 5600 tons. Net deliveries to smelter, both refinery and mine run stuff, was 2677 tons. Seventeen cars of refinery product came from the Mineral Point Zinc Co. alone, 631 tons.

Prices showed decided improvement and gains were made over the prices of the week before, 60% ore ruling on a base of \$70 per ton, with premium grades bringing fair figures in advance of this. The range on medium and second grade ores was also raised to \$65, and much low grade ore cleared

as a result of heavy buying by nearly all of the local zinc refineries in the field. The reserve looked upon 30 days ago as a depressant has practically vanished and much relief is felt on account of the clean up. Lead ore was quoted at \$85 per ton, but producers showed no disposition to sell.

Among local producing mines the Hodge alone cleared 4 cars of raw ore to Cuba, 175 tons. High grade separator ore came from the Block-House mine, 4 cars, 160 tons, to American Zinc Co. and 2 cars to Eagle-Picher Lead Co., Collinsville, Ill., 80 tons.

Benton.

Seventy-one cars cleared here last week for a total of 5,480,000 lbs. Vinegar Hill Mining Co. took the lead with 11 cars from the Kittoe mine, 5 cars from the Martin mine and 6 cars from the Blackstone, all to Cuba, 910 tons. Two cars came from the Sally mine. New Jersey Zinc Co. sent 5 cars, 200 tons, to track from the Fox and 3 from the Penna-Benton mine, 126 tons. Frontier Mining Co. shipped 8 cars, 339 tons, with the Calvert mine failing to report; Fields Co. 7 cars to Grasselli, 283 tons; Indian Mound to Grasselli, 2 cars, 70 tons; C. A. T. and Champion mines 9 cars to Skinner roasters, 394 tons. High grade ore came exclusively from the Wisconsin Zinc Co., 5 cars to Hillsboro, 196 tons; Lanyon Zinc Co., 34 tons, and Sandoval Zinc Co. 3 cars, 107 tons. A new power and milling plant is complete for the Wisconsin Zinc Co. on the Longhorn mine and production is in order on a range fully explored in adjacent lands. This work of exploration continues with 8 drilling squads, and in several instances has been exceptionally prolific in finds of extensive zinc ore deposits. Surface tramways are being built at both the C. A. T. mine and Longhorn mines to connect new shafts in ore with the main power and milling plants. The Hird mine is now ready to begin production after much work in fighting water and cutting through wild ground. On the Grotkin lease another new 200-ton mill is being built for the Frontier Mining Co. on the Bull Moose range. Dividend No. 3, of the Wisconsin Zinc Co. for 2% on stock of record Nov. 1st was paid on that date. Frontier Mining Co. paid its regular monthly dividend of 2% on the first of this month.

Hazel Green.

The Kennedy reported on 2 weeks deliveries 10 cars, 399 tons, to Mineral Point, and Monmouth Zinc Mining Co., 1 car, 30 tons; Cleveland Mining Co. to Grassellis, 41 tons; Wisconsin Zinc Co., 3 cars, 90 tons, and Lawrence Mine, 2 cars, 80 tons. The new McMillan mine has not reported any shipments as yet.

Shullsburg.

A new power and milling plant is going up for McQuitty and Rodhams on the Rodhams mine. The Winskill is shipping and the Mulcahy mine, of the Oliver Mining Co., is shipping 3 cars of high grade separator ore weekly. New roasters are being installed in the separator plant.

Galena.

Vinegar Hill Mining Co. on the Graham shipped 9 cars last week, 381 tons. Much drawback was experienced on account of heavy overflow and the new pumps are raising 2000 gals. per minute. North Unity shipped 2 cars, 85 tons. The Federal mine had a clean up with 4 cars, 125 tons, and has been shut down permanently. The Birkbeck, a new producer, turned in 2 cars, 76 tons, and is going conservatively until the mine is fully developed. Galena Refining Co. sent 1 car high grade to Lanyon Zinc Co., 40 tons; Wisconsin Zinc Co. to La Salle 3 cars high grade, 120 tons, and to Hillsboro 2 cars, 80 tons.

CANADA.

BRITISH COLUMBIA.

Three Forks.

The Rambler-Cariboo Mining Co. has sold 1000 tons of concentrates stored at the property to the U. S. Zinc Co. for \$23 a ton. The product will average 34% zinc and 28 ozs. silver. Reports from the smelter have also been received stating that \$13,000 are due in settlements for lead-silver ore. Production of 1000 tons of zinc concentrates

monthly is possible, in addition to the regular lead-silver output, and it is probable that the entire zinc output will be taken by the U. S. Zinc Co., with the exception of a small amount for experimental purposes at the Anaconda Copper Co.'s new electrolytic reduction works at Great Falls, Mont. Shipments of the 1000 tons of concentrates sold will be made to its plant at Blende, Colo., as soon as cars can be obtained.

Trail.

In a report to stockholders of the Consolidated Mining & Smelting Co. of Canada, under date of Nov. 1, and signed by President W. D. Matthews, announcement is made that the share capitalization of the corporation is to be increased 25%, and each stockholder of record at the close of business Oct. 21 will have the right to subscribe at par for one share of the new issue for every four already held. The date of subscription expires Dec. 1, and 25% of the price, \$6.25, is payable on that date, and the subsequent instalments of equal amount are due Jan. 1, 1917; Feb. 1, and March 1. Failure to pay any of the instalments within the specified time renders previous payments subject to forfeiture, but provision is made for payment of the entire amount in advance, and such shares will be in rank for dividends on and after Jan. 1, while those paid for in instalments will not be eligible to share in disbursements until April 1. The directors have reserved the right to extend the times of subscription and payment in the case of stockholders residing outside of Canada who may not have received sufficient notice to enable them to exercise their rights. The purpose of the increased capitalization is to provide permanent capital to meet the expenditures involved in the enlargement of the smelter and metal refineries at Trail, and to finance more extensive development of the company's properties. Early in the current year the Imperial Munitions Board granted large additional contracts for high-grade zinc to the company, and, while a portion of the funds required for manufacturing the metal was advanced by the Canadian government, the corporation was compelled to finance construction of increased smelting and refining facilities. The report states also that the copper refinery has been enlarged; plants for the manufacture of hydro-fluo-silicic acid have been installed, to render the refineries independent of foreign sources of supply, and considerable new equipment has been installed in the smelter, to bring it up to a capacity commensurate with the demands of the affiliated plants. It states also that mining operations have been extended and will be further extended, and that an option has been taken on an important copper property on the north end of Vancouver island, near tidewater. Development of the new holdings is under way, and still other groups are being examined, some of which undoubtedly will be taken over.

Illecillewaet.

With the completion of treatment on 15 cars from the Lanark Co.'s mine the method of concentration has been decided and a mill will be started at once, according to President Dornberg. "We will install at once a plant which will handle 75 tons a day and which will cost about \$25,000. Already we are putting up buildings to be prepared for winter. We have not let the contract for the mill, but my purpose here now is to do so. During the last few months we have shipped 15 cars of ore which have netted \$1000 a car in lead-silver ores. Much zinc-lead ore has also been opened up. In some places we have from 3 to 4 ft. of ore that goes 44% zinc and we have 10 ft. in width that averages 300% in zinc and is low in iron and lime, making it desirable for smelters. We hope to be able to ship our zinc concentrates to the smelter at Trail rather than to plants on this side of the line. We are sinking a shaft from the tunnel workings. This is down 75 ft. in 8 or 10 ft. of ore."

Kaslo.

It has been decided at the Utica to start a long drive to tap the ore bodies at depth of 350 ft. below the present workings. The work will start at once and be done by contract. The adit will be about 1900 ft. This will cost about \$25,000 and it is said the company has \$5,000 surplus. Water shortage will compel the initial work to be done by

hand. In the spring a compressor plant is to be installed. It will get power from lower down the creek than where the intake for the existing plant is. It is not known definitely if it will continue shipments during the work on the cross-cut.

Sandon.

Machinery for the Slocan Star hydro-electric plant, including the Pelton wheel, left San Francisco Oct. 20 and is expected within 12 days. Everything is in readiness for installation. A steam plant is being used at the present time owing to shortage of water supply.

Clarence Cunningham has a bond on the Idaho-Alamo group and is now employing 12 men. At the Queen Bess he has a ledge of clean ore between No. 5 and No. 6 levels and above No. 5. Five men are employed in this mine on the ore and are taking out $7\frac{1}{2}$ tons a day.

Nelson.

The California mine is now obtaining air for its drills from the Athabasca. Development in the 2nd level shows ore in the face becoming wider and increased in values. When the equipment for the air drills has been installed work will be resumed on No. 3 tunnel which is in 250 ft. and has to be driven 50 ft. more to hit the vein exposed in the 2nd level. In the drifts from No. 2 tunnel at the present time there is from 24 to 36 ins. of clean shipping ore in the face. Sixty tons of ore in the bins runs about \$45 to the ton. Between No. 2 and No. 1 tunnels 134 ft. of backs is given by the raise and the body has been proved for 300 ft. in length. Completion of No. 3 tunnel will give 205 ft. additional depth on this body.

ONTARIO.

Cobalt.

With 10 men under M. Cleveland the Shamrock made a good strike at the 300 level 15 ft. up in a raise. In the vein high grade silver and plate silver was encountered. The shoot is from 25 to 30 ft. in length and will run about 1700 ozs. to 1800 ozs.

With 30 men development is progressing at the Boston Creek Co.'s property. Work is being done through the R. A. P. shaft. A drift has been run into the Kenzie claim at the 100 level. The intention is to raise so as to connect with the Kenzie shaft. A diamond drill program is also under consideration.

Porcupine.

During the shut-down at Dome Lake reserves were increased about 25%. The new installations at the mill are now completed and the mill is treating 100 tons. The leads run about \$9. The new Hardinge ball mill is in place and about Dec. 1 the capacity should be increased to 200 tons. At present drills are working in four faces of ore. Lateral development is being pushed to the west on this level in expectation of cutting a new body 150 ft. from No. 2 stope of No. 1 vein.

A winze has been completed to the 900 level of Porcupine Crown and good ore is exposed. At the 500 level a diamond drill has been started. One hole is being put down at an incline, and is expected to cut the most promising veins at a depth of 1500 ft. About 500 ft. of work remains to be done in this hole.

West Dome Con. has started a new 4-compartment shaft. It is to be sunk some distance from the incline shaft. Raising and sinking will go on simultaneously. The crosscut from the old workings on the 300 level is being run to a point under the new shaft. From there a raise will be started to the shaft now being started.

Mazatlan.

El Tajo mine, at Rosario, 50 miles from Mazatlan, has been able to operate this year, though under great difficulties. Between 6000 and 7000 tons of ore per month are being treated by cyanidation, the crushing being by twelve 5-stamp batteries. Gold constitutes about two-thirds of the value in the ore, and silver about one-third. The bullion output, shipped out through the Port of Mazatlan to San Francisco, amounts to \$45,000 per month. J. D. Kislinsky is general manager; Geo. A. Tweedy of Los Angeles being consulting engineer.

World's Index of Current Literature

A Weekly Classified Index to Current Periodical and other Literature, Appearing the World Over Relative to Mining, Mining Engineering, Metallurgy and Related Industries, in Four Parts.

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I. GEOLOGY

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(I) METALS AND ORES

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Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

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(II) NON-METALS

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Telephones and Signalling

— *Electric Signalling in Collieries.*—I. C. Tr. Rev. Oct. 13 1916; p 453; pp 1*; 35c.

Haulage and Conveying

Wolfe, D.—*Safe Transportation Underground.* [From the Lehigh Employees' Magazine].—Coll'y Guard. Oct. 13 1916; p 713; pp ½*; 35c.

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— *Quarrying and Shipping Iron Ore.* [A description of the Broken Hill Proprietary Co.'s mines, Australia].—Mg. & Engg. Rev. Sept. 5 1916; p 308; pp 7*; 35c.

Accidents

Fay, Albert H.—*Coal-Mine Fatalities in the United States, August, 1916.* [The information is mostly in tabulated form].—U. S. Bur. of Mines Report; pp 28.

Rescue and First-Aid

Coldham, J. C.—*The Organization and Equipment of a Mine Rescue Station.* [A paper read before the Aust. Inst. of Mg. Eng.].—S. Afr. Engg. Sept. 1916; p 47; pp 1; 35c.

Jeremiah, Thomas.—*The Actual Worth of Oxygen Breathing Apparatus.* [On the use and what can be obtained with the oxygen helmets].—Coal Age Oct. 7 1916; p 577; pp 1½; 20c.

Paul, James W.; Wolfson, H. M.—*Rescue and Recovery Operations in Mines After Fires and Explosions.* [Detailed text on the subject for both metal and coal mines].—U. S. Bur. of Mines; pp 109; 35c.

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Varty, A.—*Officials' Reports to the Mine Manager*. [A paper read before the National Assn. of Colliery Eng.].—I. & C. Tr. Rev. Oct. 13 1916; p 448; pp 1½; 35c.

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Watkins, J. A.—*Health Conservation in Steel Mills*.—U. S. Bur. of Mines Tech. paper 102; pp 36; 15c.

Sociological

Jones, W. T.—*Main Island Creek Coal Co.'s Plant at Omar, W. Va.* [Deals with sociological and sanitation features as established by the company].—Coal Age Oct. 21 1916; p 682; pp 2*; 20c.

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Bancroft, J. Austen.—*Mining Operations in Quebec During 1915*. [A separate report on the geology of the zinc-lead deposits in Portneuf county is included].—Quebec Dept. of Mines; Report; pp 146*.

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Smeeth, W. F.—*Annual Report for the Year 1914*. [Part I takes up production and general conditions of the industry,

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Gillette, Halbert Powers.—*Handbook of Rock Excavation Methods and Costs*. [Details regarding the different methods used in rock excavation, as drilling, explosives, etc.].—Clark Book Co.; book; pp 835*; \$5.

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Williams, R. Y.—*Mine Ventilation Stoppings*. [Costs of construction and maintaining are given, with methods of constructing the stoppings, with special reference to Illinois fields].—U. S. Bur. of Mines Bull. 99; pp 30*; 20c.

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Huac, A. J.—*Cost Accounting for the Clay Plant*. [Gives forms and description of part of an accounting system].—B. & C. Rec. Oct. 3; p 598; pp 1½*; Oct. 17 1916; p 709; pp 1½*; 70c.

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Jorgensen, F. F.—*Sprinkling Car for Mine Use*. [This tank car is designed so that the spray may be thrown in any direction].—Coal Age Oct. 7 1916; p 584; pp 1*; 20c.

—*Economics for Small Mines*.—S. Afr. Engg. Sept. 1916; p 46; pp 1¼; 35c.

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Sampling

Fulton, Charles H.—*The Buying and Selling of Ores and Metallurgical Products*. [Methods of sampling and the different ways in which ores are settled for and penalized are explained].—U. S. Bur. of Mines Tech. Paper 83; pp 42; 15c.

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Woodbridge, T. R.—*Ore Sampling Conditions in the West*. [Excerpts from advance proofs of the U. S. Bur. of Mines Tech. Paper 86].—Mg. World Oct. 21 1916; p 703; pp 1*; 10c.

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Aichino, Giovanni.—*Tungsteno*. [On the concentration and treatment of tungsten ores].—Ind. Chim. Min. & Met. Sept. 10 1916; p 273; pp 5; 35c.

Bell, Robert N.—*Rich Gold Ore Found in Idaho*. [Reviews the deposits and recent findings in the Atlanta district].—E. & M. J. Oct. 28, 1916; p 733; pp 2¼; 25c.

Clyne, C. B.—*The Stoddard Mill—A Copper Concentrator*. [Description of a 100-ton concentrator operating successfully].—M. & S. P. Oct. 21 1916; p 598; pp 2½*; 20c.

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Morse, E. C.—*Electrolytic Precipitation*. [Gives details of equipment and methods used in operating and testing a combination cyanide and amalgamation system as regards depositing the gold and silver with electricity].—*M. & S. P.* Oct. 28 1916; p 622; pp 2¾*; 20c.

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Stillman, A. L.—*Coal Briquettes—Fuel of Future*. [A review of the past and present use of briquetted coal].—*C. Tr. Bull.* Oct. 16 1916; p 33; pp 2; 25c.

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Engle, W. D.; Gustavson, R. G.—*New Volumetric Method for the Determination of Cobalt*. [The method permits of the presence of zinc, cobalt, etc.].—*Jnl. Ind. & Engg. Chem.* Oct. 1916; p 901; pp 1¼; 60c.

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Electricity

Kapp, Gisbert.—*The Principles of Electrical Engineering and Their Application*. [A text and general elementary reference].—*Ed. Arnold, London*; book; pp 356*; \$4.

Koch, Richard.—*The Electric Safety Lamp*. [Figures on the cost of upkeep of these lamps].—*Coal Age* Oct. 7 1916; p 582; pp 1¾*; 20c.

Molesworth, Guilford L.—*Pocket Book of Engineering Formulae*. [Information on civil, mechanical and electrical engineering work].—*Spon & Chamberlain, N. Y.*; book; pp 936*; \$1.50.

Pease, J. H.—*Economic Application of Electricity to Mining*. [A paper read before the Ipswich and District Mg. Inst.].—*Queen. Govt. Mg. Jnl.* Sept. 15 1916; p 434; pp 2½; 35c.

Streeter, Robert L.—*Power Equipment for Steam Plants*. [Discusses engines used in electric power generating plants].—*Engg. Mag.* Oct. 1916; p 33; pp 12*; 35c.

Taylor, W. G.—*Electric Power Required for Various Oilfield Operations*. [A paper read before the A. I. E. E.].—*West. Engg.* Oct. 1916; p 377; pp 1*; 20c.

—*Electric Signaling in Collieries*.—*I. & C. Tr. Rev.* Oct. 13 1916; p 453; pp 1*; 35c.

—*1500-K. W. Geared Turbo Alternator*. [Abst. from Engineering on an installation at an English plant].—*Electrician* Oct. 13 1916; p 40; pp 3½*; 35c.

—*Motor-Driven Compressor at Britannia Colliery*. [General layout drawings and description of the installation are given].—*I. & C. Tr. Rev.* Oct. 6 1916; p 413; pp 2*; 35c.

—*Power Supply of the Rand*. [The inaugural address of the new president of the South African Inst. of Eng.].—*S. Afr. Mg. Jnl.* Sept. 9 1916; p 39; pp 3; 35c.

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Gillette, Halbert Powers.—*Handbook of Rock Excavation Methods and Costs*. [Details regarding the different methods used in rock excavation, as drilling, explosives, etc.].—*Clark Book Co.*; book; pp 835*; \$5.

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—*Recent Developments in Drilling Apparatus*. [Describes recent patents for equipment to be used with rock drills].—*Mg. World* Oct. 21 1916; p 705; pp 1¼; 10c.

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Hayes, J. W.—*How to Build Up Furnace Efficiency*.—*J. W. Hayes, Chicago*; book; pp 154*; \$1.

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—*Principos y Aplicaciones de los Indicadores para Maquinas de Vapor*. [Principals of application for the steam indicator].—Ing. & Contratista Oct. 1916; p 93; pp 4¼*; 35c.

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Molesworth, Guilford L.—*Packet Book of Engineering Formulae*. [Information on civil, mechanical and electrical engineering work].—Spon & Chamberlain, N. Y.; book; pp 936*; \$1.50.

Schaphorst, W. F.—*Economy of Solid Woven Belts*.—E. & M. J. Oct. 21 1916; p 747; pp 1¼*; 25c.

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IV. MISCELLANEOUS

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Arnou, G.; Portevin, A.—*Le Traitement Thermique du Bronze D'Aluminium a 10% D'Aluminium*. [On the thermic treatment and properties of bronze containing 10% aluminum].—Metallurgie, French April 1916; p 101; pp 15*; 75c.

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Dudley, Boyd, Jr.—*The Thermal Conductivity of Refractories*. [Data, tests and formulas for making computations with are given].—Amer. Electrochem. Soc. Adv. Paper 2; p 44*; 35c.

Feild, Alexander L.—*A Method for Measuring the Viscosity of Blast Furnace Slag at High Temperatures*. [The methods of testing and some results, with a description of the apparatus used are contained].—U. S. Bur. of Mines Tech. Paper 157; pp 29; 15c.

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—Pract. Eng. Nov. 1 1916; p 924; pp 2*; 20c.

Kalmus, Herbert T.; Blake, K. B.—*Magnetic Properties of Cobalt and Cobalt-Iron Alloy*. [Describes a number of tests].—Canada Dept. of Mines No. 413; pp 18*.

Morse, E. C.—*Electrolytic Precipitation*. [Gives details of equipment and methods used in operating and testing a combination cyanide and amalgamation system as regards depositing the gold and silver with electricity].—M. & S. P. Oct. 28 1916; p 622; pp 2¾*; 20c.

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Brearley, A. W.—*Some Properties of Ingots*. [A paper read before the Iron and Steel Inst., London, on crystalline structure and its effects].—I. & C. Tr. Rev. Sept. 22 1916; 344; pp 6*; 35c.

Brearley, A. W.—*Structure and Properties of Steel Ingots*. [Abst. of a paper read before the Iron & Steel Inst., London. Shrinkage, contraction cavities and crystalline structure are dealt with].—Iron Age Oct. 26 1916; p 913; pp 4*; 30c.

Campbell, William.—*Recent Progress in Metallography*. [With some description the greater part is a bibliography of literature].—Amer. Inst. of Metals Adv. Copy 17; pp 63; 35c.

Portevin, M. Albert.—*Influence du Temps de Chauffage Avant la Trempe sur les Resultats de Cette Operation*. [The influence of temperature changes with respect to steel and iron].—Metallurgie, French Feb. 1916; p 9; pp 70*; 50c.

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Hoover, Theodore J.—*Concentrating Ores by Flotation*. [Third edition describing different processes, patents, litigation, history, etc.].—Mg. Mag.; book; pp 320*; \$3.75.

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Lewis, James O.; McMurray, W. F.—*The Use of Mud-Laden Fluid in Oil and Gas Wells*. [Describes the system and other methods of details in drilling for the purpose of stopping waste of gas in drilling for oil wells].—U. S. Bur. of Mines Bull. 134; pp 86*; 25c.

McMurray, W. F.; Lewis, James O.—*Underground Wastes in Oil and Gas Fields and Methods of Prevention*. [On the prevention of conditions which reduce production, such as allowing water to enter the sand strata, etc.].—U. S. Bur. of Mines Tech. Paper 130; pp 28*.

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Societies

—*Chilean Congress of Mining and Metallurgy*.—Teniente Topics July 1916; p 2; pp 9½*; 35c.

—*Institution of Mining Engineers*. [Annual meeting at Glasgow Sept. 14].—I. & C. Tr. Rev. Sept. 22 1916; p 356; pp 1½; 35c.

—*Iron and Steel Institute*. [Autumn meeting in London].—I. & C. Tr. Rev. Sept. 22 1916; p 335; pp 2; Sept. 29; p 382; pp 2; 70c.

—*National Safety Council Meet.*—Coal Age Oct. 28, 1916; p 716; pp 3½*; 20c.

General Miscellany

Dewell, Henry D.—*Timber Framing*. [Describes in detail the making of joints in heavy timber].—West. Engg. Oct. 1916; p 385; pp 9*; 20c.

—*The Labor and Capital Problem*. [An abstract from the monthly circular of the National City Bank].—E. & M. J. Oct. 1916; p 738; pp 3; 25c.

Ore and Metal Markets; Prices-Current

New York, Nov. 9, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended November 8 were as follows:

		New York, cents.	London, pence.
Nov. 2.....	68½	32 7/16	
3.....	68½	32½	
4.....	68½	32½	
6.....	69½	33½	
7.....	Holiday	33½	
8.....	71½	34½	

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London		
	High.	Low.	Avg.	High.	Low.	Avg.
January	57½	55½	56.775	48.890	26.875	22.744
February	57	56½	56.755	48.477	27.000	22.759
March	60½	56½	57.935	49.926	27.080	23.650
April	73½	60½	64.416	50.034	31.375	23.259
May	77½	68½	74.27	49.915	34.182	23.560
June	68½	62½	65.02	49.072	31.038	21.577
July	65	60	62.94	47.619	29.870	22.950
August	67	64	65.60	47.178	31.25	22.750
September	69½	67½	68.516	48.68	32.18	23.600
October	69½	67½	67.855	49.885	32.21	23.923
November .....	.....	.....	61.713	.....	24.640	.....
December .....	.....	.....	55.038	.....	26.232	.....
Year .....	.....	.....	49.690	.....	23.470	.....

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Foreign demand has been prominent, but domestic consumers who needed copper for early delivery outbid the foreign buyers at all times. Some foreign inquiries for first quarter metal have been in the market but no first-hand seller submitted quotations. The upward trend of prices, while especially vigorous in nearby metal, is spreading to forward deliveries. Already first quarter delivery is as scarce as spot, while the amount of business that is being booked for the second quarter means an early depletion of the supply for that period. And with this condition prevailing there are whispers that "something big" is brewing respecting copper for the second half of next year. It is known that leading domestic consumers are willing to place their second half requirements under contract, but greater interest is attached to the rumors that another tremendous foreign purchase is impending.

With a roaring bull market in copper prevailing only nominal interest is attached to statistics. October output is estimated at 172,000,000 lbs. Some producers may have sizable lines of copper with which to supply consumers whose inquiries were scaled down over the first quarter. It is noted that leading sellers have limited orders to what they regard as a margin of safety. If refinery output increases sufficiently so that an outturn of 200,000,000 lbs. is attained by January then some producers will have from 2,000,000 to 3,000,000 lbs. of copper a month over their actual sales. But this metal will be easily sold, as many consumers had their allotments reduced and have been promised full tonnages if production meets expectations. Detailed returns of the principal producers give the total output for the first 9 months of the year at 1,484,159,718 lbs.

The London market, after minor fluctuations, has begun to show a strong upward trend. Cables from London to leading producers indicate a serious shortage of electrolytic copper. Last week electrolytic declined to £142 10s, but at this writing is £2 higher. Standard copper holds steady at £124 for spot and £119 for futures. Stocks of standard copper in England on Oct. 31 totalled 3168 tons and fine copper in France 2290 tons, a decrease of 172 tons in the fortnight. The afloat from Chile amounted to 650 tons and from Australia 4000 tons, a decrease of 400 tons. Thus the total visible on October 31 was 10,108 tons as contrasted with 10,670 tons on Oct. 15.

Quotations for copper per pound at New York for the week ended Nov. 8 were as follows:

(For First Quarter Delivery.)

		Lake.	Electrolytic.	Casting.
Nov. 2.....	28½ @ 28¾	28½ @ 28¾	27 @ 27½	
3.....	28¾ @ 29	28¾ @ 29	27 @ 27½	
4.....	29 @ 29½	29 @ 29½	27 @ 27½	
6.....	29 @ 29½	29 @ 29½	27 @ 27½	
7.....	Holiday	Holiday	Holiday	
8.....	29 @ 29½	29 @ 29½	27 @ 27½	

Quotations for copper per ton at London for the week ended Nov. 8 were as follows:

Month.	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.462	14.672
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	28.00	28.75	17.758
October	29½	29.00	29.18	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.462	14.672
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	28.00	28.75	17.758
October	29½	29.00	29.18	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.672
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	28.00	28.75	17.705
October	29½	29.00	29.18	17.859
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	68.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	27.00	25.50	26.40	116.10	68.560
October	28.50	27.00	27.31	117.25	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—The detailed tin statistics for October were distinctly unfavorable, there being shown increases in the visible supply and shipments of straits and Banka tin. Following their publication the market showed a tendency to recede, but when news of the sinking of the steamer Glenlogan, bound to London with 360 tons tin, was received, the market took on strength. The Glenlogan was destroyed by a submarine in the Mediterranean and bullish traders immediately took heart and advanced prices. When the news of the loss reached Singapore the market there jumped forward sharply with leading sellers refusing to quote. Based

on current market values the tin lost on the Glenlogan was worth about \$370,000. Importers here have not been informed whether any of the tin was for American account. Spot straits tin, which eased off to 41½ cts., advanced to 42½ cts., and then at the opening of the current week went to 42½ cts. Spot Banka recovered from 41½ cts. to 41¾ cts.

Consumers displayed more interest in futures when the limits from the east came higher. The east offered April, May and June shipments at 41¾ cts. and the most recent limits have been at 41½ cts. Thus with September arrival held at 41½ cts. the spot price of 42½ cts. is not considered high. For December delivery business was done at 42½ cts. with January, February and March arrivals selling at 41¾ cts. The statistics at first depressed London and Singapore, but these markets recovered towards the close of last week with fair gains. At the opening of the current week Singapore advanced £3 10s to £187, thus restoring the premium over London.

The total visible supply on Oct. 31 was 17,415 tons, an increase of 1213 tons. Straits shipments amounted to 5868 tons against 3270 tons in September, while Banka shipments increased from 1263 tons to 2194 tons, American deliveries totalled 4556 tons, leaving stocks and landing of 3419 tons.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Nov. 8 were as follows:

	New York		London.	Singapore.
	Spot.	November.	Straits, spot.	shipments.
Nov. 2.....	41¾c	41¾c	£180 10 0	£182 10 0
3.....	42¼c	42¼c	182 5 0	183 10 0
4.....	42¼c	42¼c	182 5 0	183 10 0
6.....	42¾c	42¾c	182 15 0	187 0 0
7.....	Holiday	Holiday	183 10 0	186 0 0
8.....	42.80c	42¾c	183 10 0	186 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	66.00	46.25	60.48	48.934
April	56.00	49.60	52.27½	44.38
May	52.00	46.75	49.86½	38.871
June	45.60	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.68	34.386
September	39.50	38.00	39.00	33.13
October	44.00	39.37½	41.17	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Business in lead has been very dull since our last report, but the strength of the market has not diminished in the least. With the turn of the month a few spot lots were offered at concessions by second hands, but producers, being solidly entrenched behind orders, adhered to their established quotations. Practically all of the producers are sold up for November. One producer has reserved a small tonnage with which to supply emergency requirements of regular customers. Dealers are not very large holders of November lead either. The very active buying that took place early in October has apparently given protection to all consumers. Therefore market factors do not look for any sensational developments.

It is stated that a resumption of business is not far off. One producer who is very close to the Canadian consumers who have in the recent past furnished the initial momentum to the market states that buying by the ammunition makers in the Dominion for December delivery will probably be started next week. Lead for December is quoted at 7 cts. New York, and 6.90 cts. St. Louis by independent interests. Spot lead in the outside market is available in small quantities at 7.02½ cts. New York and 6.85 cts. St. Louis. The leading interest has adhered to its price of 7 cts. New York and 6.92½ cts. St. Louis.

At London the market has shown no change, holding at £30 10s for spot and £20 10s for futures.

Quotations for lead per pound at New York and per ton at London for the week ended Nov. 8 were as follows:

	New York		London.	Futures.
	Indpts.	A. S. & R. Co.	Spot.	
Nov. 2.....	7.02¼c	7.00c	£30 10 0	£29 10 0
3.....	7.02½c	7.00c	30 10 0	29 10 0
4.....	7.02½c	7.00c	30 10 0	29 10 0
6.....	7.02½c	7.00c	30 10 0	29 10 0
7.....	Holiday	Holiday	30 10 0	29 10 0
8.....	7.02½c	7.00c	30 10 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	1916	1915.	1915.	1916.	1915.
January	High. 6.20	Low. 5.50	Avg. 5.926	Avg. 5.730	31.92
February	6.55	6.10	6.271	3.350	19.804
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August	6.70	6.95	6.32	4.750	30.260
September	7.10	6.70	6.88	4.627	31.25
October	7.10	7.00	7.05	4.612	30.20
November .....	.....	.....	.....	5.152	26.240
December .....	.....	.....	.....	5.346	28.884
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—In the Missouri-Kansas-Oklahoma district during the week ended Nov. 4 general conditions denoted a stronger market even though the top price remained at \$87, for the lower grades only ranged down to about \$83 against \$80 during the previous week. The week's production was 1,353,580 lbs., valued at \$57,380, and this brought the total for the year to date at 87,522,882 lbs., valued at \$3,629,257.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.16	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.60	48.70
April	118.00	94.40	106.20	50.60
May	97.00	92.00	94.75	60.50
June	82.50	76.00	76.36	63.60
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.60
September	78.00	65.00	72.60	48.25
October	87.00	70.50	79.875	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—A general increase in prices seems to again be coming as was noted by another increase in prices for ores during last week. The top price was \$80 per ton and this ranged down to \$70. The week's production of 12,350,420 lbs. was nearly 10% lower than that of the previous week and was valued at \$147,139. The total for the year was 561,968,240 lbs. valued at \$23,545,963.

Calamine.—Calamine shared in the boost of metal prices in the Missouri-Kansas district and sold for \$47.50 per ton as the top price, this ranging down to \$37. Production during the week was reported at 500,200 lbs., valued at \$10,802, and the total for the year was brought to \$30,389,585 lbs., valued at \$930,427.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.60	62.60
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	58.75	60.25
September	65.00	45.00	55.00	76.75
October	75.50	50.00	63.375	82.40
November .....	.....	.....	.....	92.60
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Demand for spelter has once more become active and dealers have done a sizable business with prices showing a strong trend to higher levels. Business in prime spelter for delivery in the first quarter developed late last week and with the market responding quickly consumers have shown a desire to protect requirements. Producers assert that they are not selling very freely for forward delivery, but some selling by first hands has been noted. Galvanizers have again been the principal buyers, although some brass makers have been in the market.

From a study of the situation it appears that spelter will have up and down movements for months to come. Consumers stop buying as soon as the price passes 11 cts. and when the market is back to around 9½ cts. resume buying. This has been the case in the past 6 weeks. Producers, however, declare that they will obtain much higher prices by the

and with dealers disposing of their accumulations the producers will be in a position to send the price up rapidly as soon as demand develops.

Last week business in prime western was done at 10½ cts. to 10¾ cts., but this week selling has been from 10½ cts. to 10.45 cts. St. Louis. Spot metal has advanced to 10.80 cts. New York and 10.65 cts. St. Louis. A few foreign orders have been in the market for brass special, but nothing worthy of special note has transpired. Spot brass special holds at 11 cts. St. Louis.

The London market has showed a gradual advance after an off movement last week. Quotations for spelter per pound at New York and per ton at London for the week ended Nov. 8 were as follows:

	New York.	London—	
	Spot.	Spot.	Futures.
Nov. 2.....	10.55c	£52 10 0	£50 10 0
3.....	10.75c	52 15 0	50 15 0
4.....	10.80c	52 15 0	50 15 0
6.....	10.80c	53 5 0	51 15 0
7.....	Holiday	53 15 0	52 0 0
8.....	11.00c	53 15 0	52 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York—			London—	
	1916—	1915.	1916.	1915.	
	High.	Low.	Avg.	Avg.	Avg.
January	19.42½	17.30	18.801	6.519	89.840
February	21.17½	18.67½	20.094	8.866	97.840
March	20.50	16.50	18.40	10.125	100.720
April	19.37½	17.75	18.76	11.48	98.103
May	17.50	13.75	15.98	15.825	89.507
June	13.62½	11.25	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August	9.75	8.37½	9.11½	16.110	56.00
September	9.70	8.12½	9.22	14.493	51.30
October	10.42½	9.42½	9.99	14.196	53.15
November				16.875	
December				16.675	
Year				13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Antimony.—Business in this metal has been small, with the market barely steady. Although sellers are not offering at concessions, it is stated that buyers could shade quoted prices without difficulty. Spot antimony is quoted at 13 to 13½ cts. duty paid. One Chinese producer who reports being well sold up is asking 14 cts. for spot. For November and December shipment sellers are asking 11¼ to 12 cts. in bond. There is a Canadian inquiry in the market, but otherwise little in the way of new business.

Tungsten.—The plant of the Atolia Mining Co. resumed operations on Nov. 1. The demand for tungsten has increased somewhat with sales of high-grade ore being made at \$18 delivered New York. Ordinary tungsten has sold freely at \$17. It is reported that a considerable foreign business is being negotiated, but these are not likely to mature for several weeks to come. Business is mainly for spot delivery and sellers report that holdings are now much smaller than they were a month ago.

Manganese Ore.—The market continues dull, with a general absence of new developments. Advances from Cuba are not very encouraging. Leading sellers report that demand is very poor and domestic ores are being sold at concessions. Agents of Cuban producers are asking 55@60 cts. for 40% metal contents. Some domestic ore is reported to have changed hands at a shade under 55 cts. Chemical ore is also quiet and unchanged at 4½@5 cts.

Quicksilver.—There is a fair demand for quicksilver, with the market remaining steady at \$80 per flask for spot virgin metal. Some sellers report that the placing of several large contracts for explosives may lead to higher prices, but leading factors in quicksilver do not look for an early advance.

Pig Iron.—The market is developed into a runaway affair. Birmingham iron has sold at \$20, Buffalo at \$25,

Lehigh valley at \$24, Virginia at \$25, these prices being for foundry grades. The average on bessemer and basic for October were the highest for a decade; bessemer average being \$23.6576 and basic \$20.3086. Buying has been tremendous in spite of the fact that many furnaces have withdrawn from the market. Many consumers have been caught uncovered for the first half. Selling for delivery in the second half of next year has been very active also.

Aluminum.—Business has been quiet both in the outside market on nearby deliveries and with the producers on 1917 contracts. Spot virgin ingots are quoted at 61@66 cts. On 1917 contracts the leading interest is quoting 35 cts.

PRICES-CURRENT.

Acids —Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06¼	to	.06½
Nitric, 40 deg.....	.06¼	to	.07
Alcohol —U. S. P., gal., Grain, 190 proof.....	2.74	to	2.75
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.75	to	.80
Denatured, bbl.....	.60	to	.62
Alum —Powdered, lb.....	.06¼	to	.06½
Lump, lb.....	.05¼	to	.05½
Ground, lbs.....	.06	to	.06½
Ammonia —			
Muriate, white grain, lb.....	.11	to	.12
Muriate, lump.....	.17	to	.18
Arsenic —White, lb.....	.06	to	.06¼
Red, lb.....	.62½	to	.65
Barium Chloride —Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.15
Bismuth —Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder —			
Drums, 100 lbs.....	4.50	to	5.00
Borax —100 lbs., car lots.....	7.75	to	8.00
Coke —Connellsville furnace.....	5.00	to	6.00
Foundry.....	9.00	to	10.00
Copperas —Spot, bbl.....	1.35	to	1.60
Ferrosilicon , 50%.....			100.00
Ferrotitanium , per lb.....	.08	to	.12½
Fuller's Earth , 100 lbs.....	.80	to	1.05
Glaucous Salts , bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore —			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
Lead —Granulated, lb.....	.147½	to	.15¼
Brown sugar.....	.11½	to	.11¾
White crystals.....	.13	to	.13½
Broken, cakes.....	.12½	to	.13
Powdered.....	.13¾	to	.14
Litharge , American, lb.....	.09	to	.09½
Mineral Lubricants —			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin —High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt , double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum —			
Crude (jobbing), gal.....	.15	to	.18
Refined, bbl.....			.12
Platinum —Oz. ref.....	90.00	to	96.00
Potash Fertilizer Salts —			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80% ton.....	450.00	to	475.00
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium —			
Bichromate.....	.40	to	.42
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.75	to	.77½
Prussiate, red.....	2.00	to	2.10
Salt peter —Crude, lb.....	.12	to	.14
Refined.....	.31	to	.31½
Soda —Ash, 48% (43% basis), bbl.....	3.00	to	5.60
Strontia Nitrate , casks, lb.....	.32	to	.35
Sulphur —			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin —Bichloride, 50°, 100 lbs.....	.14¼	to	.14¾
Crystals, bbls., lb.....	.29	to	.29½
Oxide, lb.....	.46	to	.48
Zinc Chloride.....	.10¼	to	.11¼

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid In 1916	Total to date	Latest						Paid In 1916	Total to Date	Latest	
						Date	Am't.							Date	Am't.
Acacia, g.	Colo.	1,435,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,916	\$1	\$.....	\$93,916	Sept. 1, '01	\$0.01
Adams, s. l. c.	Colo.	80,000	10	.....	77,800	Dec. 18, '09	.04	Golden Star, g.	Ariz.	400,000	5	.....	120,000	Mar. 15, '10	.05
Adventure, c.	Mich.	100,000	25	50,000	60,000	July 20, '16	.50	Gold' d Com. Fra. g.	Nev.	922,000	1	.....	92,111	Oct. 15, '09	.10
Ahmeek, c.	Mich.	200,000	25	2,000,000	6,050,000	Oct. 10, '16	4.00	Goldfield Con.	Nev.	3,559,148	10	.....	28,999,831	Oct. 31, '15	.10
Alaska Goldfields.	Alaska	250,000	5	.....	403,250	Jan. 10, '16	.15	Good Hope, g. s.	Colo.	500	100	.....	941,250	Jan. 1, '03	.25
Alaska Mexican, g.	Alaska	180,000	5	.....	3,507,351	Nov. 25, '15	.10	Good Sp. Anchor, z. s.	Nev.	550,000	1	38,000	119,756	June 15, '16	.01
Alaska Mines Sec.	U. S.	500,000	5	.....	90,000	Nov. 1, '08	.....	Grand Central, g.	Utah	500,000	1	20,000	1,635,250	Oct. 25, '16	.04
Alaska Treadwell, g.	Alaska	200,000	25	250,000	15,780,000	May 29, '16	.50	Grand Gulch, c. s.	Nev.	239,845	2.60	17,790	19,187	Sept. 6, '16	.03
Alaska United, g.	Alaska	180,200	5	54,060	2,045,270	Feb. 28, '16	.30	Granite, g.	Alaska	430,000	1	17,200	17,200	May 10, '16	.02
Alouez, c.	Mich.	100,000	25	700,000	800,000	Oct. 4, '16	2.50	Owin, g.	Cal.	100,000	10	.....	481,500	Feb. 1, '06	.25
Amalgamated, c.	Mont.	1,538,529	100	.....	103,444,983	Aug. 30, '15	3.77	Hazel, g.	Cal.	900,000	1	.....	1,114,000	Jan. 5, '15	.01
Am. Sm. & R. con.	U. S.	500,000	100	2,500,000	31,833,333	Sept. 1, '16	1.50	Hecla, s. l.	Idaho	1,000,000	0.25	1,250,000	6,005,000	Oct. 20, '16	.15
Am. Sm. & R. pf.	U. S.	500,000	100	2,625,000	57,421,356	Sept. 1, '16	1.75	Hercules, c.	Idaho	1,000,000	1	2,220,000	13,000,000	Oct. 16, '16	.20
Am. Sm. Sec. A pf.	U. S.	170,000	100	1,020,000	11,720,000	Oct. 2, '16	1.50	Hidden Treasure, g.	Cal.	30,000	10	.....	457,452	Sept. 1, '00	.10
Am. Sm. Sec. B pf.	U. S.	300,000	100	1,400,000	17,010,000	Oct. 2, '16	1.25	Holy Terror, g.	S. D.	500,000	10	.....	172,000	Jan. 1, '00	.01
Am. Zinc, L. & Sm.	Mo.	193,720	25	2,756,180	3,805,000	Aug. 1, '16	1.50	Homestake, g.	S. D.	251,160	100	1,632,540	37,338,348	Oct. 25, '16	.65
Anaconda, c.	Mont.	2,331,250	50	11,658,250	175,914,271	Aug. 28, '16	2.00	Hope Dev.	Cal.	500,000	1	.....	5,000	Dec. 31, '15	.01
Annie Laurie, g.	Utah	25,000	100	.....	439,561	Apr. 22, '05	.60	Horn Silver, l. s. z.	Utah	400,000	1	40,000	5,182,000	June 30, '16	.05
Argonaut, g.	Cal.	200,000	5	55,000	1,695,000	Sept. 25, '16	.07%	Imperial, c.	Ariz.	500,000	10	.....	300,000	June 24, '07	.20
Arizona, c.	Ariz.	.....	.....	521,164	20,212,164	Apr. 1, '16	.....	Inspiration Con.	Ariz.	920,687	20	5,454,959	5,454,959	Oct. 31, '16	2.00
Atlantic, c.	Mich.	100,000	25	.....	990,000	Feb. 21, '05	.50	Intermountain, c.	Mont.	1,615,000	1	8,075	6,075	Oct. 20, '16	.005
Bagdad Chase, g. pf.	Cal.	84,819	5	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, com.	U. S.	1,673,354	25	7,948,574	33,451,414	Sept. 1, '16	2.00
Bald Butte, g. s.	Mont.	250,000	1	.....	1,354,648	Nov. 1, '07	.04	Inter'l Nickel, pf.	U. S.	89,126	100	401,067	5,748,513	Aug. 1, '16	1.50
Baldy, c.	Mich.	100,000	25	.....	7,950,000	Dec. 31, '13	2.00	Intern'l Sm. & Ref.	U. S.	100,000	100	.....	4,100,000	May 2, '14	2.00
Barnes King, g.	Mont.	40,000	5	60,000	60,000	June 1, '16	.07%	Interstate Callahan	Idaho	444,990	10	2,092,455	4,499,990	Sept. 30, '16	1.50
Beck Tunnel Con.	Utah	1,000,000	0.10	.....	940,000	Nov. 15, '07	.02	Iowa, g. s. l.	Colo.	1,666,667	1	.....	270,107	Dec. 31, '15	.003%
Big Four Expt.	Utah	400,000	1	100,300	110,000	Sept. 4, '16	.05	Iowa Tiger, g. s. l.	Colo.	3,000	1	.....	25,179	Jan. 15, '15	.60
Board of Trade, z.	Wis.	120,000	1	.....	78,000	Jan. 15, '11	.05	Iron Blossom, l. s. g.	Utah	1,000,000	1	360,000	2,950,000	Oct. 20, '16	.10
Bonanza Dev.	Colo.	300,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Cap pf. d. c.	Ariz.	33,451	10	6,422	29,803	July 1, '16	.35
Booth (Reorganized)	Nev.	998,395	5	349,949	349,949	June 28, '16	.06	Iron Chad, g.	Colo.	1,000,000	1	.....	50,000	Nov. 1, '06	.05
Boss, g.	Nev.	408,500	1	.....	40,850	Dec. 10, '14	.10	Iron Silver	Colo.	600,000	20	.....	5,050,000	Dec. 31, '15	.10
Boston & Colo. Sm.	Colo.	15,000	10	.....	402,350	Oct. 2, '02	.75	Isabella, g.	Colo.	2,250,000	1	.....	742,500	Mar. 1, '01	.01
Bot. & Mont. Con.	Mont.	100,000	25	.....	63,225,000	May 15, '11	4.00	Isle Royale, c.	Mich.	150,000	25	450,000	600,000	Oct. 31, '16	2.00
Breece, l. s.	Colo.	200,000	25	.....	220,000	Dec. 15, '13	.10	Jamison, g.	Cal.	390,000	10	.....	378,300	Jan. 1, '11	.07
Brunswick Con., g.	Cal.	300,000	1	.....	208,315	Sept. 15, '15	.06	Jerry Johnson, g.	Colo.	2,500,000	10	.....	187,500	Nov. 5, '14	.005%
Bullion-B. & Champ	Utah	100,000	10	.....	2,768,400	July 11, '08	.10	Jim Buller	Nev.	1,716,020	1	343,604	516,406	Aug. 1, '16	.10
Bunker Hill Con. g.	Cal.	200,000	1	60,000	671,000	Oct. 4, '16	.02%	Joplin Ore & Spelter	Mo.	400,000	5	62,000	62,000	July 22, '16	.04%
Bunker Hill & Sull.	Idaho	327,000	10	1,397,750	18,162,750	Oct. 5, '16	.20	Jumbo Est., g.	Nev.	1,550,000	1	194,000	684,998	June 30, '16	.05
Butte Alex Scott.	Mont.	75,000	10	844,662	1,954,118	Apr. 10, '16	10.50	Kendall, g.	Mont.	500,000	5	60,000	1,555,000	Apr. 3, '16	.10
Butte Malakela, c.	Mont.	250,000	10	.....	125,000	Aug. 1, '10	.50	Kenefick Zinc	Mo.	200,000	.....	60,000	80,000	June 1, '16	.10
Butte Coalition, c.	Mont.	1,000,000	15	.....	4,700,000	Dec. 1, '11	.25	Kennecott, c.	Alas.	2,780,998	10	11,200,000	16,200,000	Sept. 30, '16	1.50
Butte & Superior, z.	Mont.	272,897	10	7,676,734	13,196,758	Sept. 30, '16	6.25	Kennedy, g.	Cal.	100,000	100	.....	1,801,001	June 1, '00	.05
Caladonia, l. s. c.	Idaho	2,606,000	1	781,500	1,664,281	Oct. 5, '16	.03	King of Arizona, g.	Ariz.	200,000	1	.....	396,000	Aug. 2, '09	.12
Calumet & Ariz., c.	Ariz.	641,923	10	3,849,522	26,997,847	Sept. 25, '16	2.00	Klar Piquet, z.	Wia.	20,000	1	.....	167,500	Dec. 16, '12	.25
Calumet & Hecla, c.	Mich.	100,000	25	5,000,000	134,250,000	Sept. 22, '16	20.00	Knob Hill, g.	Wash.	1,000,000	1	.....	70,000	Aug. 1, '13	.003%
Camp Bird, g.	Colo.	1,750,000	25	113,584	10,243,964	Jan. 1, '16	.17%	La Fortuna, g.	Ariz.	250,000	1	.....	1,200,500	Oct. 1, '07	.01%
Cardiffs, l.	Utah	500,000	25	875,000	500,000	Sept. 19, '16	.25	Lake View	Utah	500,000	.05	60,000	114,500	June 12, '16	.01
Carissa, g. z. c.	Utah	600,000	25	.....	60,000	Dec. 1, '06	.01	Last Dollar, g.	Colo.	1,500,000	1	.....	180,000	Feb. 23, '03	.02
Centennial, c.	Mich.	1,000,000	1	100,000	100,000	Sept. 1, '16	1.00	Liberty Bell, g.	Colo.	133,551	5	.....	1,762,795	Jan. 31, '16	.06
Centennial Eureka.	Utah	100,000	26	100,000	4,000,000	Apr. 25, '16	1.00	Lightner, g.	Cal.	102,251	1	.....	331,179	June 1, '06	.05
Center Creek, l. z.	Mo.	100,000	10	86,000	730,000	Oct. 1, '16	.15	Linden, z.	Wia.	1,020	10	.....	11,200	Dec. 31, '15	3.00
Central Eureka, g.	Cal.	100,000	1	.....	799,159	Mar. 5, '06	.05	Little Bell, s. l.	Utah	300,000	1	15,000	55,000	Apr. 22, '16	.05
Century, g. s. l.	Utah	1,000,000	1	44,000	392,807	Feb. 15, '16	.05	Little Florence	Nev.	1,000,000	1	.....	430,000	Jan. 1, '06	.03
Cerro Gordo, l. s. z.	Cal.	1,000,000	1	25,000	25,000	Sept. 23, '16	.02%	Lost Pecker	Idaho	150,000	1	.....	37,500	Oct. 23, '15	.25
Champion, c.	Mich.	100,000	25	6,280,000	16,280,000	Oct. 8, '16	1.40	Lower Mammoth.	Utah	1,000,000	1	.....	67,000	Dec. 15, '15	.01
Chiet Con.	Utah	882,960	1	132,323	483,350	Aug. 2, '16	.05	MacNamara, g. s.	Nev.	734,576	1	.....	46,800	Apr. 23, '05	12.00
Chino Copper c.	N. M.	869,980	5	5,002,385	11,700,377	Sept. 10, '16	2.25	Magma, c.	Ariz.	240,000	5.00	360,000	600,000	Sep. 30, '16	.50
C. K. & N. g.	Colo.	1,431,900	1	.....	171,828	Nov. 1, '04	.01	Mammoth, g. s. c.	Utah	400,000	10	60,000	2,380,000	Sept. 30, '16	.05
Cliff, g.	Alaska	100,000	1	.....	115,000	Feb. 14, '05	.05	Manhattan-Big 4, g.	Nev.	762,400	1	.....	30,248	Aug. 15, '11	.02
Cliff, s. l.	Utah	300,000	10	.....	90,000	Jan. 1, '13	.10	Mary McKinney, g.	Colo.	1,309,252	1	.....	1,169,306	July 28, '14	.02
Clinton, g. s.	Colo.	1,000	100	.....	60,000	Dec. 1, '03	.30	Mary Murphy, g. s. l. z.	Colo.	370,000	5	25,067	93,106	May 1, '16	.07
Colo. G. Dredging.	Colo.														

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest		
						Date	Amt.								Date	Amt.	
Petro, g. s.	Utah	600,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success	Ida.	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03		
Pharmacist, g.	Colo.	1,600,000	1	.....	91,600	Feb. 1, '10	.00%	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Oct. 10, '16	1.00	
Phelps, Dodge & Co	U. S.	450,000	100	9,000,000	57,371,527	Sept. 30, '18	8.00	Superior & Pitta, c.	Ariz.	1,499,792	10	.....	10,318,568	Dec. 21, '15	.35	
Pioneer, g.	Alaska	5,000,000	1	.....	2,041,526	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	.....	9,420,000	July 23, '07	4.00
Pittsburg, I. s.	Mo.	1,000,000	1	.....	20,000	July 15, '07	.07	Tamarack-Custer	Idaho	2,000,000	1	71,050	71,050	Aug. 30, '16	.62	
Pittsburg-Idaho, I.	Ida.	1,000,000	1	42,600	291,004	Oct. 2, '16	.04%	Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75		
Pitts Silver Peak	Nev.	2,790,000	1	.....	840,600	Dec. 1, '14	.07	Tightner	Cal.	100	100	.....	160,000	Jan. 3, '14	.....	
Platteville, I. z.	Wis.	600	60	.....	179,500	June 16, '07	10.00	Tomboy, g. s.	Colo.	310,000	6	74,400	3,861,555	June 30, '16	.24	
Plumas Eureka, g.	Cal.	150,625	10	.....	2,831,294	Apr. 8, '01	.06	Tom Reed, g.	Ariz.	909,555	1	.....	2,555,934	Sept. 5, '16	.01
Plymouth Con.	Cal.	240,000	5	116,500	289,300	Aug. 10, '16	.24	Tom-Belmont, g.	Nev.	1,500,000	1	750,000	8,393,027	Oct. 2, '16	.12%		
Portland, g.	Colo.	3,000,000	1	360,000	10,537,090	Oct. 20, '16	.03	Ton-Extension, g. s.	Nev.	1,272,501	1	604,680	1,591,776	Oct. 1, '16	.15		
Prince Con., a. l.	Nev.	1,000,000	2	200,000	325,000	Oct. 5, '16	.02%	Tonopah, g. s.	Nev.	1,000,000	1	600,000	13,600,000	Oct. 21, '16	.15		
Quartette, g. s.	Nev.	100,000	10	.....	375,000	July 31, '07	.20	Tonopah Midway, g	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.05%
Quicksilver, pf.	Cal.	43,000	100	.....	1,931,411	Apr. 8, '03	.60	Tremont	Cal.	300,000	2.50	.....	234,000	Apr. 25, '15	.02
Quip, g.	Wash.	1,600,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,000,000	Oct. 30, '12	3.00
Ray Con., c.	Ariz.	1,571,279	10	2,743,748	22,987,500	Sept. 25, '16	4.00	Tudumna, c.	Mont.	800,000	1	.....	495,525	Apr. 15, '13	.05	
Red Metal, c.	Mont.	100,000	10	.....	7,322,875	Sept. 30, '16	.76	Uncle Sam Con. s.	Utah	600,000	1	.....	476,000	Sept. 20, '11	1.00
Red Top, g.	Nev.	1,000,000	1	.....	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	.....	167,070	Nov. 15, '10	.10
Republic, g.	Wash.	1,000,000	1	.....	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	1,600,000	1,600,000	Apr. 15, '07	3.00	
Richmond, g. s. l.	Nev.	64,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	.....	6,125,000	Aug. 6, '07	1.75
Rocco-Home, I. s.	Nev.	300,000	1	.....	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	.....	211,527	Oct. 15, '07	.80
Rochester Ld. & L.	Mo.	4,900	100	.....	152,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Round Mountain, g.	Nev.	859,018	1	.....	190,846	July 1, '12	.50	United (Crip. Ck.)	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev.	859,018	1	.....	363,954	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	1,173,000	3,749,000	Sept. 30, '16	18.00	
Sacramento, g.	Utah	1,000,000	6	.....	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	60,000	100	11,000,000	11,000,000	Sept. 23, '10	5.00	
St. Joseph, I.	Mo.	1,409,466	10	1,761,830	12,029,729	Sept. 10, '16	.75	United Verde, c.	Ariz.	300,000	10	3,150,000	38,947,000	Oct. 1, '16	.75		
St. Mary's M. L.	Mich.	160,000	25	2,730,000	7,530,000	Oct. 14, '16	2.00	United Verde Ext.	Ariz.	1,000,000	50	600,000	600,000	Oct. 1, '16	.60		
Schoenherr-Wal'n, z. l.	Mo.	10,000	10	.....	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo.	59,188	100	.....	414,076	Oct. 9, '03	1.00
Scratch Gravel	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. Red. & R. pf.	Colo.	39,483	100	.....	1,775,936	Oct. 15, '07	1.50	
Seven Tre. Co., g. s.	Nev.	1,443,077	1	36,076	252,532	Apr. 1, '15	.02%	U. S. S. R. & M. com	USMx	351,115	60	1,316,657	7,941,860	Sept. 21, '16	1.00		
Shannon, c.	Ariz.	300,000	10	.....	750,000	Jan. 30, '13	.50	U. S. S. R. & M. pf	USMx	486,350	60	1,718,224	18,513,922	Oct. 15, '16	.87%	
Shattuck-Ariz, c.	Ariz.	350,000	10	1,663,300	4,637,000	Oct. 20, '16	1.25	Utah, c.	Utah	1,624,490	10	13,808,165	46,630,962	Sept. 30, '16	3.00		
Silver Hill, g. s.	Nev.	108,000	1	.....	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	528,200	6	396,154	462,179	Sept. 30, '16	.25	
*Silver King Coal'n	Utah	1,250,000	6	750,000	14,334,955	Oct. 1, '16	.15	Utah Con., c.	Utah	300,000	6	675,000	9,825,000	Sept. 26, '16	.75		
Silver King Con.	Utah	637,582	1	191,274	1,006,131	Oct. 22, '15	.10	Utah M. & T. pf.	Utah	750,000	1	325,000	1,285,492	Aug. 15, '16	.50		
Silver Mines Expl.	N. Y.	10,000	100	.....	250,000	June 16, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00	
Sloux Cons., I. s. c.	Utah	745,389	1	.....	872,105	July 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	.....	207,500	Apr. 23, '10	.04
Skidoo, g.	Cal.	1,000,000	1	.....	365,000	Oct. 2, '14	.01	Victor Con., g.	Colo.	1,600,000	1	225,000	3,487,500	Oct. 25, '16	.06	
Smuggler, s. I. z.	Idaho	1,500,000	1	.....	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D.	600,000	1	100,000	649,466	May 15, '16	.02%	
Snowstorm, c.	Idaho	1,500,000	1	.....	1,169,610	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,800,000	1	600,000	1,250,000	Oct. 1, '16	.02	
Socorro, c.	N. M.	377,342	5	66,599	196,070	Sept. 1, '16	.05	West End Con.	Nev.	1,788,488	1	89,424	625,969	Oct. 24, '16	.05		
South Eureka, g.	Cal.	239,981	1	167,920	1,469,754	Aug. 15, '16	.07	West Hill	Wia.	10,000	1	8,000	40,000	June 29, '16	.20		
South Hecla	Ida.	600,000	1	39,450	29,450	Aug. 10, '16	.16	White Knob, g. pf.	Cal.	200,000	10	60,000	190,000	Aug. 25, '16	.01		
So. Swansea, g. s. l.	Utah	300,000	1	.....	237,600	Apr. 3, '04	.01%	Wilbert	Ida.	1,000,000	1	30,000	40,000	Aug. 15, '16	.10	
Spearfish, g.	S. D.	1,500,000	1	.....	165,500	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	720,600	9,120,000	Oct. 2, '16	6.00	
Standard Con., g. s.	Cal.	178,394	10	.....	6,274,408	Nov. 17, '13	.25	Wolverine & Ariz, c.	Ariz.	118,674	16	.....	53,403	Dec. 15, '15	.25
Standard, c.	Ariz.	426,000	1	.....	69,500	Sept. 8, '06	.50%	Work, g.	Colo.	1,500,000	1	.....	1,597,685	Apr. 31, '12	.02
Steward, I. z.	Idaho	1,238,362	1	.....	2,043,297	Dec. 31, '15	.06	Yak.	Colo.	1,000,000	1	190,000	2,197,685	Sept. 30, '16	.07	
Stratton's Crip. Ck.	Colo.	2,000,000	1	.....	500,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	.....	167,500	Feb. 1, '13	.01
Stratton's Ind.	Colo.	1,000,000	5	.....	5,028,568	Dec. 23, '06	.12	Yellow Aster, g.	Cal.	100,000	10	28,000	1,200,785	Oct. 6, '16	.06	
Str'n's Ind. (new) g.	Colo.	1,000,000	30	160,000	691,250	Jan. 31, '16	.16	Yellow Pine, z. I. s.	Nev.	1,000,000	1	800,000	1,693,008	Oct. 25, '18	.10		
Strong, g.	Colo.	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	.....	102,583	July 15, '14	.10

Corrected to November 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Ajuchitlan	Mex.	60,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrillas	Mex.	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00
Amistad y Concordia g.s.	Mex.	9,600	60	.....	429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25	.....	1,627,320	Dec. 15, '16	\$0.24
Amparo, s. g.	Mex.	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.05	Lucky Tiger	Mex.	715,337	10	386,281	8,649,673	Oct. 20, '16	.10
Barlo de Medina Mill	Mex.	2,000	25	.....	103,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,692	1	269,724	4,877,492	Oct. 2, '16	.03
Batoplas, s.	Mex.	448,268	20	.....	55,870	Dec. 31, '07	.12%	Mexican, I. pf.	Mex.	12,500	100	.....	1,018,750	May 1, '12	3.60
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex.	240,000	10	.....	660,000	Mar. 10, '05	.25
Boleo, g.	Mex.	120,000	20	.....	721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex.	150,000	6	.....	4,478,500	June 26, '14	.96
British Columbia, c.	B. C.	591,709	6	.....	615,399	Jan. 5, '13	.15	Minas Pedrazzini	Mex.	1,000,000	1	.....	497,600	Jan. 23, '11	.08%
Buena Tierra, s.	Mex.	330,000	5	.....	160,350	Jan. 30, '16	.24	Mines Co. of Am.	Mex.	900,000	10	.....	4,958,600	July 25, '13	12%
Buffalo, Ont.	Ont.	1,000,000	1	.....	2,787,000	July 1, '14	.06	Mining Corp. of Canada	Can.	2,075,000	1	570,625	1,348,750	Sept. 30, '16	.15
Canadian Goldfields	Can.	600,000	0.10	.....	237,093	July 15, '14	.01%	Monteruma, I. pf.	Mex.	5,000	100	.....	402,600	Nov. 15, '12	3.50
Cananea Central, c.	Mex.	600,000	10	.....	360,000	Mar. 1, '12	.60	Monteruma M. & Sm.	Mex.	500,000	1	.....	100,000	July 20, '09	.04
Cariboo-Cobalt	Ont.	1,000,000	1	.....	235,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11
Cariboo-McKinney, g.	B. C.	1,250,000	1	.....	56,250	Dec. 1, '09	.00%	Naica, s. l.	Mex.	100,300	100	.....	3,150,000	Oct. 11, '09	\$23
City of Cobalt	Ont.	600,000	1	.....	135,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	300,000	4,050,000	Oct. 25, '16	.50
Cobalt Central, s.	Ont.	471,600	1	.....	192,840	Aug. 24, '06	.01	Nipissing, s.	Ont.	1,200,000	5	1,600,000	14,940,000	Oct. 20, '16	.50
Cobalt Lake, s.	Ont.	3,000,000	1	.....	465,000	May 23, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	633,000	633,000	Feb. 1, '10	.02
Cobalt Silver Queen	Ont.	1,600,000	1	.....	315,000	Dec. 1, '08	.03	Paloma, g.	Mex.	3,000	.....	.....	99,600	Dec. 1, '12	6.00
Cobalt Townsite, s.	Ont.	199,282	5	.....	1,042,259	Aug. 20, '14	.24	Panuco	Mex.	10,000	.....	.....	7,465,000	Nov. 4, '09	6.00
Coniagas, s.	Ont.	800,000	5	400,000	8,240,000	Aug. 5, '16	.25	Panoles, s. g.	Mex.	120,000	20	.....	6,451,687	Sept. 30, '13	1.25
Con. Mg. & Sm., g. & c.	B. C.	53,650	100	.....	2,951,341	Oct. 1, '16	2.60	Peregrina, pf.	Mex.	10,000	100	.....	328,556	Sept. 1, '10	3.50
Crown Reserve, s.	Ont.	1,999,957	1	.....	8,102,408	July 15, '16	.03	Peterson Lake	Ont.	2,401,820	1	126,096	332,319	Oct. 2, '16	.01%
Dolores	Mex.	400,000	5	.....	1,374,865	July 24, '11	.22%	Pinguic, pf.	Mex.	20,000	100	.....	730,000	Apr. 15, '13	3.00
Dome Mines, s.	Ont.	400,000	10	600,000	2,000,000	Sept. 1, '16	.50	Porcupine Crown	Ont.	2,000,000	1	240,000	660,000	Apr. 2, '16	.03
Dog Estrellas, (El Oro)	Mex.	300,000	0.50	.....	15,400,000	Sept. 1, '16	1.50	Principencia, (S. J.)	Mex.	6,000	.....	.....	963,360	Apr. 1, '08	1.00
El Oro, g.	Mex.	3,600,000	1	.....	210,000	Oct. 30, '14	.01	Rambler-Cobalt	B. C.	17,600	100	70,000	49,000	Apr. 15, '01	.01
El Oro, g. s.	Mex.	1,147,600	5	.....	9,136,442	July 11, '13	.24	Rea Mines, Leasing	Ont.	200,000	1	.....	12,750	Feb. 15, '15	.08%
El Rayo, g. s.	Mex.	260,020	2	.....	140,410	Apr. 24, '11	.15	Right of Way	Ont.	1,685,500	1	25,281	569,090	Sept. 15, '16	.00%
El Triunfo, c.	Mex.	2,000,000	1	.....	20,000	Aug. 28, '11	.01	Rio Plata	Mex.	374,518	5	.....	345,744	Feb. 1, '13	.05
Esperanza, s. g.	Mex.	450,000	5	.....	12,521,250	Dec. 31, '15	.10	San Francisco Mill	Mex.	6,000	25	.....	445,086	Oct. 15, '08	1.00
Granby Con. c. g. s.	B. C.	149,985	100	.....	749,326	Aug. 1, '16	2.00	San Rafael	Mex.	2,400	25	.....	6,798,260	Jan. 11, '12	2.00
Greene-Cananea, c.	Mex.	474,411	100	2,431,045	6,656,850	Aug. 28, '16	2.00	San Toy, s. l.	Mex.	6,000,000	1.00	.....	540,000	July 24, '13	.01
Greene Con., c.	Mex.	1,000,000	10	3,500,000	13,544,000	Oct. 26, '16	.07	Santa Gertrudis, Hdgo.	Mex.	1,500,000	5	364,500	2,819,772	June 16, '16	.24
Greene Gold-Silver, pf.	Mex.	300,000	10	.....	194,871	Mar. 28, '07	.01	Sta. Gert y Guadalupe, g.s	Mex.	60,000	.....	.....	3,980,000	Mar. 27, '09	1.00
Guanaquato Con.	Mex.	540,000	5	.....	600,000	Oct. 8, '16	.07%	Sta. Maria del Paz	Mex.	9,600	12%	.....	6,696,000	Jan. 2, '13	2.50
Guanaquato Dev. pf.	Mex.	10,000	100	.....	274,356	Jan. 1, '11	3.00	Seneca-Superior	Ont.	475,844	1	861,982	1,783,194	Oct. 1, '16	.20
Guggenheim Explorat.	Mex.	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.85	Soledad, s. l.	Mex.	960	20	.....	4,439,840	Oct. 17, '11	.60
Halleybury, s.	Ont.	60,000	1	.....	50,000	Apr. 5, '11	.60	Sopresa, g. s.	Mex.	19,200	20	.....	3,979,240	Jan. 6, '11	34.00
Hedley	B. C.	120,000	10	180,000	2,003,520	Sept. 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	600,000	2,300,000	Oct. 10, '16	.02%
Hinds Con., g. s. l.	Mex.	5,000,000	1	.....	88,000	Feb. 27, '03	.02	Temiskaming & Hud. Bay	Ont.	7,761	1	.....	1,940,250	Nov. 10, '14	3.00
Hollinger	Ont.	4,000,000	6	1,680,000	5,850,000	Oct. 2, '16	.06	Temiskaming, s.	Ont.	2,500,000	1	160,000	1,609,156	Oct. 22, '16	.03
Himuk, s.	Ont.	100,000	100	.....	975,000	Feb. 27, '11	1.00	Teutonian, c.	Mex.	5,000	100	.....	1,855,000	Jan. 1, '09	1.50
Kerr Lake	Ont.	600,000	6	.....	6,561,000	Oct. 8, '16	.07%	Thompson, s. l.	Mex.	1,000	5	255,745	832,100	Jan. 1, '13	.15
La Blanca	Mex.	140,000	20	.....	2,775,700	Mar. 31, '13	.90	Tretheway, s.	Ont.	1,000,000	1	.....	1,061,985	July 1, '16	.05%
La Republica, s.	Mex.	400,000	6	.....	110,000	Aug. 15, '11	.06	Wettlaufer-Lorrain, s.	Ont.	1,416,190	1	.....	656,356	Oct. 20, '13	.05
La Rose Con., s.	Ont.	1,498,627	6	299,724	5,696,844	Oct. 20, '16	.06	Yukon, g.	Y. T.	3,500,000	5	787,500	8,370,610	Sept. 30, '16	.02%

Advancements and Present Status of Preferential Flotation

HENRICUS J. STANDER.

It is quite a hard matter for the practical mining man to readily obtain the required information, when he starts out on a preferential flotation proposition. Many of these mining men have not the time and opportunity to collect and sample out the rather scarce contributions on this subject, although they may be in great need of the same.

In Arizona there are now at least two small companies that are doing successful work on the separation of molybdenum and pyrite, while in Utah very successful results are being obtained in the separation of lead and zinc. Although I have perhaps been instrumental in helping along the experiments of some of these companies, one is not at liberty to publish any of their results or methods. The small company, and generally a leasing company in this instance, is beginning to be more and more reticent with regard to letting its neighbor know what it has succeeded in accomplishing.

Contributions to the literature of flotation, dealing with principles involved, and attempts made to set forth theories, with an endeavor to explain and elucidate such principles, are, of course, extremely valuable to the mining fraternity, and to the general development of the topic under discussion; yet there is an extremely large percentage of men directly connected with, or interested in, mining, that feel a keener desire to read and digest articles that bear directly on the real obstacles in the field of their operations. It is because of the great number of men belonging to this class, and also because of the frequency of the occasions on which such men have asked me to direct them to sources of information on preferential flotation, that this article has been prepared. And thus an endeavor has also been made to put all data in a form in which it can be of value to the practical operator.

"Preferential Flotation" is the term applied to that process by which one mineral is separated from another, both being minerals amenable to the flotation treatment. "Selective Flotation," on the other hand, means the flotation of a valuable mineral, in the presence of waste material. Making a froth concentrate

of galena and blende, from a lead-zinc ore, is a sample of selective flotation; but if two separate concentrates, one containing a high percentage of lead and the other a high percentage of zinc, are made, by means of two or more different treatments, the process would be "preferential."

There are at present leasing companies, operating on lead-zinc tailing dumps, that are making high-grade concentrates of lead and zinc, respectively. By the ordinary selective flotation process, they would be able to produce either a concentrate fairly high in the one metal, but with a very appreciable percentage of the other metal in the concentrate, or vice versa. In other words, they would not be able to make two separate concentrates, one of lead and the other of zinc. This is only made possible in the flotation field by a preferential treatment.

This process dates back to the year 1904. Cattermole, with regard to his preferential flotation process of 1904, says:

"The invention relates to the classification of the metalliferous constituents of ore which have been separated from gangue by oil or similar matter, and consists in fractionally removing the different constituents from the agglomerated masses by freeing the constituents in turn from oil, and thus obtaining them in a separable condition by the use of emulsifying agents of varying strengths and activity preferably in conjunction with an alkali."

His process is as follows:

"The metalliferous matter agglomerated by oil is mixed and agitated with a solution of an emulsifying agent, such as a soluble soap-alkaline oleate, for example, to which a certain proportion of soluble alkali, preferably caustic potash or soda, has been added."

He found that minerals vary in their affinity for oil employed in the above manner, and thus by heating the oily masses or granules in the first place with an alkaline emulsifying solution of a certain strength, the mineral of least affinity can be separated therefrom, and by increasing the strength or modifying the proportions of the breaking-down solution step by step, the various constituents can be thrown out in the order of their increasing affinities.

The Cattermole process involves one of the funda-

mental factors of flotation, although, in itself, it is a "bulk-oil" process. The Cattermole process is not of much direct practical value to us now, but it is mentioned because of the fact that Cattermole was one of the first to do work in the direction of preferential flotation.

So far the chief methods of preferential flotation can be classed into these three groups:

1. Roasting Methods.
2. The Use of a Chemical Solution.
3. Controlling Flotation.

(1.) The Roasting Process.

The roasting process was developed chiefly by Wentworth, Ramage and Horwood. This process really consists in the "deadening" of certain sulphides by a short and slight roast, while certain other sulphides, which may be present, remain unaffected by the heat. Ramage terms this "fractional roasting," while Horwood speaks of it as "preferential flotation." The Horwood process of preferential flotation is practically the same as the processes of Wentworth and Ramage.

In 1909 Wentworth patented his preferential flotation process, which depended on fractional roasting, and in the following year, Ramage, in explaining his own process of preferential flotation, says: "The principle of the process is founded on the combination of fractional roasting with chemical floating." He described the following three experiments as examples of his process.

(1.) The ore contains iron pyrite and chalcopryrite, with a content of 5% copper and about 35% sulphur. Preliminary roasting is necessary to deaden the pyrite, but must not be long enough to affect the chalcopryrite. The ore is then crushed to the required mesh and passed through a hot solution of acid sulphate of soda and nitric acid. The results of this is that the chalcopryrite comes up to the surface of the liquid, whereas the pyrite goes to the tailings. After the pyrite has been given an oxidized coating by the preliminary roasting, it is no longer so amenable to flotation as the copper sulphide, and by subjecting such a mixture of these two minerals to the hot-acid-bath flotation process, it is possible to float the chalcopryrite and allow the roasted pyrite to go to the tailings.

It is to be observed here that although in the above-given example, Ramage says that, after the roasting, the ore should be subjected to the hot-acid-bath process, it is not essential that this particular kind of flotation be used. The essential feature is that the ore must be given a preliminary roasting only sufficient to affect the pyrite, without oxidizing the chalcopryrite. The ore is then ready for flotation treatment. This preliminary roasting has simply made the pyrite less flotative, and thus making it possible to bring about the separation of the chalcopryrite and pyrite by two successive flotation treatments. A

few simple preliminary experiments will enable the operator to know exactly at what time to stop the roasting, as it is only a matter of seeing that the ore is not heated beyond a certain definite temperature. In the above instance the ore should not be heated beyond 600° C.

(2.) The ore contains pyrite, chalcopryrite and zinc-blende. It is roasted, but just enough so that only the pyrite is deadened, and this requires a temperature of about 600° C. By then crushing the ore and subjecting it to the flotation process, a concentrate of chalcopryrite and zinc blende can be obtained, the iron pyrite being left in the solution with the tailings. The concentrate of zinc and copper sulphides is then roasted up to a temperature of about 700° C., with the result that the zinc sulphide is decomposed; and by using a solution of dilute sulphuric acid, the zinc can be dissolved, and a separation of the zinc and copper thus brought about.

(3.) The ore contains cobalite, niccolite, chalcopryrite, pyrite and native silver. It is crushed and subjected to flotation, with the result that the silver goes to the tailings, whereas the other minerals come to the surface of the liquid in the form of a concentrate. The sulphides are then roasted to a temperature of about 800° C. The ore is again subjected to flotation, and this time only the chalcopryrite floats, as the other minerals have been deadened by this roast.

In 1913 the Zinc Corporation, Ltd., Broken Hill, Australia, adopted the Horwood process for separating the lead and zinc of its slime concentrates. Preliminary roasting, Horwood pointed out, makes it possible to float such a substance as sphalerite, whereas other sulphides, such as galena and pyrite, become deadened by the roasting and are then immune to flotation; so that the two latter substances will go to the tailings in the first treatment, while the sphalerite appears as a concentrate in the froth.

A report of the Zinc Corporation says:

"The Horwood process is being applied to a certain by-product from the zinc-lead concentrator. After a slight roast, this material is amenable to flotation, and yields on the one hand a fine zinc concentrate, and on the other a good lead concentrate. The application of the Horwood process has increased considerably the resources of the corporation."

(2.) The Use of a Chemical Solution.

In the Lyster process a preferential action is brought about by the use of a chemical solution. A frothing agent is used in a neutral or alkaline solution of the sulphates, nitrates or chloride of calcium, magnesium, sodium, potassium, or mixtures of these, or solutions of manganese, zinc, iron, acid sodium, or sodium potassium sulphate. In this process one mineral is floated in preference to another; for example, in a lead-zinc ore the lead is floated off in the first treatment; almost all of the sphalerite going to the tailings, and by retreating the tailings and using more oil, the sphalerite can be obtained in the form of a froth concentrate. It seems then as if the preferential

action really takes place in virtue of the fact that galena is more amenable to flotation than sphalerite, unless the chemical solutions employed brought about a marked change in the behavior of the sulphides, which does not seem possible.

This particular method of preferential flotation was further developed by Greenway and Lowry. Describing their process of 1914, they said that:

"If a salt of chromium (such as sodium bichromate or potassium bichromate) is introduced in solution in the circuit liquors, or if the material to be treated is subjected to the action of such chromium salts solution by digestion or otherwise, that the sulphides are affected in such a way as to leave certain of them amenable to flotation, whereby products are obtained relatively high in some sulphides on the one hand and in other sulphides on the other."

These inventors cited samples of a molybdenum ore carrying about 25% iron pyrite, of a copper ore containing 6.5% copper and 35% iron, and of a lead-zinc slime containing about 19% lead and 32% zinc. In each case the one mineral was separated from the other by the use of a weak, hot solution of sodium bichromate. In the case of the molybdenum ore, it does not seem as if the chromate is of any special use, since we know that molybdenite is more amenable to flotation than even galena; and in the ore carrying molybdenite and pyrite, the former is so much more easily floated than the latter, that a solution of sodium bichromate seems almost wholly unnecessary.

If an ore containing chalcopryrite and pyrite is ground sufficiently fine, the copper sulphides particles will constitute a much finer product than the pyrite, and it is because of this property of chalcopryrite to disintegrate into very fine flakes on crushing, that it can be separated from the pyrite by flotation. So that again it seems unnecessary to employ a chemical solution to bring about a separation of these two sulphides by the flotation process.

The chief point of interest in this process is that galena can be deadened by heating it with a weak, warm solution of sodium bichromate. A lead-zinc slime, containing 18.6% lead and 32.3% zinc, was put into a hot solution of 1% sodium bichromate; after the slime was left in the solution for half an hour, the liquid was decanted and the sulphides subjected to flotation; one pound of eucalyptus oil per ton of slime was used, and the froth formed contained 47.2% zinc and 6% lead, while the tailings produced contained 31.6% lead and 16.3% zinc. From this it is evident that the lead was made almost wholly unamenable to flotation; yet we know that galena is one of the very easily floated minerals, in fact more so than zinc sulphide. In this instance, a true preferential flotation was brought about by the use of a chemical solution. The sodium bichromate evidently deadens the galena particle, inasmuch as it oxidized the surface of the particle, whereas it does not affect the sphalerite.

With regard to the Bradford process for the treatment of mixed sulphides, we are told:

"The new process consists of treating ores in a medium that wets the zinc sulphide, and which does not wet the lead sulphide or pyrite, and therefore leaves the last-named sulphides floatable, while rendering the zinc sulphide temporarily immune to flotation. The lead sulphide or pyrite is thus obtained first as a float concentrate; thereafter the residues comprising gangue and zinc sulphide are treated for the separation of the zinc sulphide from the gangue.

"This wetting effect is procured by adding to an acid flotation solution a limited quantity of a substance that is decomposed by the said solution, and produces in this decomposition a reducing gas which is more or less soluble. Thio-sulphates, sulphites, and bi-sulphites are notably so decomposed in a solution of sulphuric acid with the production of such a gas (sulphur dioxide). With practically equal results, either the gas can be brought into it in a current, or added in solution. A similar result is obtained by means of another reducing gas, sulphuretted hydrogen, which may be introduced into the solution in the same way or may be produced in it by adding sulphides or polysulphides that the solution is capable of decomposing."

A considerable amount of work has been done on this particular method of preferential flotation, and in some cases results show that a true preferential action was brought about by the use of an acid solution of sodium chloride, or of zinc chloride of the right concentration, while in other cases organic substances afforded a means to produce a sharp contrast between two or more sulphides with reference to their amenability to flotation.

(3.) Controlling Flotation Method.

It is known to anyone at all familiar with the various flotation phenomena, that the percentage of extraction, by flotation, of a sulphide in an ore, depends on various factors. The degree of fineness of the gangue and of the mineral particles plays a very important role, and so also do some of the other variables, such as the amount and kind of oil or acid used, the time and speed of agitation, and the temperature at which the experiment is done. And furthermore we know that one sulphide is more floatative than another, a very important property in this particular phase of flotation.

In 1913 Nutter and Lavers made use of these different behaviors of sulphides under different conditions, and brought out their process for preferential flotation of minerals:

"It is a process for concentrating ores which consists in treating the crushed ore by a flotation process two or more times under different conditions to obtain froths or scums having the constituents of each in certain ratios of size, and thereafter subjecting the powdered mixture contained in each froth to a classifying step to separate the constituents."

According to the description of their process, the one sulphide can be separated from the other by correctly controlling certain conditions in the flotation plant.

The following is an example cited by the inventors: An ore containing galena, chalcopryrite and sphalerite, is crushed and admitted to the flotation machine. Using cresylic acid without any mineral acid it is possible to float most of the chalcopryrite, and a small quantity of the galena. So from this first treatment

a chalcopryrite concentrate is obtained, the residue being given a second treatment, and with the help of sulphuric acid, a galena froth-concentrate can be produced, most of the sphalerite being left in the tailings, from which it can then be removed. In case the ore contains only copper and zinc sulphides, a preferential action can be produced by the use of eucalyptus oil or creosol. No mineral acid is necessary, and a concentrate, containing most of the chalcopryrite and very little sphalerite can be obtained.

In a method where the separation of one mineral from another depends largely on certain conditions, the process becomes somewhat delicate, especially in the case of flotation, where there are so many conditions to regulate and control. Nevertheless, it seems as if one of the chief ways in which preferential flotation will be developed in the future is this method.

In summing up, I must say that of these three different methods of procuring a preferential action, the "roasting" and the "controlling flotation" methods have given better results in this country than has the "chemical solution" method. The actual flotation part in the roasting process is simple; the main thing to be worked out is, of course, the degree, or degrees, of roasting to which the ore is to be subjected. Once this is fully determined, so that the desired deadening effect, or effects, can be obtained, the problem resolves itself in getting the required successive flotation treatments, a matter which can easily be determined by experimentation.

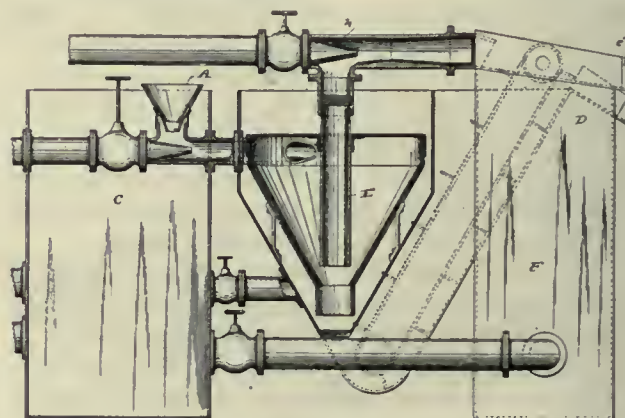
Within the last year I have worked out an alkaline oil mixture which is now being used successfully at three preferential flotation plants. It seems as if, with careful experimental work, most of our troubles in preferential flotation will be solved either by the roasting method, or by the so-called controlling-flotation method.

Preferential flotation is sometimes also known as "differential flotation." It may be well, however, to speak of all methods for the separation, by flotation, of one mineral from another, or some minerals from other minerals, in the same ore, as "preferential flotation." It hardly seems necessary to employ the word "differential," as it may lead to confusion, rather than be of any help in the flotation literature. "Preferential" and "selective" ought to be terms sufficient to denote the two different flotation processes.

In reducing the size of pipes, say from 2 to 1 in., very often a 2-in. coupling and a bushing from 2 to 1 in. is used, the bushing screwing into the coupling, the 1-in. pipe into the bushing, while 2 to 1-in. reducer would do the work cheaper. One piece would answer for two, etc., or if an outlet was needed by means of a Tee, instead of using a 2-in. Tee with a 2 to 1-in. bushing in it, a Tee that has 2-in. ends and 1-in. branch (2x2x1), could be used. It costs exactly the same as a standard 2-in. Tee and by using it the cost of the bushing could be saved.

A Centrifugal Ore Separator.

Take ore or coal, carrying mixed impurities such as slate or bone, of a different specific gravity, mix them with large quantities of water and cause them to whirl rapidly in a conical tank, and separation will take place by virtue of centrifugal force and gravity. The heavier materials will be thrown farther out, and fall rapidly in a spiral, close to the surface of the cone. The lighter materials will be held longer in suspension and near the center of the cone. Frank Pardee, Hazelton, Pa., makes use of this principle in a new separator here shown. Suppose coal (light) is to be separated from slate (heavy). It is fed into the funnel (A). A powerful jet of water carries it through into the cone, near the top, admitting it tangentially. Coal, water and slate swirl about in the cone, falling spirally toward the open bottom. The slate, being the heavier, is carried outward and downward more rapidly and falls through the bottom, to be carried away



CENTRIFUGAL SEPARATION.

by the elevator shown in dotted line. The coal takes a more inward path and sinks more slowly, almost coming to a standstill at a level near the end of the pipe (E). By forcing another powerful jet of water through nozzle (h), vacuum is created, sufficient to suck water and coal up through (E) and discharge them to trough (e') which has a perforated bottom so that the water runs into tank (F). The water is collected from the tank (F) and from the cone as shown by pipes and carried to tank (C), from which it is pumped into the nozzles and used over again.

Japan's Iron-Industry Commission.—The Iron-Industry Investigation Commission of Japan was authorized by the government on May 7 to conduct investigations as to the possible sources of ore and to devise plans for their acquisition. Other important matters to be looked into, according to Vice-Consul M. D. Kirjassoff of Yokohama, Japan, are the sorts of material the country most urgently needs and should try to produce first, measures for eradicating the clash of interests between government-owned and private enterprises and the means of accelerating the development of Japan's iron industry, because of its dependence on outside countries for iron and steel.

Mining and Milling at Robinson, Colorado

W. A. SCOTT.

The Progress Mining & Milling Co. is operating at Robinson, situated on the west side of the divide, between Leadville and Kokomo, Colo. The company has acquired 26 patented claims of the Wilson group, has leased the Iron Prince, Free America, Champion, Robinson and Col. Sellers, and has contracted for the production of Michigan group at Kokomo. This combination gives control of the Robinson contract for 3500 ft. on its northeast strike. This is a contact between a limestone footwall and a sandstone hanging wall. The ore occurrence is a replacement in limestone, the vein being nearly flat, having a dip of about 20°. The old workings are those of former individual holdings, and comprise Robinson tunnel, Wilson, Robinson, Felicia Grace and other shafts. The Robinson tunnel was driven 4400 ft. on the strike of the con-

has a depth of 1200 ft.; at its base is an 800-ft. incline on the contact. This shaft was being unwatered at the time visited, with a 500-gal. bailer; after all the water has been taken out, electric-driven pumps will be installed at the bottom. New air compressors are to be installed at Wilson and Robinson shafts, with the idea of making two main centers of operation. Both have steam hoisting machinery. The Felicia Grace shaft, below the mouth of the tunnel, has a steam hoist, and is being operated to get access to the ore on the Champion and others, having ore shoots off the main contact.

The mill, having capacity of 500 tons per day, is housed in an old building, purchased with the property. This plant is situated at the Wilson shaft. Electric motors for power are installed throughout, and a



PROGRESS CO.'S MILL, ROBINSON, COLO.

tact, attaining a vertical depth of 1000 ft. Workings from this tunnel established the existence of three or four ore shoots, on the contact, separated from each other by considerable distance; the ore in these shoots is highly mineralized, made up of iron sulphide, carrying lead, zinc, silver and gold, and very little gangue. The sections of the contact between the high-grade shoots consist of continuous, disseminated ore-bodies of low grade, much more silicious than the rest. The contact vein is 6 to 10 ft. thick. Development below the tunnel level was carried on by means of an incline, drifts from which opened the several rich ore shoots. At present, ore is being mined from stopes, both above and below the tunnel. Ore is also being mined on the 100, 200, 300 and 400-ft. levels of Felicia Grace shaft, which cuts other ore bodies. The Robinson shaft taps the contact at a depth of 600 ft. The Wilson workings, which are farthest east on the group, open ore shoots at a depth of 1040 ft., these being considered the downward extensions of the main ore shoots opened from the tunnel. The workings of Robinson and Felicia Grace shafts are connected with those of the tunnel, but the 200-ft. block between Robinson and Wilson shafts has not been opened. The Wilson

Sturtevant steam and hot-air heating plant has been installed. Heat is radiated from steam coils, and the atmosphere of the mill, kept at 60° F., is circulated by a fan in the plenum chamber, the entire volume of air in the building being changed every 15 minutes. Robinson is at an altitude of 11,000 ft., and proper heat supply and regulation are essential during the winter season. The coarse crushing is effected by Symons No. 5 and No. 3 crushers, and the fine grinding by a set of 42x18 Traylor rolls, this machine reducing the ore to 16 mesh. In this form it passes to 10 Butchart roughing tables, making a coarse lead concentrate. These table tailings are discarded, and the middlings are reground to minus 50 mesh in two 6 by 6-ft. ball mills made by Denver Engineering Works. This minus 50-mesh product is classified and the thickened material is treated by 12 Wilfley tables, making clean lead and iron products; also a zinc-iron middling which is reconcentrated on other Wilfley tables, making a clean zinc product. The iron-zinc middling from the last process is passed to three flotation machines manufactured and installed by Traylor Engg. & Mfg. Co. These machines are belt driven, and are in operation, turning out a flotation product

running 45% zinc. The table products carry 30 to 40% lead, accompanied by most of the silver and gold recovered, although the iron concentrates contain some silver and gold. The plan is to install other treatment plants, possibly including one for electro-magnetic separation of iron from zinc. It is stated that the capacity of the mill will be doubled next year.

Philip S. Smith, Denver, is president of this company; Ross D. McCausland is vice-president and general manager, with Thos. H. Teal as mine superintendent, and Roy Chapman as mill superintendent.

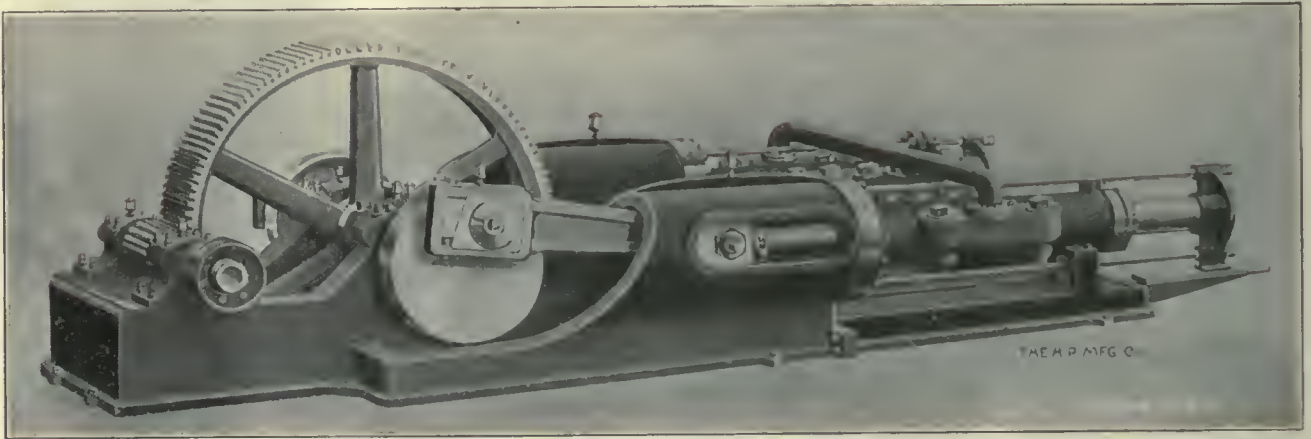
Field's Flotation Machines in Arizona.

The flotation mill being built for the Keystone Con. Mining Co., at Chloride, Ariz., is expected to be in operation before Dec. 1. This company is controlled by G. S. Holmes, Los Angeles, and W. O. Kay, John Pingree and others of Salt Lake. The plant was designed by the Fields Flotation Co. Utah Machinery Co., Salt Lake, has the contract for furnish-

Motor-Driven Four-Plunger Horizontal Hydraulic Pump.

The hydraulic pump illustrated is a recent addition to the extensive line of high pressure hydraulic pumps built by the Hydraulic Press Mfg. Co., Mount Gilead, O. It is of the horizontal, 4-plunger type and designed to fill the requirements for a simple, heavy duty hydraulic pump for supplying a large volume of water or other fluid against a high pressure.

This hydraulic pump is designed so that it may be equipped with 16 different sizes of plungers ranging from $1\frac{3}{8}$ to 5 ins. in diameter, advancing by quarter inches. The water cylinders are made of forged steel for the highest pressures. For the medium pressures, 1500 to 2900 lbs. per sq. in. inclusive, cast steel is used, and for the lowest pressures the cylinders are semi-steel. The pressures range from 9500 to 700 lbs. per sq. in., and the water capacity from 24 to 326



FOUR-PLUNGER HORIZONTAL HYDRAULIC PUMP.

ing and installing the equipment. The ore is to pass through a 9x15-in. Blake crusher, and then to a 5x6-in. ball mill, operating in closed circuit with an Aikens classifier, both made by Colorado Iron Works. The undersize of classifier is to be carried by a launder to a Fields flotation machine to make a rougher product, which is then passed to the cleaner cell of same type which will turn out a finished concentrate. As the ore consists of a silver, lead and zinc sulphide, the final concentrates will be passed over Wilfley tables for separating the lead from the zinc. The plan is such that there may be table concentration ahead of flotation, to collect the heavy lead product and eliminate a good part of the silica. In this case, the middling product would be sent to the flotation machines. The Fields rougher machine consists of a cell 30 ft. long, 3 ft. wide and 8 ft. deep. The air line runs across the top of the cell; the air is thence conducted by air hose to air lifts, built on 2-ft. centers, by which the solution is mixed and agitated, the pulp and water being drawn into ports at the bottom of the air lifts, then discharged at points 2 to 3 ft. above the surface of the solution through narrow apertures. By this operation thorough mixing and aeration is effected. The machine for cleaner work is similar to the rougher, except that it is smaller.

gpm. All sizes have bronze valve seats and bronze or nickel steel valves.

It is built for motor drive and requires 150 hp. to operate. The pump is equipped with a flexible shaft coupling for motor connection. Any 150-hp. motor having a speed of from 450 to 750 rpm. may be used. The speed of the crank shaft is 60 rpm. The stroke of the plungers is 16 ins., the two cranks being set at 90° so that a uniform flow of fluid may be obtained.

The construction of this pump is especially adapted to long service, being strongly built and well proportioned in every detail. At all points where the strain and wear is most severe, the parts such as main bearings, connecting rod ends, cross-head guides, valves and valve seats, are of easy access for adjustment and replacement. The frame or pump bed consists of two heavy castings securely bolted together. The cross-head guides and main bearing containers are machined in this frame. The pump occupies a floor space 18 ft. 8 ins. in length by 6 ft. 10 ins. in width.

While the illustration shows the pump equipped with a spur gear and pinion, the pump is just as easily equipped with a herringbone gear and pinion.

The Use of Signboards and Signals in Mines

D. J. PARKER* and E. STEIDLE.†

The more favorable accident reports of recent years of mining companies, of state mining departments, of compensation insurance companies and of the mine accident statistical department of the Bureau of Mines, emphasize unquestionably the importance of adopting every precaution or device, however simple, which may insure greater protection to the underground worker.

This paper has been written primarily with a view to increasing safety in mining operations, i. e., to draw attention to the need of sign boards and signals in mines, and particularly to suggest a set of danger and safety symbols which might be adopted by the mining fraternity and thereby be made universal for all mines.

In May of 1913, over 3 years ago, this same subject was discussed in Technical Paper 67 of the Bureau of Mines, entitled "Mine Signboards." However, no definite action has been taken in the matter by any particular mining company, mining district, or organization of mining men.

Use of Sign Boards.

History is antedated by the use of signs and symbols. It is a universal custom to place sign boards at street crossings in our cities; also to place warning signs at railroad crossings, dangerous excavations, etc. Costly electric display signs are now widely used in advertising. In fact, there are few conditions in the activities of man that do not embrace the use of sign boards.

If such signs as those above outlined are so commonly used on the surface where man has the benefit of the light of day, surely there is even more necessity for direction and warning signs and symbols in mines where there is little or no light. The Bureau of Mines pleads with all mine operators for the thorough and systematic posting of underground workings with sign boards marking dangerous places and conditions and pointing out the way to safety in cases of disaster. It is true that many operators post their mines, but the problem is not worked out systematically.

The Specific Problem.

To most captains and foremen, long acquaintance with underground workings make the sign board necessary. These men may, therefore, not readily see why any one else should require such guides. However, the fact that the average miner is generally of foreign birth or recent descent and almost a total stranger to the plan of the underground workings, is proof of the necessity of sign boards. This is especially true in the larger mines where hardly a shift passes that one

or more of the miners is not lost. The fact must not be lost sight of, too, that statistics prove that many accidents occur due to the negligence of well-experienced miners who have become somewhat hardened to danger.

There is a large floating class of labor throughout most of the mining districts of the United States. Moreover, the working places of the men in some mines often change from day to day, as the coal or ore is worked out, so that even a miner thoroughly acquainted with the plan of a particular section of the mine one week may find himself completely lost the next. Here surely a system of mine sign boards would guide the miner, no matter how strange or changed the workings might look to him. Such guides not only save many steps in the miner's daily work, but are of the greatest value to him in time of disaster, where even the coolest headed and best acquainted man may become panic-stricken.

Sign Boards.

The selection will depend on the type of the mine and, to a certain degree, on the class of miners employed. The size of the boards and letters will depend on the position which they shall occupy in the mine, the most logical viewpoint and the illumination being, of course, taken into consideration. The color scheme should be black letters on a white background.

Need for a Universal Set of Symbols.

The bureau also advocates the universal adoption of a set of nomenclature and symbols. This not only because non-English speaking labor is largely employed, a class which requires guidance in the matter of protecting themselves from accidental injury, but also because mine workers are generally of transient habit, and finally because the men are frequently changed from one portion of a mine to another with the dangers of which they are possibly unfamiliar. It is evident that a universal set of danger and safety symbols would soon become so impressed upon the mental vision of the worker, English speaking or whatnot, that wherever or whenever he might see a standard symbol he would understand intuitively its meaning and act accordingly. These symbols, if accepted universally, would in time be equally as significant to the illiterate as is the sign of the Red Cross to the armies and navies of the world. Under such conditions the danger symbol, for example, would be regarded by fair thinking men, judges, or juries, as a sufficient warning of danger.

Universal Symbol of Danger.

Red is the color in general use to indicate danger, and there appears to be no good reason why this color

*Mining Engineer. †Asst. Mining Engineer. Published by permission Director Bureau Mines.

should not be used in mining. It is recommended that a circle filled in solidly with red, making a red ball, and painted on a white background 12 by 20 ins. in size, be adopted as the universal symbol of danger. No wording whatever should be inscribed on the red disc, but appropriate words to designate a particular source of danger may be printed on the white background. (See sample on exhibition.)

Universal Symbol of Exit.

Green is the general accepted color to indicate caution and this color can be used in mining for the same purpose. The universal symbol of exit should be a plain, green arrow on a white background, 8 by 20 ins. in size. This symbol may or may not be accompanied by word or words printed on the white background to indicate any particular exit.

Universal Symbol Indicating Ladderway.

It is recommended that a green ladder on a white background, 8 by 20 ins. in size, indicate a ladderway or stairway (required for coal mines in some states). This symbol may or may not be accompanied by words or numbers printed on the white background to designate the mine working to which the ladderway leads.

Discussion of Proposed Symbols.

Standardized symbols should never be used to indicate any other notice, or, in other words, convey any other meaning, than that originally specified. For example, the "arrow" should be used only in pointing the mine exit. If it is desired to use an emblem to point out direction in the mine other than exit a "hand," or other appropriate emblem, should be used.

The arrow should be plain without tail. In poor light and at a distance an observer might not on first sight distinguish between the spearhead and the tail. This criticism of the arrow's tail has been raised many times by miners.

The color scheme is adaptable to home-made sign boards or rolled steel signs in baked enamel. Furthermore, these colors will show up clearly in illuminated signs. Ground glass makes an excellent white background and sets off to advantage either red or green colors.

Practice tests were made by the authors underground with signs made up in different combinations of colors, and the color schemes above suggested appeared to be most efficient in every particular; also white, red, green and black paint are easily mixed, are durable and are readily retouched.

The background for all mine sign boards should be white, because this color is easily soiled and is, therefore, more likely to be washed and retouched without delay when warranted. Letters or symbols in white on a dark colored background is not preferable, for the reason that the smallest area and most important part of the sign board would be that part of the board most quickly soiled and subsequently obliterated.

Sign Making.

In the case of a small mine, the engineers could design, to any size that is desired, a set of letters, number and symbols, or a pattern of the sign itself, on stiff, durable cardboard which could be cut out, forming stencils or sign patterns, as the case might be. With the use of these forms all signs could be painted quickly. A brush, a bucket of paint, a set of stencils, a few feet of plain lumber, a little time and patience and a complete set of mine sign boards could be had at little cost. From time to time sign boards should be washed of their accumulated dirt and the letters repainted. If properly cared for these sign boards should last many years.

In case of a large company, regular sheet copper or tin stencils or sign patterns can be purchased and used almost indefinitely. There are manufacturing companies which make enameled, steel signs. The letters and colors of enamel are fused on rolled steel which makes them indestructible. Where signs are purchased in quantity it is intimated that enameled, steel signs can be purchased as cheaply as home-made signs can be prepared and they will surely outlive the home-made sign.

Mine Signals.

Pages might be written on mine safety signals and shaft signals. Two safety signals will be discussed in this paper, principally because they are relatively new, simple and should prove exceptionally practicable. On first thought these safety signals may not be given due consideration, but we must not forget the fact that often the simplest safety device proves in reality the most effective. A common accident in a coal mine is where a miner traveling a haulage road steps into a manhole to let a trip go by, and unconscious of a second section, steps out into the roadway and is run down. The miner's eyes and ears are occupied with the first trip and he is not aware that a second section follows the first trip. Why not tie a cowbell to each underground motor. No two bells are of the same tone, and particularly where there is a variance in size. The ring of a cowbell is not sharp, nor does it ring loud enough when the motor is moving slowly in making up a trip or distributing cars, to drown out the signals of the snapper.

In metal mines it is not practicable to employ a station tender at each level. A miner will often extend his head out into the hoisting compartment, when the cage is above his level, to ascertain whether or not the cage is in motion. Place a cowbell under each cage and its ring will be clearly audible for several levels when the cage is in motion.

The mining law of states where mining is a principal industry, provides for a uniform code of shaft signals for the type of mines in that particular state. It is hardly to be expected that a standard code could be established that would entirely suit the conditions obtaining in all kinds of mines. The authors have not made a complete survey of the subject of shaft sig-

nals and with this apology will not commit themselves further on the subject.

In conclusion the Bureau of Mines desires to urge in the strongest language the thorough and systematic posting of mines with suitable sign boards, and particularly the immediate adoption by the whole mining fraternity, of a set of universal danger and safety symbols and the color scheme to be employed in preparing all signs and symbols. At some time there

must be concerted action in the matter, and if the question is left open for indefinite consideration, years may pass before anything satisfactory to everybody is selected. Why not, as a beginning, adopt the symbols and color schemes outlined above? There appears to be no reason why one or all of these symbols cannot be used in every mine in the United States; they will at least serve as a foundation upon which a final and complete set can be built.

G-E Miners' Lamp Approved by the U. S. Bureau of Mines.

Two improved forms of G-E miners' lamp have been recently approved by the Bureau of Mines (Approval Nos. 13 and 13A, Schedule 6-A).

"Form C" has a case of drawn and folded sheet steel while the "Form D" battery container consists of $\frac{1}{8}$ -in. aluminum alloy casting, 91 per cent pure aluminum. Otherwise the lamps are identical.

The cap lamp is a steel shell lined with fibre insulation and contains the reflector of porcelain enameled steel and phosphor bronze spring contacts rigidly mounted. These latter hold the Mazda lamp bulb in such manner that it is shattered and expelled from the contacts by a blow that would be only sufficient to crack or chip the glass bulb as usually mounted. This prevents the heated filament coming in contact with inflammable gaseous air.

Double steel hooks electrically welded together and riveted to the shell provide means for attaching the lamp to the miner's cap. The cap lamp is waterproof and weighs about four ounces. The weight on the cap is about six to eight ounces, depending on how the lamp and cable are worn.

The lamp is a $\frac{1}{2}$ candle power wire-drawn Mazda with a guaranteed life of 300 hours. It has two contact bases, and a single filament running straight through the bulb together with the reflector produces a well diffused illumination at an angle of 130 degrees.

A 43-inch cable connects the lamp to the battery. This is ample for the unrestricted movement of the miner. It is double twisted, strand copper, rubber coated, individually, laid together and the whole rubber coated. The weight is about 8 ounces. This construction gives a strong, light, flexible, non-kinking cable, of low resistance. Protection at each end is afforded by steel spring armor, double at the battery and single at the lamp. The cable is fastened in the lamp and battery cover entrance bushings by rubber packings secured with lock nuts. It will stand a very heavy strain without loosening or putting undue strain on the terminals of the conductor. The case for the "Form C" is of two pieces of drawn sheet steel folded and electrically welded with horizontal corrugations

on the front. The cover is of cast aluminum in one piece including entrance bushing and hinge-pin. When the cover is closed phosphor bronze spring contacts on the inside engage the terminal studs of the battery at three points on each stud insuring perfect contact with maximum contact surface. These contacts are mounted on fibre insulating blocks riveted to the cover and exert a constant pressure on the studs, preventing loose contact or movement of the battery in the



G-E ELECTRIC MINERS' LAMP.

case. The cover locks with a simple, rugged, self-acting, double latch lock that unlocks with a key. Tempering is impossible without detection.

The case for the "Form D" is of aluminum alloy, $\frac{1}{8}$ th inch thick, in a single piece with hinge slot, belt straps and parts which are engaged by the lock. Otherwise it is identical with the "Form C."

Both forms have approximate outside dimensions

of thickness 2", height 6½", and width 5". Total weights are, "Form C" 4 lbs. 7 ozs., "Form D" 4 lbs. 13 ozs.

All metal parts are finished with a semi-transparent acid proof, baking varnish which gives a very serviceable and pleasing gray finish.

The battery is an "Iron-clad oxide" (iron-clad positive plate and "oxide" negative). It is guaranteed to give service for not less than 10¾ hours per charge throughout a period of two years. The plates are contained in a medium hard rubber, non-spillable case, ribbed vertically for strength and sealed with a special vent and filling plug. The cover is so constructed that the pressure of the contacts on the terminals strengthens the seal. All parts of the entire outfit are interchangeable. No gas is generated on discharge and explosions are therefore impossible.

Automatic charging racks are not part of the equipment but can be furnished to take care of any requirements. Each battery space on the charging board is provided with the proper resistance unit so that regardless of the number of batteries on charge the proper current is automatically maintained. The phosphor bronze spring contacts are of such form and arrangement that the battery cannot be inserted incorrectly. The proper polarity is absolutely necessary to secure contact. A single motion of the hand places the battery on the charging board and automatically cuts it into the charging circuit.

The advantages of this outfit are summed up as follows:

Ignition of mine gas is impossible.

Neither battery nor lamps can be short circuited.

The battery gives a full steady illumination for the entire shift.

Failures except as the result of accident are impossible.

It will operate submerged in water.

Safe, durable, efficient and easy to wear.

The light cannot be extinguished except by intentional disabling.

The outfit may be sealed so tampering will be rendered visible.

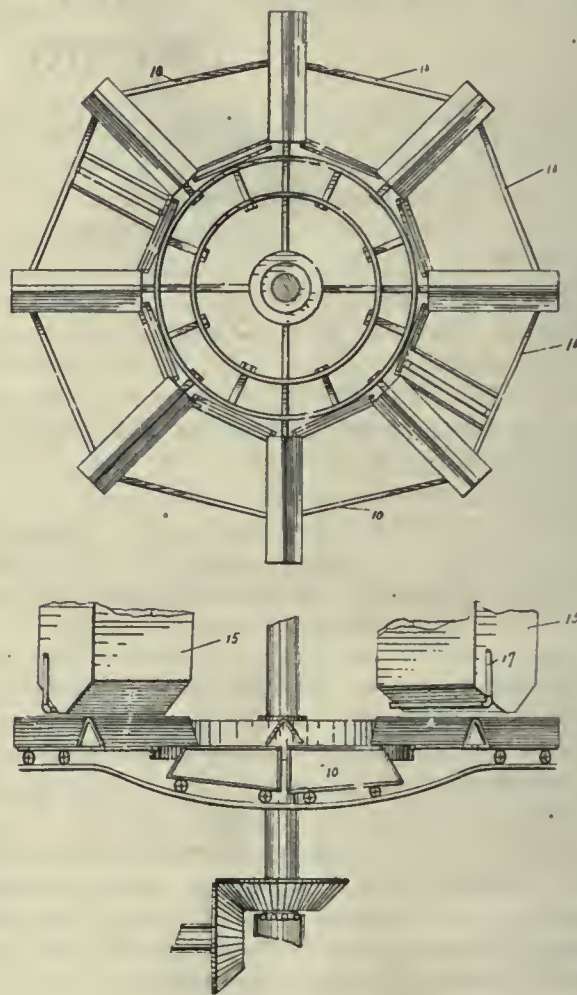
Ralph T. Mishler of Pomona, Calif., in his new oil flotation concentrator, repeatedly agitates the pulp, in the presence of air or other gas, each period of agitation being followed by one of quiescence, during which the concentrates rise to the surface and the gangue settles. The agitation is also carried on at a point in the concentrator where it is under the pressure of a considerable height of pulp, obtaining the advantage of expansion of the air bubbles as they rise to the surface.

In a mill where there are several elevators a number of belt clamps should be provided. During a period of general repair this allows quick work. They should be of different sizes according to the widths of the belts.

A Self-Dumping Wet Screen.

Maurice Peterson, who is superintendent of a concentration and flotation mill in Pioche, Nev., has devised a revolving wet screen, which, in addition to providing large capacity, has the features of being automatically self-dumping and self-cleaning.

The plan and side views show a vertical shaft carrying a framework upon which sectional screens (10) are mounted. Situated above the screens are two feed chutes (15), through which the crushed ore is fed continuously. The pipe (17) feeds water and



A SELF-DUMPING WET SCREEN.

air in a spray upon the ore as it falls upon the screens. The slimes and crushed material are washed through the screen by the force of the jet, the screen section at this point traveling in a horizontal plane.

It will be noted, however, that the outer end of the screen section (10) travels on wheels which follow an undulating track. After each screen section receives its batch from the chute, and the fines are washed through, the outer end of the screen comes to the dip in the track and, following down it, the screen section is tipped outwardly, dumping from its surface the coarser ore pieces which will not go through the screen and consequently need re-grinding.



TYPICAL OF THE NORTHWEST COUNTRY.

Northwestern Country Tributary to Spokane is a Great Mineral Producer.

J. E. DUFF.

By the end of 1916 mining companies, both coal and metal, operating in the northwestern territory will have distributed dividends amounting to \$13,828,920 for the year, and will have disbursed during their existence \$97,804,786. This estimate is based on the presumption that those corporations now sharing profits with their stockholders will pay the regular established rate of monthly and quarterly disbursements for the two remaining months of the period, and that those that have been in the habit of presenting their members with extra payments as Christmas gifts will continue the custom. This is an increase of \$3,268,860 over 1915.

Providing that this estimate is correct, mining companies in the Coeur d'Alenes and immediately adjoining territory in Montana and in eastern British Columbia will have divided among their stockholders during the year \$1,152,410 monthly, and they will have created and caused to be distributed in trade and investment channels not less than \$69,144,600, as the difference between gross income and net profits is expended for labor, equipment and supplies. This means that in the last 20 years the mining industry has brought into existence not less than \$500,000,000 of new wealth, dug from the hills and mountains of the intermountain regions of the northwest.

The most of this gigantic sum has been distributed in the districts where it was secured, the major part of it going into the coffers of the tradesmen of the different supply points or back into development of non-productive properties, but a small part of it going out of the country in the shape of purchase payments of equipment and machinery that can not be secured except in eastern manufacturing centers.

Operating costs are also being gradually reduced by the establishment of smelting enterprises in the

mining centers, such as the Granby Co.'s plants at Anyox and Grand Forks, B. C.; the Consolidated Mining & Smelting Co. of Canada at Trail, B. C.; the Northport Smelting & Refining Co. at Northport, Wash., and the new \$1,000,000 smelter being constructed by the Bunker Hill & Sullivan Co. at Kellogg, Idaho. The operation of these mammoth reduction works in the mining territory is resulting in keeping more of the wealth created by the companies circulating in the northwest than is generally supposed, as the enlarging of their activities results in increased payrolls and the employment of more men in allied industries, such as the collieries in western Canada, which supply practically all the fuel and coke required by the smelters; the manufacturers of building material and machinery that provide housings for the workmen in the different camps and equipment for the mines, mills and smelters, and the railway corporations that provide transportation for the ore from the properties to the reduction works, lime and coke to charge the furnaces and carry the finished product to the market centers, besides creating a demand for more men in the banks, mercantile establishments and other enterprises that profit, both directly and indirectly, from mining activity.

Of the wealth that is created by the mining industry in the immediate northwestern territory \$10,666,568 of the year's earnings are credited to the Coeur d'Alenes, which also is entitled to credit for \$61,558,714 of the grand total, while British Columbia contributes \$2,951,583 for the year and \$16,578,911 to the aggregate from its metal producing companies and \$210,769 and \$3,442,124, respectively, is contributed by coal and coke companies operating in western Canada provinces. Of the \$16,225,037 that was paid by the inactive metal companies, including those that have been absorbed by other corporations or dis-



INTERSTATE CALLAHAN PROPERTY, NINE MILE DISTRICT, IDAHO.

solved, the greater portion was from concerns that operated in British Columbia.

Among the Coeur d'Alene companies first place goes to the Hercules, which owns and operates the Hercules mine, at Burke, Idaho, rated as the premier silver producer of the west. This is a partnership and not a stock concern, and its earnings can only be estimated, but information from reliable sources places the net profits at \$250,000 monthly, or \$3,000,000 for the year, and it is believed that this estimate is conservative, as production during the period was greater than ever before and lead and silver prices higher than for any time since the property assumed a rank among important producers.

Second place is held by the Consolidated Interstate-Callahan Co., which owns and is operating the Interstate-Callahan and other groups of lead-silver-zinc properties, comprising approximately 150 claims, in the Nine-Mile district of the Coeur d'Alenes. This corporation, which inaugurated dividends in April, 1915, already has paid three quarterly dividends of \$1.50 a share, or \$2,092,455, and is certain to pay at least that much during the current quarter, which will make the disbursements for the year \$2,789,940, or \$6 a share on the issued capitalization of 464,990 shares at \$10 each, making the total payments \$5,347,385, or \$11.50 a share. Recent official reports state that the Interstate-Callahan Co. has not less than 4 years' ore in reserve at the prevailing rate of production, approximately 5600 tons of zinc concentrates and 400 tons of lead concentrates monthly, and it is officially stated also that the company can pay dividends of 10% annually with spelter at 5 cts. a pound.

The Hecla Mining Co. is credited with the third largest yearly payment, \$1,550,000, presuming that it will continue to pay 15 cts. a share for the remainder of the period, as there is every reason to believe that it will, as production has been increased since it leased the Union mill from the Federal Mining & Smelting Co., and a further increase is contemplated when the 200-ton addition to its own mill at Gem, now under construction, is completed. This will bring the milling facilities up to 950 tons daily, provided the Union plant, which treats 350 tons, is maintained in service. Hecla paid at the rate of 10 cts. a share monthly on its 1,000,000 shares at 25 cts. each in January, February, March, April and May, but in June the disbursements were increased to 15 cts. a share, at which

level it is believed they will be maintained so long as lead and silver prices remain at or near the prevailing quotations.

The Bunker Hill & Sullivan Co. holds fourth place in the tabulation for the year, credited with \$1,473,500, an estimate that is based on the presumption that it will pay but the regular dividend of 20 cts. a share in November and December. Extra dividends of 20 cts. a share, or \$81,750, were paid in March, April, May, June, July, August and September, but none was declared in October, leading to the belief, although no official announcement was made, that earnings in excess of dividend requirements for the next 2 months will be diverted to the surplus fund, to finance operations at the new smelter until the enterprise is self-sustaining. There is a possibility, however, that further extra payments will be made during the year. Bunker Hill & Sullivan takes first rank among Coeur d'Alene companies for total disbursements, having \$18,162,750 to its credit.

Caledonia ranks next to the Bunker Hill & Sullivan, accredited with \$912,750 for the year, having paid 3 cts. a share monthly to date, except in January, when but two cts. were distributed, and there is no doubt but the November and December payments will be equal to those of recent months. Search for the faulted orebody is being continued on the Keating tunnel level, but so far without success, according to recent announcement by Stanly A. Easton, general manager of the company, who also is president of the Caledonia Co., in which the Bunker Hill corporation is the controlling factor. In 1917 it is believed that the Caledonia Co. will be able to pay but 2 cts. a share, even though metal prices remain firm, unless exploration in the Keating tunnel results in locating the faulted ore. In fact, the management has officially announced that a reduction in the dividend rate is probable unless the lost vein is recovered.

There has been no increase in dividend payments by the Federal Co., which has paid three quarterly disbursements of \$1 a share, or \$120,000, on the preferred stock. The same amount probably will be disbursed during the current quarter, but no extra declaration is anticipated. The Federal properties, except the Morning mine at Mullan, which now is the principal producer, are said to be nearing exhaustion. The Iron Mountain mine, near Superior, Mont., purchased several months ago for \$110,000, has been



HERCULES MINING CO.'S PROPERTY, BURKE, IDAHO.

closed down, and also the Frisco mine near Gem, Idaho, also a recent acquisition. The Frisco mill has been sold to the Tamarack & Custer Co., for \$150,000, and as soon as a clean-up can be made at the mine it is said that it will be abandoned, at least temporarily, and there is reason to believe that the suspension of operations will be permanent.

The Success Co. suspended dividend payments in July, when 3 cts. a share was distributed. Similar payments were made in January, February, March, April, May and June, and 2 cts. a share special dividends was paid in April. The Success officials refuse to make any statement as to the financial standing of the company or the physical condition of the property, and as a result not even a prediction of the resumption of dividends can be made safely. The company now is involved in litigation with the Alameda Co. over alleged trespass on Alameda ground and the extraction of Alameda ore, and it also is in controversy with some of its stockholders, who, it is claimed, were refused access to the corporation's books and records.

The Stewart Co. paid no dividends to date in 1916, and it is not probable that any payments will be made. The management has announced that the Stewart mine practically is worked out, and efforts now are being made to secure new properties.

There were two new dividend payers added to the list during the year, the Tamarack & Custer, controlled by the Day interests, which owns and operates the Consolidated Tamarack & Chesapeake and the Custer holdings in the Nine-Mile district, and the Intermountain, organized several months ago to take over the old Amador mine, near Superior, Mont. The Tamarack & Custer made two payments, aggregating \$71,050, but the company is not shipping now, pending installation of an aerial tramway nearly 3 miles long, connecting the workings with the recently purchased Frisco mill, and it is not probable that any declaration will be made during the remainder of the year.

The Intermountain Co. will pay its first dividend, a half cent a share on its issued capitalization of 1,621,894 shares at \$1 each on October 20; another of equal amount has been declared for November 20 and it is believed that a similar disbursement will be made in December, according to an official of the company. The Intermountain Co.'s new mill, of 150

tons daily capacity, now is operating, producing an exceptionally good grade of concentrates, and the product is under contract to the British Columbia Copper Co. for treatment in its smelter at Greenwood, B. C., for a freight and treatment charge that is said to assure satisfactory profits. It is said that a several years' reserve of ore has been blocked out, and that soon the dividend rate will be increased to 1 ct. a share monthly.

The Granby Co., owning and operating properties in Alaska and different parts of British Columbia and smelters at Anyox and Grand Forks, B. C., already has announced its fourth quarterly dividend for the year, \$2 a share, or \$299,970, payable Nov. 1 to stockholders of record Oct. 14. This gives it first place among the British Columbia companies with disbursements of \$1,049,894 for the 12 months. For the first two quarters the payments were \$1.50 a share, but the rate was increased to \$2 a share, or 8% annually, in August, and it probably will be maintained indefinitely on this basis, as earnings and production are greater now than at any period in the corporation's history.

The Cons. Mining & Smelting Co. of Canada, with mines in northern Washington and eastern British Columbia and a large smelter and refineries at Trail, B. C., also has announced its full complement of dividends for the year, the last having been paid Oct. 1. No special disbursements by this concern are anticipated, as surplus earnings are being devoted to financing construction and equipment of the Trail plants, which eventually will be the most important of the kind in Canada, as refineries sufficient to handle the entire copper, gold, lead, silver and zinc output are being installed.

The Standard Silver-Lead Co., practically an exclusive Spokane corporation, owning and operating the Standard mines and mill at Silverton, B. C., will pay its regular monthly dividend of 2½ cts. a share, or \$50,000, each month in the year, and there is probability of an extra payment of equal amount in December. The company's earnings have been reduced in recent months because of zinc concentrate shipments having been held to the minimum, 500 tons monthly, but an effort is being made to dispose of the stored zinc product and the profits may be increased

to the normal sum by such a sale. The company's property is in better physical condition than ever before, recent discoveries of high-grade lead-silver ore in the upper tunnels of the Alpha claim having materially increased the reserves.

The Hedley Co., operating the Nickel Plate mine, a gold property, at Hedley, B. C., has paid three quarterly dividends of \$60,000 each, and undoubtedly will pay another of equal amount in December. Earnings for the year probably will be greater than ever before, but extensive development of the property is under way and a cyanide treatment system is being installed, both of which will be paid for out of the operating income.

The Mother Lode Co., operating in the Sheep Creek region, near Nelson, B. C., paid its initial dividend, \$137,500, in January, but no declarations have been made since, and no further payments are anticipated this year.

The Rambler-Cariboo Co., also a Spokane corporation, owning and operating the Rambler-Cariboo mine and mill at Three Forks, B. C., has paid \$87,500 to date in 1916, but the officials will not say whether or not further payments will be made this year.

The Le Roi No. 2, an English company, which owns and is operating the Le Roi No. 2 group at Rossland, B. C., has paid nothing this year, and, because of the European war, it is probable that this corporation's dividend record will be blank for 1916.

Western Canada coal and coke companies have paid \$210,769 to date in 1916, but owing to labor troubles, it is not believed that any further payments will be made during the period. This is problematical, however, and they may yet contribute to the year's total.

Why Diesel Engine Crank-Shafts Fail.

The engineer in charge is primarily responsible for the life of the crank-shafts of Diesel engines and simple precautions will prolong the period of usefulness indefinitely. A number of failures cited by recent authorities have been attributed to lack of alignment of the main bearings, which generally resulted from unequal wear of the several shaft bearings, although this same result was brought about in some cases by negligence in the erection of the engine, or to defective foundations in some of the older ones. A 4-cylinder engine is most likely to suffer shaft breaks, with the 2-cylinder types having heavy fly-wheels, a close second. The shafts almost always fail through the throw arms, the crack starting at the center and working outward. With the 4-cylinder engine the throw arm nearest the flywheel fails in most cases and this is also true of the 2-cylinder units. Either throw of the single-cylinder type may fail and with a 3-cylinder engine, which is the least likely to be affected, the failures are equally divided between the two end throws.

Dr. John Scott Haldane.

Dr. John Scott Haldane, the noted English physiologist, recently delivered a number of scientific lectures at Yale University, New Haven, Conn., and Johns Hopkins University, Baltimore, Md. Dr. Haldane took enough time from his lectures to visit the Pittsburgh experiment station of the Bureau of Mines. He expressed much interest in the various investigations that are being carried on in behalf of the miner



DR. HALDANE WEARING THE GIBBS APPARATUS.

and put on and wore the new Gibbs oxygen breathing apparatus which is now undergoing severe tests by the rescuers of the bureau. In fact, Dr. Haldane made the statement that although the apparatus had certain defects, which might be modified, it is one of the best apparatus that has yet been devised.

Illustration shows Dr. Haldane wearing the Gibbs oxygen breathing apparatus at the experiment station of the Bureau of Mines, Pittsburgh, Pa.

There were more strikes and lockouts in the United States in the 6 months ended June 1 than in entire year of 1915, according to Bureau of Labor Statistics. Between Dec. 1 and June 1, 1432 labor disputes were reported, while during 1915 the number was 1405. In May alone 396 strikes were started. Building and metal trades showed greatest strike activity, with mining next, followed by longshoremen and freight handlers, and clothing industries. Machinists started 44 strikes. Pennsylvania and New York had most labor disputes, Ohio ranking third, New Jersey fourth, and Massachusetts fifth.

Taking Care of the Men at the Mines. Texas Sulphur Deposits Are Being Actively Developed.

A good night's rest in clean, comfortable quarters makes a world of difference in a man's efficiency. The mine operator who recognizes this not only gets the most out of his men, but he is able to keep the good ones longer. The poor man is bound to be a floater,



MINERS' HOUSES OF TENNESSEE COPPER CO.

always; the good man moves along until he finds a place that suits him.

Observe in the illustration the bunk houses of the Tennessee Copper Co., at Copper Hill, Tenn. They are commodious, well-built and located amid sanitary surroundings. The interior view shows the Tiger steel bunks that are used. In this one room there are 300 double-deckers, capable of caring for 600 men. They



INTERIOR BUNK HOUSE, TENNESSEE COPPER CO.

are equipped with comfortable springs, and the frames are braced so as to be perfectly rigid. The upper bunk is sufficiently low for convenience in getting in and out, while there is ample headroom for the man occupying the lower one.

The Tiger bunks are made by Haggard & Marcussen, 1112 West 37th street, Chicago, Ill.

Fuel at most metal mines costs more per ton than at any other market, and by fact of location is often of inferior quality.

With certain kinds of coal, a series of check dampers, properly installed, will make a large saving in the coal bill.

The manufacture of sulphuric acid is now being carried on in Texas on a commercial scale of considerable magnitude. The Sugarland Manufacturing Co., which recently constructed a sulphuric acid plant at Sugarland, at a cost of about \$300,000, is now making regular shipments of the refined product. One of its largest recent consignments of sulphuric acid consisted of five tank carloads, all of which was destined to supply the urgent needs of a large fabric dyeing plant in New England. The raw sulphur for the plant at Sugarland comes from the sulphur mines of the Freeport Sulphur Co., near Freeport, Tex., situated about 60 miles south of Sugarland. A direct railroad connection between the two places was recently obtained by the construction of an extension of the Sugarland railroad, which is owned by the same interests that control the sulphuric acid plant and the large sugar refinery at Sugarland.

It is announced that the large sulphur deposits, situated in western Texas, particularly in the vicinity of Orla and Toyah, will be turning out big quantities of sulphuric acid in a very short time. Several companies are now installing equipment for mining the sulphur and manufacturing sulphuric acid in those localities. The Michigan Sulphur Co. and the New Orleans Sulphur Co., both of which have large sulphur holdings in that part of the state, have begun preliminary operations. They have already made some shipments of the sulphur and are preparing to greatly broaden the scope of their development work.

The large sulphur deposit situated in the vicinity of Fort Stockton, Tex., is being prospected by the Calumet & Arizona Copper Co. with the view of mining the product and manufacturing sulphuric acid. Large quantities of sulphuric acid are required for leaching copper, and it is for this use that the company is preparing to engage in its manufacture. The demand for the acid for copper leaching purposes is so great that some of the smelters have installed plants for extracting the product from the fumes that come from their plants.

It has long been known that native sulphur existed in enormous quantities in different parts of Texas, but it is only of late years, particularly since the big advance in prices of the refined product and its acid content, that the utilization of this natural resource began to assume big proportions.

The sulphur near Freeport is obtained by the Frasch method of forcing steam into deep wells and converting the product into liquid form and bringing it to the surface by powerful pressure. The underground deposit of sulphur near Freeport is said to be probably the largest yet discovered anywhere in the world. The deposits in western Texas are upon and close to the surface and they cover large areas of the desert region.

What the Mining Companies are Doing

October Copper Productions.

The production of copper by various companies is given below, comparing with previous months and years:

ARIZONA COPPER CO.

	1916.	1915.	1914.	1913.
January	*	3,632,000	3,474,000	3,100,000
February	2,414,000	3,200,000	3,062,000	3,000,000
March	3,510,000	3,540,000	3,284,000	3,200,000
April	5,140,840	4,200,000	3,570,000	3,100,000
May	4,900,000	3,516,000	3,092,000	3,200,000
June	4,800,000	3,674,000	3,742,000	3,000,000
July	4,400,000	3,390,000	3,300,000	2,600,000
August	4,800,000	3,600,000	3,738,000	1,800,000
September	4,180,000	*1,552,000	2,408,000	1,880,000
October	4,900,000	*	2,406,000	3,550,000

*Closed by strike.

INSPIRATION COPPER.

Month.	Lbs.	Month.	Lbs.
October	11,300,000	May	10,400,000
September	11,850,000	April	10,122,686
August	11,450,000	March	9,549,762
July	11,300,000	February	7,921,662
June	10,500,000	January	5,354,815

KENNECOTT COPPER.

Month.	Lbs.	Month.	Lbs.
October	7,300,000	April	10,500,000
September	8,000,000	March	10,150,000
August	10,200,000	February	9,750,000
July	10,750,000	January	10,000,000
June	10,500,000	December	10,500,000
May	10,500,000	November	10,000,000

EAST BUTTE COPPER.

Month.	Lbs.	Month.	Lbs.
October	1,650,160	May	1,517,000
September	1,760,100	April	1,501,000
August	1,849,120	March	1,306,900
July	1,893,120	February	1,277,160
June	1,639,560	January	1,060,000

SHATTUCK, ARIZONA.

	Lbs.		Ozs.	
	Copper.	Lead.	Silver.	Gold.
October	1,663,671	335,008	35,995	361
September	1,566,446	233,800	26,928	419
August	1,699,575	253,143	30,542	508
July	1,397,445	174,091	22,525	314
June	1,446,080	61,889	24,636	367
May	1,383,963	.....	25,865	326
April	1,366,830	130,570	19,849	353
March	1,594,330	714,379	32,187	393
February	1,523,137	499,155	27,139	630
January	1,565,224	267,853	30,369	514

Nevada Con. Co., Nevada.

The third quarterly report of the company, just issued shows that production of copper amounted to 24,585,393 lbs., as compared with 24,091,021 lbs. the previous quarter. The following shows the production the three quarters of 1916:

Lbs.		Lbs.		Lbs.	
Jan.	6,157,862	Apr.	7,716,101	July	8,537,231
Feb.	6,436,853	May	7,723,148	Aug.	7,688,014
March	6,565,559	June	8,651,772	Sept.	8,360,148
Totals. .	19,160,274		24,091,021		24,585,393
Av. mo. prod.	6,386,758		8,030,340		8,195,131

During the quarter 1,020,546 dry tons of Nevada Con. ore averaging 1.68% copper were milled, as compared with 1,094,879 dry tons averaging 1.57% copper for the previous quarter. Of the tonnage milled, 84% was supplied from the pits and 16% from the underground workings of the Ruth mine. In addition to the above 16,775 dry tons of Gironx Con. ore were milled during the quarter.

The cost of copper produced, including Steptoe plant depreciation and all charges except ore extinguishment, and after crediting all miscellaneous earnings was 8.67 cts. per pound, as compared with 8.51 cts. for the previous quarter. Excluding the item of depreciation the cost was 8.01 cts. as compared with 7.78 cts. for the previous quarter. The outcome is figured on copper price of 23.883 cts. per pound for the quarter, and 24.959 cts. for the first 9 months of the year. No copper available for delivery remains unsold.

There was a surplus for the quarter of \$1,901,740.40 after

payment on Sept. 30 of the 27th dividend of 50 cts. per share and extra dividend No. 6 of 50 cts. per share. There was set aside \$173,186.70 for plant and equipment depreciation and \$103,205.40 for ore extinguishment, leaving a net credit to earned surplus for the quarter of \$1,625,348.30 and a balance of \$11,091,045.84 in earned surplus.

PROFIT AND LOSS.

Earnings from mine, investments and miscellaneous.	\$ 3,901,197.40
Dividend No. 27 and extra dividend No. 6.....	1,999,457.00
Net surplus for quarter.....	1,901,740.40
Depreciation of plant and equipment.....	\$173,186.70
Ore extinguishment	103,205.40
	276,392.10
Net credit to earned surplus.....	\$ 1,625,348.30
Lbs. copper produced.....	24,385,393

ASSETS AND LIABILITIES.

Assets—	
Property: Cost of mines.....	\$ 6,187,285.49
Equipment and development.....	791,946.87
Milling and smelting plant.....	9,466,959.99
	\$16,446,192.35
Less depreciation and ore extinguishment.....	7,117,155.31
	9,329,037.04
Investments	2,184,000.00
Deferred charges	4,924,559.92
Materials	847,942.36
Deferred accounts	77,033.38
Accounts collectable	1,674,086.04
Nevada Northern Ry.....	216,271.46
Metals at refinery and in transit.....	6,017,045.60
Metals at Steptoe.....	1,611,896.36
Cash	3,030,488.99
	\$29,912,371.15
Liabilities—	
Capital stock	\$ 9,997,285.00
Surplus	7,071,850.17
Refining and delivery charges (not due).....	875,493.34
Accounts payable (not due).....	764,420.10
Deferred accounts	112,276.70
Earned Surplus	11,091,045.84
	\$29,912,371.15

Chino Copper Co., New Mexico.

The report of the Chino Copper Co. for the third quarter of 1916 shows net earnings of \$3,445,291, or at the rate of \$15.84 a share per annum.

Production of copper amounted to 20,606,723 lbs., compared with 18,099,182 in previous quarter.

Costs per pound of net copper produced, after allowing for smelter deductions and crediting all miscellaneous income, was 8.17 cts., as against 8.89 cts. for previous quarter.

The income account compares as follows:

	Sept. 30, 1916.	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.
Net profit from copper.....	\$3,366,541	\$3,136,278	\$2,667,416	\$2,407,919
Mis. income, rents, etc.	78,750	85,690	79,570	53,797
Total	3,445,291	3,221,969	2,746,986	2,461,716
Dividends paid.....	1,957,455	1,957,455	1,087,475	869,980
Surplus	1,487,836	1,264,514	1,659,511	1,591,736

Earnings are based on 25.61 cts. per pound for copper, as against 27.49 cts. per pound for previous quarter.

Copper production for past 4 quarters follows:

	Sept. 30, 1916.	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.
First month	6,883,403	4,496,270	5,316,975	6,319,194
Second month	6,326,116	6,359,294	4,617,220	6,339,006
Third month	7,597,204	7,243,618	6,333,255	6,302,045
Total	20,606,723	18,099,182	16,267,450	19,560,245

President MacNeill and Managing Director Jackling say in part:

The total amount of ore treated for the 3 months was 801,500 tons, being an average of 8712 tons per day. This is the highest average tonnage treated by the mill since the beginning of operations, being an average of 47 tons more per day than for the previous quarter. The average copper content of the ore treated this quarter was 1.89%, as against 1.79% for the previous quarter.

The recovery per ton of ore milled for these three months was 25.71 lbs. as against 22.95 lbs. per ton for the previous

quarter. There were produced 62,531 dry tons of concentrates, averaging 16.48% copper, as against 62,241 dry tons of concentrates averaging 14.54% copper for the second quarter of 1916.

In addition to the copper recovered by milling there were 44,038 lbs. recovered from the precipitation plants at the mine, making a total production from all sources for the third quarter of 20,650,761 lbs., equivalent to 6,883,587 lbs. per month.

The ore was of somewhat better concentrating character during this quarter, as well as slightly higher in grade than for the previous quarter; also a further part of the improvements being installed in the mill was put in operation, so that while the wage and material conditions remained practically the same as for the previous quarter, the cost was lower by reason of increased recovery.

During this quarter there was removed by the steam shovels at Santa Rita a total of 1,410,415 cu. yds. of material in place, an average of 470,138 cu. yds. per month as against a total of 1,330,148 cu. yds. for the previous quarter, an average of 443,383 cu. yds. per month. Of the total material removed for this quarter 961,617 cu. yds. were stripping, the remainder being equivalent to 825,914 tons of ore.

The Ray Con. Copper Co., Ariz.

The report of the Ray Con. Copper Co. for the quarter ended Sept. 30 shows net of \$3,299,400, or at the rate of \$8.36 a share per annum.

Production amounted to 19,061,727 lbs. of copper in concentrates, compared with 18,667,664 in previous quarter, an increase of 394,063.

Income account for past 3 quarters compares as follows:

	Sept. 30, 1916.	June 30, 1916.	March 31, 1916.
Net operating profit.....	\$3,280,424	\$3,226,749	\$2,191,592
Miscellaneous income	18,976	15,792	13,954
Total	3,299,400	3,242,542	2,205,547
Bond interest			
Balance	3,299,400	3,242,542	2,205,547
Dividends	1,182,884	788,589	789,302
Surplus	2,116,515	2,453,952	1,416,245

The average net cost per pound of all copper produced for the quarter was 10.348 cts., compared with 10.501 cts. in previous quarter.

Earnings for third quarter this year are based on a price of 27.722 cts. per pound for copper, as compared with 28.067 cts. for second quarter of 1916.

Production for past 4 quarters follows:

	Sept. 30, 1916.	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.
First month	6,606,657	6,162,117	4,164,043	5,894,441
Second month	6,400,636	6,106,657	5,539,408	5,576,083
Third month	6,054,434	6,398,890	6,098,117	5,725,009
Total	19,061,727	18,667,664	15,801,568	17,195,533

The average monthly production in third quarter of 1916 was 6,353,909 lbs., compared with 6,222,555 lbs. in previous quarter.

President Aldrich and Managing Director Jackling in remarks to stockholders say in part:

In addition to copper derived from concentrating ores, there was a total of 620,734 lbs. of copper contained in ores shipped direct to the smelter. This, combined, brings the total gross production for the quarter up to 19,682,461 lbs.

Total amount of ore milled for the quarter was 849,400 dry tons, averaging 1.571% copper, compared with 865,300 dry tons, averaging 1.579% for the previous quarter.

The milling cost for the quarter was 54.99 cts. per ton, compared with 51.41 cts. for the previous quarter.

During the quarter a large part of the improvements which have been in progress for the past year or more, looking to the betterment of metallurgical results, were completed and in consequence the recoveries were the best ever obtained by us. These improvements not only assure better operating results, but also a very considerable increase of copper output.

The average mining and coarse crushing costs of ore milled for the quarter was 83.77 cts. per ton, of which 5.31 cts. was the cost of coarse crushing, leaving the net mining

cost 78.46 cts. per ton, as compared with a net cost of 74.90 cts. for the previous quarter.

The underground development for the quarter was 16,479 ft., making the total development to date 544,423 ft.

Utah Copper.

The Utah Copper Co.'s report for the quarter ended Sept. 30, 1916, shows net profit of \$12,049,460, or at the rate of \$29.66 a share per annum. In the previous quarter net profits were \$9,958,317. Production was 61,079,924 lbs. copper, compared with 48,384,929 in previous quarter.

After making allowances for smelter deductions and crediting miscellaneous income, including Bingham & Garfield railway earnings, average cost per pound was 6.322 cts., compared with 6.726 cts. for previous quarter.

The income account compares as follows:

	Quarters			
	Sept. 30, 1916.	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.
Net profit from opera- tions	\$10,283,878	\$8,675,432	\$6,186,414	\$5,771,281
Other income	90,082	132,509	68,165	240,273
Nev. Con. dividend....	1,000,500	759,375	500,250	500,250
Bingham & Gar. Ry. div.	675,000	400,000	325,000	407,397
Total net profit	\$12,049,460	\$9,958,316	\$7,079,830	\$6,919,203
Dividends	4,873,470	4,873,470	4,061,225	2,436,735
Surplus	\$7,175,990	\$5,084,846	\$3,018,605	\$4,482,468

Earnings are computed on basis of 25.364 cts. per pound for copper, compared with 26.758 cts. per pound for previous quarter.

Copper production for past 4 quarters follows:

	Sept. 30, 1916.	June 30, 1916.	March 31, 1916.	Dec. 31, 1915.
First month	20,302,228	14,557,282	11,999,910	16,004,607
Second month	20,315,440	15,950,215	11,849,972	13,722,723
Third month	20,462,256	17,877,432	12,714,651	14,497,385
Total	61,079,924	48,384,929	36,564,533	44,224,715

Average monthly production was 20,359,975 lbs. compared with 16,128,309 lbs. in previous quarter.

President MacNeill and Managing Director Jackling say in part:

During the period in question a total of 3,404,300 tons of ore was treated, being 645,800 tons more than the previous high record of the preceding quarter, when 2,758,500 tons were milled. The average grade of the ore was 1.4484% copper, as compared with 1.3810% for the second quarter of the year, and the average extraction was 61.94%. The low extraction was due to the fact that the mills were operated at nearly twice their normal capacity. The average cost per pound of net copper produced during the quarter, after allowing for smelter deductions and crediting miscellaneous income from Utah operations only, including Bingham & Garfield railway earnings, was 6.322 cts., as compared with 6.726 cts. for the second quarter of 1916. This was the most successful quarter in the company's history.

During the period, there was removed a total of 1,585,063 cu. yds. of capping, as compared with 1,659,954 cu. yds. for the second quarter of 1916, being a decrease of 74,531 cu. yds. The average per month was 528,354 cu. yds., as compared with 553,198 cu. yds. for the previous quarter.

The traffic on the Bingham & Garfield railway was greater than for any quarter in the history of that property. An average of 31,746 tons of ore per day was transported from the mines to the mills, and an average of 4026 tons per day of other freight was handled, making a total of 35,772 tons per day, as compared with 27,753 tons per day for the preceding quarter.

Miscellaneous Company Reports.

During September net profits of Goldfield Con. Mines Co. were \$16,072. This compares with \$18,211 in August and \$30,016 in July.

Charles E. Mills, general manager of the Inspiration Con., has been chosen president of Cananea Con., succeeding Dr. L. D. Ricketts, who remains with the company in advisory capacity. Mr. Mills will probably continue as general manager of Inspiration.



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*Illustrated.

Present Huge Demand for Copper Establishes Record Price.

A French inquiry for 225,000,000 lbs. copper for delivery in the second half of next year, the selling of spot electrolytic at a new high record price, a tremendous demand from domestic consumers for first half copper, a serious shortage of copper for this delivery, a pressure on producers to open their books for last half business, have been the developments in the copper market since our last market report. Last week it was stated that there were "rumors that another tremendous foreign purchase is impending." The French inquiry was announced on Thursday. It was stated that "domestic consumers are willing to place their second half requirements under contract." Definite acknowledgement of such inquiries has since been made by leading producers.

Business in copper since our last report has been excited. Consumers who were in need of first quarter copper shopped around all of the leading producers without filling their wants. Dealers who are holding large blocks of metal available for nearby delivery are selling sparingly waiting for higher prices. Copper has sold at 32¼ cts. for spot 31 to 31½ cts. for first quarter delivery and 30 to 30½ cts. for second quarter delivery. Predictions that the red metal will sell at 40 cts. a pound before the end of the year are being heard. The extent of the copper requirements of domestic consumers for delivery in the first quarter that must still be purchased appears to have been greatly underestimated. One important wire drawer is now seeking 6,000,000 lbs. a month for the first quarter. Several brass makers are negotiating for 2,000,000 to 3,000,000 lbs. a month for that delivery. There are even some million pound lots being sought for December delivery. The amount of copper inquired for in carload lots is also tremendous.

With dealers controlling the entire situation over the first quarter the fact that a premium market for copper has arrived cannot be disputed. The inability to increase production of copper is primarily the cause of the tight situation now prevailing. Consumers who felt secure in the belief that output would run above 200,000,000 lbs. a month by the first of the new year have since come to a realization of the fact that consumption will be greatly in excess of the output. Producers warned these consumers of their peril, but they failed to heed the injunction. Price considerations are no longer the determining factor as to whether a consumer will buy copper.

Melters who are protected over the first half are clamoring for coverage over the second half. There has been a remarkable change of sentiment among copper consumers. The opinion is now more general that the future of copper does not depend wholly on the continuance of the war. With Europe buying copper a year ahead on orders that cannot be cancelled and willing to pay the prevailing high prices,

domestic consumers have found that the fears of a reaction, if the war should end, are baseless.

Producers are today limiting even transactions for the second half of next year, to regular customers. Buyers who have made a practice of shopping around, are finding that their "penny saved is a penny earned" policy is of no earthly advantage to them when the market turns from a buyers' to a producers' market. It has come down to apportioning production. Output cannot be increased sufficiently to take care of the greatly enlarged world demand. Facilities may be created, but labor cannot and there is the rub. Plants cannot be run forever without repairs and when parts for repairs cannot be obtained plants are closed. Thus notwithstanding the desires of producers to bring the output up to 225,000,000 lbs. a month there are factors that prevent them from so doing.

Cleanliness and Attention to Details Necessary in Chemical Work.

Neglect of cleanliness and attention to details by chemists and assayers in making chemical analyses means inaccurate work, and analytical work that is not accurate within certain well-defined limits is worthless or even worse. The importance of these matters should be thoroughly inculcated in schools where chemistry and assaying are taught. They usually are emphasized but the words of the professor are not always heeded, some men by nature being careless and sloppy workers. Such men were not intended to be chemists.

There is a great difference between sanitary cleanliness and chemical cleanliness. Glass measuring apparatus must be free from all greasy matter, if accurate measurements are to be made with them. A burette that is greasy in the slightest degree will retain drops of the standard solution with which a titration is being made, causing high readings. Cleanliness about delicate balances is essential. Fumes and dust should be kept away or the accuracy of the balance is almost sure to be impaired. Dusty and corroded balances are all too common sights. Balances must be protected from the direct rays of the sun as the uneven expansion produced makes them very erratic.

Many precautions for manipulation might be mentioned, but it is our purpose merely to call attention to the importance of developing a habit of cleanliness and attention to details that are so essential to accuracy and rapidity in performing chemical operations.

Utilization of Wastes.

One of the important questions that has occupied the attention of past meetings of the American Mining Congress and was considered in its various aspects at

the meeting held in this city this week is the utilization of wastes.

Practically everything has a commercial value. Wastes are only waiting for some genius to discover a use for them. The term "waste product" has given way to "by-product." Some of the great problems of modern technology are concerned with the means of extracting profits from these so-called waste products, or at least with the finding of an outlet for them by which they can be disposed of without becoming a source of annoyance or expense.

Of the material hoisted from mines only a small proportion of it—the metallic contents—is sought primarily, the remainder going to the waste or tailings dump at the mines or to the slag dumps at the smelter. Both tailings and slags are no longer considered useless wastes, important uses having been found for them in recent years. Slag is now used for making roofing, cement and other products. Tailings have found an outlet as an almost ideal material for railroad ballast and road making, and as an ingredient in cement concrete for building construction.

The use of mine and mill tailings for these purposes has become of considerable economic importance, especially as a ballast in railroad and wagon road building, in which they are highly prized.

It is gratifying to owners and operators of mines whose ores carry values in silver to note the stiffening price of silver—a 13-ct. raise since the low of July. This increase means much to mines of large tonnage, where silver is of any moment as a by-product, as the copper and lead mines of the country. With the unusually high prices for some supplies any increase on the returns for silver is a welcome addition to the revenue of the operators. Mines in those regions where silver is still the chief content of the ores, as regards values, will be benefited most materially by a continuance of the upward tendency of silver, however small each step in the ascendancy may be. The outlook for the balance of the year, at least, is encouraging.

The American Mining Congress closed a very successful session in Chicago—the nineteenth annual—on Thursday evening of this week. The attendance was unusually large—coal mining men, however, predominating, with the various sessions of that branch productive of a number of excellent papers. The attendance of the metal-mining fraternity was disappointing, but those who were here were treated to some highly instructive papers. A complete account of the meetings will be given in Mining and Engineering World in next week's issue.

Some idea of the immensity of the expenditures for labor by American mines and works may be gained from the October payroll in the Butte camp. Out of a total for all mines in the camp of approximately \$2,500,000, Anaconda alone paid \$1,672,265.

PERSONAL.

Walter Fitch of the Chief Cons. Co. is at Houghton, Mich., for a brief visit.

P. H. Crawford has accepted the superintendency of the Grecia mine, Nicaragua.

William Motherwell, flotation engineer, has left Nelson, B. C., and will go to Baker, Ore.

J. W. McBride, Spokane, Wash., has returned from inspecting properties in Troy, Mont.

J. Cleveland Haas, mining engineer, Spokane, Wash., has returned from a trip to Princeton, B. C.

H. L. Christensen now has charge of all mill work being done at the Alaska Juneau property, Juneau, Alaska.

W. E. Mitchell now has charge of the Anaconda Copper Co.'s plant for the treating of residue at Great Falls, Mont.

Charles McKinnis, secretary of the Caledonia Mining Co., who has recently been in Alaska, has returned to Kellogg, Idaho.

Leo F. Arnold, mining engineer, has returned to Chicago from a trip during which he inspected properties in Arizona and Oregon.

C. T. Griswold of the Associated Geological Engineers is in Wyoming. Ernest Marquardt of the same organization is in Kansas.

William Nicol, formerly a professor at the Queen's School of Mines, Kingston, Ont., has resigned and gone to Los Angeles, Calif.

C. E. Mills, general manager of the Miami Copper Co., Miami, Ariz., has returned from a trip to Santa Barbara and Los Angeles, Calif.

A. G. Larson, mining engineer, Spokane, Wash., has been in Nelson, B. C., and will go from there to Boundary, Wash., on professional work.

F. A. Knapp, secretary and manager of the Portoma Co., Wallace, Idaho, has returned to Portland, Ore., from a trip of inspection to the properties.

E. L. Hayes, who is on the efficiency force of the Calumet & Hecla Co. at the Isle Royale mine, has joined the selling force of the Ingersoll-Rand Co.

Arthur K. Adams, mining geologist for the Mascot Copper Co., Dos Cabezas, Ariz., has accepted a similar position with the Andes Copper Co., Chile.

Fred Ely, field engineer for Gunn-Thompson & Co., Superior, Ariz., has recently been in New York and left for an indefinite stay at Vancouver, B. C.

Wong Kwong, chief engineer for the Yangste Engineering Co., Hankow, China, has been in Salt Lake City and left for various cities on the Pacific coast.

Ernest LeDuc, president of the Big Ledge Co., Prescott, Ariz., has returned to Duluth, Minn., from a trip of inspection to the company's properties.

Eustice Dwyer, mining engineer with the American Smelting & Refining Co., Superior, Mont., has been transferred to the company's Salt Lake offices.

H. W. Du Bois, consulting engineer for the Alaska Copper Corporation, has returned from the Copper River country, Alaska, to his headquarters at Philadelphia, Pa.

Pres. F. W. McNair of the Michigan College of Mines and Herman W. Fesing of Houghton, Mich., attended the annual meeting of the American Mining Congress at Chicago this week.

John R. Stanton of New York, president of the Mohawk and Wolverine companies, with Fred Smith and Angus Smith of Detroit, directors of the White Pine Extension, and Mr. Van Law of Boston arrived at Houghton, Mich., the 14th

to inspect the mines of the district and some of the properties near the White Pine Extension on the Nonesuch or White Pine formations.

Chas. Chynoweth of Houghton, Mich., secretary of the Wolverine & Arizona Co., will attend the annual meeting of the company at Bisbee, Ariz., and will also visit Prescott and Jerome.

C. G. Sheldon has become a member of the engineering staff of the Munroe mine at Iron River, Mich., succeeding K. G. May, who has gone to the smelter of the Anaconda Co. at Great Falls, Mont.

Capt. Jos. Chenoweth of Calumet, Mich., has gone to St. Augustine, Fla., for the winter. Capt. Chynoweth was formerly superintendent of the Allouez, Old Colony, Mayflower, Contact, and Continental mines.

SCHOOLS AND SOCIETIES.

College of Mines and Engineering at the University of Arizona.—A short course for miners is announced. Tuition is free to residents of the state, others pay \$1 per course. Prospectors have 5 weeks, starting on Oct. 30, field geology 2 weeks from Dec. 4, assaying 10 days from Jan. 3, metallurgists 3 weeks from Jan. 15, flotation 1 week from Feb. 5, and miners 6 weeks from Feb. 12.

NEW PUBLICATIONS.

Magnetic Properties of Cobalt and Iron-Cobalt Alloys. By Herbert T. Kalmus and K. B. Blake. Canada Dept. of Mines, Mines Branch, Ottawa, Ont. Report 413; pp. 18; illustrated.

This research work was carried on at Queens University for the purpose of finding more commercial uses for cobalt. The apparatus and nature of the experimental work is described and followed by results and discussion of the same with some of the findings plotted in a curve.

Rescue and Recovery Operations in Mines after Fires and Explosions. By James W. Paul and H. M. Wolfen. Washington, D. C., U. S. Bureau of Mines. Booklet; pp. 109.

As might be mistaken from the title, there is no information in the contents regarding first-aid work. The contents is confined to bringing out the proper way to manage things immediately after the accident has happened and what to do to prevent accidents. Who to call and how to direct the crew coping with the affair are among things considered. For example, it is stated a fresh hoisting engineer should relieve the one who was at work when the accident happened since his system is rendered unfit by the shock.

The Flotation Process. By H. J. Stander. Mining World Co., Chicago. Book; pp. 175; illustrated; \$3.

The flotation process is so comparatively new that previous texts have been unable to treat on the subject in logical sequence. To date most people interested in flotation are merely students with respect to the process and the author has made this book of greatest value to the student, not only in the college but also those practicing in the field. It has been gotten up in a concise yet complete manner. The theory of various phenomena are described so as to be of value in studying out flotation problems in practice and, to make the description more vivid, descriptions and reference are made to operating plants. Under Flotation Processes brief descriptions are given of the principles of the several kinds of flotation. Various flotation machines are then described and a very complete chapter follows on the details of methods of testing and in some cases results which have been obtained by the author and others. There are separate chapters on Surface Tension and Occluded Gases, The Electrical Theory of Flotation, Interfacial Tension and Colloids, and the Function of Oil and Acid in Flotation. There is also a

brief chapter on costs with information on litigation, patents and a complete bibliography of flotation literature to date.

Concentrating Ores by Flotation. By Theodore J. Hoover. The Mining Magazine, London, E. C. Book; pp. 320; illustrated. For sale by Mining World Co., \$3.75.

In this, the third edition of a book which needs but little introduction in the way of description, the principal addition is that of Chapter XIII, which reviews the progress made in the art of flotation from 1914 to 1916, during which time considerable development in the industry has been witnessed. New findings made during this period are described in the chapter. There is a list of patents obtained during the period and a bibliography of current literature published during the same time.

Report on Mining Operations in the Province of Quebec During 1915. Quebec, Department of Colonization, Mines and Fisheries, Mines Branch. Report; pp. 146; illustrated.

The more important of Quebec's products are asbestos, zinc and lead. Brief separate reviews are made of the several minerals produced in the province and a list of the operators is given and classified according to the mineral they produce. A review of accidents which occurred during the year is given. The last 44 pages are confined to a report on the geology of the zinc-lead deposits in Montauban and Chavigny townships of Grondines.

Geology of the Hound Creek District of the Great Falls Coal Field, Cascade County, Montana. By V. H. Barnett. Washington, D. C., U. S. Geological Survey. Bulletin 641-H; pp 17; illustrated.

The contents of the bulletin is of a purely geologic nature regarding the structure of the formation and coal seams which do exist but to date have not been opened to an extent which will permit of saying whether or not they are of commercial value. The bulletin will be found of value as regards literature on the possibilities of coal in the area since the principal reason for the study of this area was to classify the land as mineral land or otherwise.

A Reconnaissance for Phosphate in the Salt River Range, Wyoming. By G. R. Mansfield. Washington, D. C., U. S. Geological Survey. Bulletin 620-O; pp. 19; illustrated.

This investigation was made because of certain lands which had been withdrawn from mineral rights. The area lies on the west flank of the Salt River range. The data obtained it is stated in the bulletin showed that the phosphate deposits which occur in this area are inferior to those of Idaho though there is a medium grade which occurs that may be held as a good reserve. In view of the higher grade deposits in Idaho and low prevailing prices it is probable that the deposits will not be worked for some time.

TRADE PUBLICATIONS.

Recording Pressure and Vacuum Gauges. The Bristol Co., Waterbury, Conn. Catalog No. 1001; pp 63; illustrated.

Illustrations and description of each class of recorder of this type are given. Reproductions of some charts from practice are shown and a very complete list of charts of different kinds to be used on the gauges is included.

Boiler Tube Cleaners. Lagonda Mfg. Co., Springfield, O. Booklet T2; pp 15; illustrated.

With illustrations and brief descriptions a line of boiler-tube cleaners operated by air, steam or water are shown. Included in the pamphlet besides these are automatic valves, oil strainers, filters, etc., reseating machines, boiler tube cutters, and feeding devices for cleaners in connection with Stirling boilers.

Drill Sharpener. Ingersoll-Rand Co., New York. Bulletin Form No. 4122; pp 24; illustrated.

The sharpener in general is of the usual type of sharp-

pener which is pneumatically operated. The first few pages of the bulletin described what may be expected from the sharpener as regards capacity and variety of the work to be done. With views, drawings and description the construction of the machine is gone over. The concluding pages are confined to reviewing good practice in the proper use and making of rock-drill bits.

Automatic Weighing of Coal and Water in Power Plants.

Richardson Scale Co., Passaic, N. J. Bulletin 101; pp 63; illustrated.

The first pages consist of a general discussion of power plant practice and efficiency. Complete descriptions of construction and operation of the company's equipment are then given and views shown of installations of the equipment at various plants. Drawings are shown of the general arrangement of plants and equipment where coal and water for the boilers is weighed. This is supplemented with discussion and further information regarding the design.

Spraco Paint Gun. Spray Engineering Co., Boston, Mass. Booklet; pp 12; illustrated.

The gun and its operation are described. In the first few pages of the booklet it is stated that the paint gun is a practical hand tool for applying any liquid coating. The equipment consists of the gun, hose connection and a portable, air-tight tank in which the liquid is contained and into which pressure can be applied to force the liquid out through the gun. In various work in shafts and stations underground this tool will be found of advantage as well as in applying paint and coatings to buildings about the mines and plants such as mill and smelter connected therewith.

Soot Cleaners. Vulcan Soot Cleaner Co., Du Bois, Pa. Bulletin; pp 91; illustrated.

In the first three sections of this bulletin the question of soot, its formation and the advantages to be had by cleaning it away, is discussed and reviewed in a practical manner to show why soot cleaners should be in every power plant. Section IV takes up Vulcan cleaners as applied to water tube boilers of different classes and for each type a drawing is reproduced showing a Vulcan cleaner installed though where similar types occur they are referred to each other to save space. Section V is similar to Section IV but confined to fire tube boilers and Section VI to economizers.

Flotation Oils. General Naval Stores Co., New York. Catalog; pp. 12.

Oils are separately described with respect to the way in which they are manufactured and the uses for which they are best adaptable in flotation work, that is as a frothing or collecting oil. Each standard oil handled by the company is then considered separately. Under each heading are the subheads: kind; method of manufacture; color; specific gravity limits; flotation value; nature of froth; and use. The company states that the catalog has been gotten up with respect to the mill man rather than the experienced metallurgist and under the last subhead "Use" suggestions will be found for combining the oils so as to obtain an oil with the proper physical properties to successfully treat any ore.

INDUSTRIAL AND TRADE NOTES.

Aerial tramways recently supplied by A. Leschen & Sons Rope Co. of St. Louis were as follows: Queen of the West Mines Co., Cornucopia, Oregon, a gravity 2-bucket tram 3200 ft. long, the line having a fall in this distance of 1456 ft. This tramway will have a capacity of 6 tons of ore per hour, and replaces a single-line tram of another manufacture. Cottonwood Coal Co., Lehigh, Mont., a 2-bucket tram for the disposal of waste. This line has length of 800 ft., and carries at the rate of 20 tons per hour. The tram has 1½-in. diameter special-steel track-ropes, and a 5⁄8-in. diameter traction-rope. The carriers are of 24-cu. ft. capacity. The material is dumped by means of an aerial trip at any point along the line.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Whitehorse.

Conditions and progress here are considerably above what they were last year. The Pueblo is rushing ahead, and a new boiler is being installed. The old sheds are being torn down and new ones erected. Work is also being rushed at the War Eagle. This mine is handicapped only by poor transportation in getting their output to the railroad.

Skagway.

W. L. Stevenson of this city has purchased property in the Kantishua district from W. R. Taylor. The price paid was \$45,000 cash.

Sitka.

Activities on Windy Arm are manifested in the recent shipment of 1200 sacks of ore from the Venus mine to the Granby smelter. Supt. McFarland is making preparations to commence work at the Montana and a force is at work taking the ice and water out of the mine. Both of the mines are being developed by the Harper interests. The M. & M. mine has produced ore valued at \$165. McFarland expects his first shipment from the M. & M. on Polley Gulch. Three men are breaking and sacking high-grade silver. Work will be pushed through the winter at practically all of the mines now open by McFarland.

Juneau.

At the Goldstein group located on the Salmon creek side of Mt. Juneau a 48-ft. prospect tunnel has been driven to cut the vein and good showings of free gold in the quartz have already been made.

Knik.

All lands included within Alaska Townsite Withdrawal No. 4, in sections 22, 23, 26 and 27, T. 17 N., R. 1 W., Seward Meridian, have been restored. This land was withdrawn when it was thought it would be needed for railroad and townsite purposes. It is found that there is no need for the land. It is located in the Matanuska Valley, about $\frac{1}{2}$ mile from the main line of the railroad and within 2 miles of the new town of Wassilla on the Knik-Willow Creek wagon road.

Fairbanks.

It is rumored that Morrison & Johnson, drifting on No. 6 below Cleary, struck pay on the claim on which W. C. Gates made a fortune. They have struck 6 ft. of gravel that will run in the neighborhood of \$5 per sq. ft. of bed rock.

Kennicott.

Charles McKinnis, Wallace, Idaho, on returning recently from Alaska, states that in the Jumbo an ore shoot is being mined which is 40 ft. wide and 125 ft. long. Prospecting is being done in this part in an area about 200 miles wide. During the summer a strike was made in the Mother Lode Co.'s ground adjoining the Bonanza mine. The company is said to have 500 tons of good ore ready for shipment, and other ore opened to keep shipments going at the rate of 250 tons per month all winter. It has a large tonnage of milling ore on the dump and in the mine, and will build a concentrator next summer.

Engineers' estimates show about 600 tons of 40 to 50% ore on the Josevig-Kennicott claims which are amongst the most recent developments.

The newest development in that immediate district is of the Josevig-Kennicott claims. These were bonded to Seattle and Spokane parties last fall. In the incorporation of the company, D. K. McDonald, of Spokane, was made president, and M. E. Hay, former governor of Washington, vice-

president. The other members of the directorate are bankers and lawyers of Seattle. Wallace people own some stock in the company.

The company is now building a road from the Bonanza mine to the property. The road extends 6 miles across the Kennicott glacier, and 3 miles on the mountain-side from the end of the glacier to the workings. The company is shipping in supplies from Seattle, via Cordova. A large crew will be put to work next spring.

The company has already shipped out 3 tons of ore from various open cuts on the vein which, it is estimated, will run from 40 to 45% copper.

ARIZONA.

Globe.

With the mining of high-grade sulphide on the 13th and 14th level, reserves have been added to at the Arizona Commercial by the opening of high-grade in a crosscut on the 10th level. It is not, however, quite as good as that on the 13th and 14th levels. On the 14th level the smelting ore is averaging 7% and concentrating ore 4%. The body shows variations from a few feet to over 40 ft., the average being about 20 ft.

Miami.

Work on structures for the reclaiming of water from the Inspiration mill is progressing. Instead of pumping the whole water supply from the wells and performing this against a high head, the bulk of the pumping is done at the top of the dam which is at a considerably higher elevation than the wells. The second tier of trestle work for the launders has been built along the face of the tailing storage dam north of the smelter. This dam is at the lowest elevation of any of the three dams which are strung out in a row along the canyon. Its face at present approximates 50 ft. in height.

Chloride.

The power line has reached camp and the town will be electrically lighted and the mining machinery be electrically driven just as soon as the transformer station is completed and the line extended throughout the camp.

Activity among the mines continues to increase and good strikes are of daily occurrence. The strike of 4 ft. of high-grade ore in the shaft at the Georgia was good news; the widening of the strike at the 175 level in the Schenectady, the finding of a rich shoot in an old winze that had just been cleaned out on the Silver Hill, together with 73 sacks of high-grade that had been filled in years past from the same shoot and abandoned for reasons that will perhaps never be known; the find of high-grade on the Rattlesnake group just south of Silver Hill, kept the public interested throughout the week.

Another feature of importance was the taking over of the Elkhart by W. L. Leland and San Francisco capitalists, and the announcement that a new shaft will be sunk immediately to 1000 level. Also that the old mill will be remodeled and modern concentration processes installed.

The raise from the 1400 to the 1170 at the Tennessee is within 50 ft. of breaking through. This raise will provide air for the lower workings and enable a larger force of men to work below.

The Cerbat mine has begun shipments to Selby. R. W. Richardson just made a shipment of concentrates. A. W. Clapp shipped concentrates last week. Gus Theida and Alois Herbst are stopping and will start the old Gem mill in a

few days. A new hoisting engine was installed on the Copper Age and another engine is on the way for use at another point on the same property.

The tunnel at the Hidden Treasure is within 150 ft. of its goal and is going forward at the rate of better than 4 ft. daily.

A representative of the Callow Engineering Co. of Salt Lake is here, making an examination of Hidden Treasure at the request of the Hidden Treasure Co. The company will submit plans for a 150-ton reduction plant.

Leasers are becoming active and applications for blocks of ground being made. This results from presence on ground of four milling companies who are striving to get custom mills erected. The Silver Hill will begin work on its mill at once. The Steffy mill will also begin work at once. Sufficient ore contracts have been made to provide 250 tons daily. The Copper Age mill will add a custom department. This has encouraged leasers, as it will insure them home treatment of their ores and hence a profit.

Jerome.

Decatur Copper Co. with main office at Decatur, Ill., has just been reorganized with the same number of shares, 2,000,000, which will be exchanged at the rate of two of the old for one of the new, thus disposing of 850,000 shares and leaving in the treasury 1,150,000 shares of which 400,000 shares will be offered for sale and 750,000 in the treasury. The new board of directors are: Philip Carroll, Hancock, Mich.; F. P. Wells, Chicago; C. M. Hearst, W. J. Wayne, W. C. Fields, and S. T. Lowry, Decatur. The property lies, it is thought, in the way of the great vein of the United Verde Extension and next to the Green Monster.

Quartzite.

Lidgerwood Mfg. Co., through the Los Angeles office, has sold a 1½-yd. excavator to the Yuma Con., to handle dry placer material on the latter's gold property near Quartzite. The excavator will be operated by electric power, taking up material from the surface and dumping it into a hopper from which it is loaded into 4-yd. ore cars and hauled by electric locomotives to the mill. The dry milling plant is being equipped with a Quenner chain-hammer pulverizer and Stebbins dry concentrating tables, and a belt conveyor for stocking the tailings. Concentrates made from this dry placer dirt, after taking out the coarse gold, ran \$180 gold, 22 ozs. silver and 40% lead. Excavations made through the false bedrock disclosed a good grade of placer material below it.

Oatman.

The Iowa is now entering the foot wall of its vein at 400-ft. depth, and from the mineralization of the wall rock, and signs of replacement of calcite by quartz, the operators believe that they will encounter a pay shoot not far from where the crosscut taps the vein.

Picture Rock, Arizona Tom Reed, Carter, Boundary Cone, Gold Road Bonanza, San Francisco, Mohawk Central and Crescent are other properties which should soon be due for interesting developments.

In the Tunner level of the Times, which has resumed operations, a full face of ore averaging better than \$20 has been encountered, and a drift is now into this ore about 20 ft.

Taken as a whole, Oatman today looks better than ever. A number of insufficiently financed concerns have suspended, but those now operating are performing their work with an earnestness and determination which promises much for the future of the camp, and several other concerns which have just been re-financed with strong capital back of them are making preparations to resume early.

The Gold Dust is steadily developing ore on two levels, and will soon have the old Orion mill equipped to handle 25 tons of its ore daily. The Zimmer centrifugal amalgamation process will be used. Laboratory tests have shown a high saving on these ores, the gold in which is so fine that it cannot be caught by ordinary amalgamation processes.

The Oatman United, at a depth of about 150 ft., has passed through what it believes to be the first fold of a big vein which its operators believe may be the Big Jim vein,

and now is entering the hanging wall of what seems to be the reverse fold of this same vein. J. K. Turner, of the Goldfield Great Bend and Jumbo Extension, is consulting engineer for the Oatman United.

The Big Jim shows the finest example of a folded vein which it is possible to find. On the 485 and the 400 levels, the strike of the vein is N 60° E, and its upward strike is toward the south, at an angle of about 85°—almost perpendicular. At about 200 to 240 ft. depth, the vein encounters a massive dike, the strike of which is parallel with that of the vein, runs upward along the wall of this dike for some 40 ft., and then turns back to the north at an angle of about 56°. This elbow, at point of present work, is near the southerly side-line of the Big Jim, and indications are that further to the east, this elbow will be thrust out some distance beyond its southern side-line, but that the upward inclination of the vein at that point brings its apex back to fully 120 ft. within the Big Jim lines. It is one of the most interesting and geological studies of vein folding.

CALIFORNIA.

Zabriskie.

Fifty Associates Securities Co., Los Angeles, is developing large bodies of talc in San Bernardino and Inyo counties, near the line of the Tonopah & Tidewater railroad. After stripping off the overburden, the talc deposit is bored into with coal augers and blasted with black powder. An analysis of this material shows the following content: SiO₂, 59.3%; MgO, 27.14%; CaO, 2.52% Al₂O₃, 0.43%; FeO, none; H₂O, 5.38%. This is deemed exceptionally high grade, and commands a market among manufacturers of paper, surgical and toilet powders, automobile tires, lubricants, cotton bleaching and paints. It is also used in tanneries, in ceramic arts and in rubber factories. F. W. Remy, E. M., is directing this work.

Caliente.

The Big Fifty antimony mine, 15 miles from Caliente, Kern county, has been developed by adit levels, exposing a 50-ft. ore body, carrying 30% stibnite in a porphyritic gauge. The ore occurs within a porphyry dike which extends along a contact of limestone and granite, the vein having a dip of about 80°. Shipments amount to 4 or 5 tons per day of the ore of higher grade. A much larger tonnage of lower grade ore is available, and for this a mill may be built. The property belongs to the Fifty Associates Securities Co., Los Angeles, for which F. W. Remy is mining engineer and geologist.

Goldstone.

An important strike was made on the Gold Ring claim of the United Goldstone group last week. The vein is 4 ft. wide and has been opened for 70 ft. with strength displayed as developments advance. About 22 ins. of the center of the ledge carries high values, with 3 to 4 ins. picture ore. It is stated the ledge averages throughout its total width \$72 per ton.

Preparations are being made for resumption of work on the Big Drum group. Large quantities of medium-grade ore are exposed, and shipments to the custom mill are contemplated. The management contemplates erecting its own mill as soon as a satisfactory reduction process has been perfected. The company is controlled by the Shorey-Brown interests of Boston.

The Daggett custom mill is being improved and will soon be in shape to treat 200 tons daily. Some trouble has been experienced in securing a satisfactory extraction, but no further difficulty is anticipated. Boston capitalists control the plant and are supervising it.

Victorville.

A deposit of high-grade tungsten has been discovered on the property of the United Tungsten Mines Co., in the Morongo district. The ore is high-grade scheelite, occurring in a formation of granite and limestone. Contracts have been awarded for supplies, machinery and building material, and construction of a 50-ton plant will be rushed. William

K. Weaver, Warren Gillelen, J. Wells Smith, H. A. Cole, Frank F. Peard, E. M. Coplen and other New Yorkers are interested. D. G. Kidder is manager.

Mt. Gaines.

A large interest has been acquired in the Mt. Gaines Mining Co. by Pennsylvania people, headed by Joseph Cauffel, ex-Mayor of Johnstown, Pa. George Kislingbury has been chosen general manager and consulting engineer, and arrangements made for extensive operations. The Mt. Gaines mine has produced upward of \$1,500,000 in gold, but has been idle since 1911. It is to be immediately unwatered and vigorous work prosecuted. Considerable California capital is also interested. The Mt. Gaines is said to have been the first gold mine in the State to be operated by electric power.

Keeler.

The deposit of rich silver-lead ore lately opened in the Cerro Gordo continues to develop splendidly. As depth is gained the vein appears to be gaining strength with the values maintaining their original average. In the lower workings high-grade zinc is mined and heavy shipments made. The tramway is taxed to capacity to handle the tonnage.

Jackson.

The strike of the miners in Amador county came to an end last Friday, following instructions from the executive offices of the Western Federation of Miners. In these instructions it was stated the strike was ill-timed, without merit, and had been called without instructions from the head officials. All the mines are resuming with full crews as rapidly as places can be found for the men, and roads and trails are crowded with returning workers. With the exception of a few particularly objectionable leaders, all the men are being employed in their old places.

Nevada City.

The North Star Mines Co. is preparing to construct an aerial tramway from the Champion mill to the Providence shaft, which will shortly become the main outlet of the Champion group. Connections of the Champion and Providence mines at a depth of 1800 ft. are proceeding. On the 2700 workings of the Champion a 4-ft. ledge of milling ore has been encountered and is apparently developing into an orebody of importance. Thirty stamps are dropping at the mill, and ten more will be placed in commission in the near future. One hundred and fifty men are employed.

Unwatering of the Delhi mine, on Columbia hill, has been completed and active exploration is about to start. According to miners ore of excellent grade was exposed in the shaft when water forced closing of the property, and if this is proven by actual work, the mill will be placed in commission at once. Considerable low-grade quartz is exposed in the upper levels.

The Sailor Flat hydraulic mine has been taken over by local people and will be worked by the drift method. New lines of flumes have been laid and a good water supply developed. Large bodies of excellent gravel have been blocked out. The outlook is considered encouraging for a profitable season.

Hammonton.

The Yuba Gold Fields Con. will launch dredge No. 16 on No. 20. It will be of steel throughout, equipped with 16-cu. ft. buckets, and designed to handle over 450,000 cu. yds. of material per month. It will closely resemble No. 15 dredge of the Yuba fleet, but will be equipped with improved gold-saving devices and is expected to be even more efficient in every department.

Placerville.

The Placerville Gold Mining Co. has sold 23 claims to a syndicate of California and Eastern people headed by J. W. Northrop, San Francisco. The deal includes the Pacific mine, which has been opened to a depth of 2000 ft. by shaft and winze and five properties located within the city limits of Placerville. For 40 years the Pacific was a consistent producer, but at the outbreak of the European struggle was closed by its English owners. Under the new ownership the Pacific shaft will be dewatered and drifts thrown out to intercept promising shoots disclosed in adjacent territory. R. Chester Turner, general manager of the Brunswick, Con.,

at Grass Valley, has been chosen consulting engineer and general manager.

The Ohio gravel mine, near Smith's Flat, has been sold to J. A. Forsythe and associates of Alaska by William Richards and W. F. Fairchild. Work is to start immediately and some equipment will probably be installed. The Ohio formerly yielded substantial dividends, but has lain idle several years.

Tuolumne.

A marked mining revival is reported throughout the east section of Tuolumne county, and considerable Eastern capital is being invested. In the Columbus a strong vein of \$10 ore has been encountered in the shaft, which is being deepened to 500 ft. In the nearby Carlotta rich ore is showing and the management is preparing for more comprehensive work. Operations have been resumed at the North Star, formerly a good producer.

The Confidence Mines Co., a strongly-financed \$1,000,000 corporation, is rapidly completing arrangements for extensive work at this property. Considerable new equipment has been decided on, and some orders placed. The Sonore & Duffield property has been reopened. The United Mines Co. is clearing the legal title to its holdings and expects to start along broad lines in the near future. Options have been taken on the Chapparel and Garfield, and other old time producers are receiving attention.

Grass Valley.

The Indiana Dredging Co. has taken a bond on several miles of land along Greenhorn creek and is exploring the territory with prospect shafts. Because of the heavy water flow encountered at shallow depth steel caissons are sunk and the shafts kept clear with a centrifugal pump. Satisfactory results will be followed by construction of a large dredger. The company is one of the leading dredging enterprises in California.

On nearby ground Louis Girdetz and associates are mining rich gravel with a drag-line scraper. The holdings comprise part of Arkansas canyon, and extend for 3 miles to the You Bet placers. Much gold has been recovered by surface placering, but the bedrock has never been worked.

Howland Flat.

Several mines have been reopened and preparations for resumption of hydraulic operations are proceeding actively. The huge restraining dam across Slate creek is nearing completion and as soon as it is accepted by the California Debris Commission, hydraulic operations will start at Howland Flat, Port Wine, St. Louis, La Porte and other camps. Considerable work is going on at the Miners' Home, Wink-eye, and other mines.

Happy Camp.

At the Gray Eagle mine, recently acquired by the Mason Mines Co., the camp is being enlarged and the mine placed in condition for operations on a large scale. The working force has been increased and development of new ground is proceeding. Facilities are also being provided for storage of ore. It is rumored the company plans the building of a concentrator at the mine in the spring, and that concentrates and the higher-grade ores will be shipped to the smelter at Thompson, Nev.

Hart.

Oro Belle Mines Co., whose main office is at Houghton, Mich., will resume mining under the management of the John Hays Hammond-Royer interests about Dec. 1. The new company was organized Oct. 26 and the old company will hold a meeting of the stockholders Dec. 12 to dissolve and distribute the new company's stock on the basis of one share for two of its own; the books closed the 9th and will be opened Dec. 13. The Woodward vein is believed to have a large quantity of low grade gold ore which will prove to be profitable.

Atolia.

The Atolia Mining Co. has temporarily suspended operations, pending shaft improvements which will consume about 60 days. Lessees left portions of the property in bad condition and repairs were necessary. Most of the miners have gone to other camps, but a small amount of tungsten is still being produced by independent operators.

COLORADO.

Ophir.

Drifting for the ore bodies of the Matterhorn Mining & Milling Co. is now being done through the Butterfly.

Wichmann & Co. has shipped 1 car from Santa Cruz and Otho Bever and Lou Lomax made a small shipment from the Pike County lode. The Highland Mary is driving a tunnel and Newton Sankey and Jim Belisle have been doing development on a gold property.

The Black Bear mine is enlarging its 450-ft. shaft and will install an electric hoist. Supt. Nevala intends later to sink the shaft further as better ore is noted in the deeper workings.

Rico.

Dead work done to develop ground has retarded production at the Rico-Wellington considerably during the past few months. This work is now nearly completed and uninterrupted production will commence soon and continue through the winter.

Telluride.

The trapway on the Carruthers lease between the mine and new mill is finished and will be started immediately. There is plenty of ore on the mine dumps to keep it busy all winter with what is gotten out regularly.

The Liberty Bell Mining Co. has just about closed a deal for the purchase of ground on their east end lines from the Smuggler-Union Co.

October shipments were: Tomboy 61 cars of concentrates; Smuggler 51; Liberty Bell 15; Black Bear 1; total 128 cars.

Leadville.

Since dewatering the Down Town Basin, the first shipments have been made from the Penrose shaft. Two cars of high grade iron-manganese were sent to the A. S. & R. Co., Denver. A steady tonnage will be extracted and the output increased gradually for some time. The body is just being opened and has only a comparatively small breast for stopping. As the ore is developed, a larger force of men will be put to work. A decrease of 300 gals. per minute has been noted in the flow since the reaching of the bottom level.

The bottom of the Hibsche shaft has been reached after several weeks of work. It was held up by a heavy cave in the shaft which necessitated considerable retimbering. Work is now under way cleaning out the drift from the Hibsche to the Newell shaft. It proposed to carry on some development through the Newell. Owing to the displacement from the Pendery fault, the formation in the Newell is found much deeper than in the Hibsche. Here large bodies were found directly under the wash at the contact of the lower quartzite and the white limestone. The Newell shaft did not penetrate through the white porphyry to the first contact between this and the blue lime formation which is most favorable for ore deposition.

Colorado Springs.

In a recent report of Pres. Castello it is stated that during the period beginning Jan. 1, 1916, and ending Oct. 1, the shaft was sunk to the 12th level and a drift run to the main vein. Three hundred and ten ft. west good ore was encountered 100 ft. in depth. It laid in pockets. The vein is strong. Indications are that the body between the 12th and 13th levels will be larger and regular. We did not find pay ore in the north end of the 12th level, but are still drifting on the vein. We opened several flat veins on our 8th level which returned low grade.

Pueblo.

Indications of oil activities in this vicinity have again been revived through the activities of certain interests now attaining land here. Sinking the shaft to the 1360 level has been completed. The distance to the vein is estimated at 330 ft. As soon as the crosscut enters the vein, work of drifting in each direction will be prosecuted. We have also drifted north on our 9th level and are now getting under the flat veins we had on the 8th. Prospects for good ore on the 13th and the north end of the 9th are good. The 11th level

has been disappointing as but one small body was encountered. Development work is still being carried on on this level. Owing to these conditions and extensive development earnings have been small. The financial statement shows the ore sales of the company amounted to \$18,524.05, and that of lessees to \$71,255.96. The total earnings amounted to \$193,859.33 with expenses of \$183,526.31, a net profit to the company of \$10,333.02. The cash balance on hand on Sept. 30, was 98,535.06.

IDAHO.

Wallace.

During the 3 months ended Sept. 31, the Consolidated Interstate-Callahan Mining Co. produced 17,451,243 lbs. of zinc ore and concentrates and 1,454,562 lbs. of lead ore and concentrates, according to the official report of President John A. Percival, under date of Oct. 20. Mill recovery during the period was 85.7% as compared with but 80.99% in the previous quarter, an increase of 4.71%, the result of a more efficient system of treatment and separation that has been incorporated in the milling practice. The net value of the shipments, entrained and ready for forwarding at the point of consignment, was \$655,034, as against \$997,182 for the preceding 3 months, and miscellaneous receipts were \$6030, making the total net income \$661,064, as compared with \$1,004,566 for the previous quarter, a decrease of \$343,502, due to a decline in the price of spelter. The surplus for the period was \$405,726 and the profit was \$413,695, compared with \$713,677 and \$716,348, respectively, for the 90 days ended June 30. Operating costs were \$247,369, a decrease of \$40,848, and improvement costs were \$7968. The shipments consisted of 3297 tons of ore averaging 50.5% zinc, 14,184 tons of concentrates averaging 47.7% zinc, 388 tons of ore averaging 18.9% lead and 1121 tons of concentrates averaging 19.4% lead. The total metal in the shipment was 16,868,836 lbs. of zinc and 1,454,562 lbs. of lead. The combined cost of mining and milling was \$6,302 the ton. During the quarter dividend disbursements of \$1.50 a share, or \$697,485, were made, making \$10 a share, the par value of the stock, distributed since payments were inaugurated on April 1, 1915, and another payment of similar amount probably will be made in December. The new 3-compartment shaft was completed during the quarter to the No. 7 level, and the Interstate vein was opened by a 130-ft. crosscut. Drifting on the lead has disclosed 12 ft. of high-grade zinc ore, showing that the shoot opened on the Nos. 4, 5 and 6 levels continues to depth, and that it is increasing in value as it goes deeper. Referring to the benefits that will accrue to the company by increased railway facilities, the report says: "Construction of the O. W. R. & N. new branch line up Beaver creek will enable us to ship our ore all the way by rail to Enaville, Idaho, where the proposed new mill is to be erected. It also will make possible opening the property on the Beaver creek side, giving us a depth of 3000 ft., 1500 ft. lower than the No. 7 level.

Murray.

Tests of the new mill of the Golden Chest mine were made last week by Supt. Berlin and are said to have proved satisfactory. Because gold and tungsten are nearly the same weight, it was found necessary to entirely remodel the mill in order to save the values. This has been done and new equipment added. Dry crushing has been adopted and two heavy iron rollers have been put in. The ore goes from these to a Trumbull cylindrical screen and thence to the power jigs. Elevators take the ore to the Wilfley tables. Mr. Berlin expects to commence a steady run this week.

Albion.

The Melcher mine, 12 miles from Albion, has lately produced and shipped 50 tons of ore worth \$70 to \$80 per ton. The metals consist of gold, silver, lead and copper. This shipment, which was hand sorted, was hauled to the railroad at Marshfield, a station near Burley. Pere McIntyre, of Salt Lake, is superintendent.

Hailey.

The North Star-Triumph group, acquired several months ago by the Federal Mining & Smelting Co., will begin pro-

duction soon. The new mill, now nearing completion, will handle 150 tons of ore daily, and the output will be transported by wagons to the shipping point until a branch of the Oregon Short Line railway is extended to the property. The group, developed by three tunnels, is credited with production in excess of \$600,000, the result of operations under the ownership of the Philadelphia Smelting Co. "The old lower tunnel, 600 ft. below the outcrop, is 1500 ft. long, and exposes a body of complex lead-silver-zinc ore several hundred feet in length and from 10 to 15 ft. wide," says Robert N. Bell, state mine inspector, in a recent report on the property. "A large part of the production was from below this level, from which a winze was sunk 200 ft. on the shoot and drifts run every 100 ft.

LAKE SUPERIOR.

COPPER.

Houghton.

Mohawk has increased its shipments to nearly normal and its tonnage for October will be about 63,000 tons which at 19.5 lbs. a ton will yield 1,239,500 lbs. There is every reason to believe that the figure for November will be the capacity of the mill, about 68,000 tons.

Wolverine will gain this month in its tonnage. For October it had 27,000 tons, but it is gradually increasing its number of men. The normal for this mine is about 36,000 tons monthly. The production in refined copper for October is about 465,500 lbs.

Michigan has found the width of the Evergreen lode to be about 48 ft., of which the first 25 ft. disclosed only occasional specks of metal, the next 15 about 300 lbs. of small mass, which made this strip probably of commercial value, and the 4 ft. following were like the first and were succeeded by 2 to 3 ft. of trap and 8 ins. of a greenish decomposed epidote which carried considerable copper and lay quite flat to the dip of the preceding parts of the lode. The copper bearing strip is most promising. It will be developed by drifts as soon as the main crosscut on its way to Nos. 1, 2, and 3 of the North lodes of the South lake has progressed sufficiently so as to be out of the way. The drift on the Ogimah lode is getting a fair grade of stamp copper and the eastern drift from the Butler lode which is being pushed up to the 5th level in the longitudinal fissure lying just above the lode is now running into a good quantity of mass copper such as has been abundantly met with here. It seems likely that one or more lodes of profitable grades will be encountered by this crosscut and that eventually a good sized and profitable production will be made.

Calumet & Hecla ceased work Election Day and offered those who worked Monday and Wednesday full pay Tuesday. The production in October was nearly up to the average of 10,600 tons daily, and that of the entire district was considerably better than in September with the same number of working days. Mohawk was close to its normal, Isle Royale was better than ever, Hancock pushed forward notably, Osceola rose fast at the last of the month, and the others increased slightly or at least held their own, and some of them, as the Quincy and Copper Range, are about up to the top notch. The present month will have a better daily average and probably will ship more rock than was milled in October. Men are staying better and there is a fair supply coming in steadily. The copper is going out as fast as possible by boat to save the extra cost of rail transportation, as it will have to be delivered as soon as it is ready and therefore none can be held over for the spring. There are about 13,500 tons of copper that will be taken from the 11th to the 30th by the Great Lakes Transit line, the limit of insurance expiring on the last named date.

Lake is driving crosscuts from its shaft on the Knowlton lode over the Butler on the 4th and 6th level, a distance of about 400 ft., because the latter is known on the whole to be the richer. The Butler is being mined at the Mass, South Lake, Michigan and the Indiana, and at the two first is producing highly profitable rock, while at the third the showing is good, and at the last it has only just been opened,

and should show value here just north of the South Lake where its copper is of heavy grades give pleasing disclosures.

Cherokee has drifted 30 ft. each way in as good copper as has been passed through, the small mass and barrel predominating as usual; it will not crosscut on the lode so as to get its width and mineral contents. An efficient crew has been gradually taken on and the work is progressing at a good rate.

South Lake has been getting a large amount of mass from the Butler lode, one piece weighing about 6 tons. The lode, ever since it has been opened at this property, has had a remarkable amount of mass, both large and small, and is so far the best of the seven South Lake lodes. It is being drifted on in both directions and is sending quite a steady quantity to the Franklin mill, the rock being all from the drifts which are quite uniform in values. The tonnage is being steadily increased, and will be enough to yield considerable profit as soon as the new houses that the company is building are ready for their families. The lack of houses for families has been a great drawback.

New Arcadian is finding some excellent grades of rock on the southern drift of the 1050 level at quite a distance in from the shaft. The track has been shifted over for the new rockhouse, and in a short time all will be ready so that the underground work can be pushed.

New Baltic is down 42 ft. with its shaft pit and is putting in the timbering. After this task is finished, sinking to the ledge will be resumed. The top of the ledge should be cut into at any time.

Flint Steel has been pumping out its old shafts on the Butler lode for the past week. The owners of this option have all the money that is necessary to explore this property and will probably thoroughly ascertain its mineral values before giving the public an opportunity to participate.

Houghton has discontinued the exploration of the West vein that has been so rich at the Superior and has put the drill to work on the bottom of 12th level of the winze. The West vein showed its characteristic rock but not its characteristic copper and consequently no more work will be done on this level, but later if the winze or the shaft is carried down further undoubtedly it will be opened again.

Winona is working its shafts, Winona No. 4 and King Philip No. 1, both shifts, but has not yet been able to get the men for the night shift at Winona No. 3.

Osceola had a tonnage of 113,800 for October which, is the largest for 3 months and is some days running to its mill capacity nearly 4700 tons since it has been quite successful in getting the men it has been needing. It will be soon running up to its normal about 119,000 to 120,000 monthly. A few men have been taken on all around but the most at No. 3 North Kearsarge.

Hancock produced in October 408,836 lbs. of refined copper from 24,782 tons of rock with a yield of 16.50 lbs. a ton, a rise from that of 15.16 in August. The most striking fact is net earnings of over \$42,000. This is sufficient to show what will be achieved in the future when the ground at both shafts is opened up for a large production, the construction costs for quite a while ahead having been provided for. It is probable that the production can be made large enough while the metal is soaring in price so that the costs will be quite low when the prices begin to drop. Men are the great want here now. They are coming slowly and are staying better than before as they are looking for good jobs for the winter.

Keweenaw is still unable to work its mill all of the day shift for the lack of trammers, having only 11 to 12 when it needs 24 to 25, consequently it will be some time before it can start the night shift. Only about 1000 tons had been milled up to Sunday the 5th; and therefore the management will not publish the mill run until a much larger amount of rock has been stamped, especially when it has so much on the surface in the stockpile. It is known that the rock in its recovery is equal in yield to the average of the lower grade mines of the district.

Isle Royale has completed enlarging to full size the shaft, which had been at first only holed through by raises,

and has now begun to sink. Some kind of a makeshift rock-house will be provided soon so that the good rock here, that has been so abundantly met with in the cutting out of the shaft can be added to the mine's production. The tonnage is constantly over 3000 tons daily.

Indiana in its shaft on the lode thought to be the Butler down about 85 ft. from the surface, or about 60 from the top of the ledge which is at the bottom of an old trench, and is finding some copper ore and occasionally bunches that are of a commercial value. The width of the lode is apparently quite good. A crosscut will be driven both to ascertain this figure and explore the lodes where there are the usual members of the Knowlton and Evergreen series.

IRON.

Virginia, Minn.

Work is being commenced by the Oliver Iron Co. on 4 forties known as the Missabe Mountain property. Drilling has been prosecuted on the property for the past year and it is said that sufficient ore has been proven to warrant 25 years' work. From 1 to 3 shovels will be engaged in stripping to be undertaken this winter. Tracks and making of grade is now being worked on. Trestles for the stripping material are also being built.

Crystal Falls, Mich.

The mines of Iron county are carrying considerable more ore over in their stock piles this season than was expected. There are large piles at the following mines: Great Western, Bristol, Carpenter, Tobin, while at the Dunn and Odger mines the piles have been entirely cleaned up.

J. M. Longyear, Jr., is now doing exploratory work in this district and it is said that J. M. Longyear, Sr., is intending to take over and reopen the Mansfield mine.

Ashland.

Attracted by the finding of lines of magnetic attraction by State geologists, work has been started again for the purpose of locating commercial bodies of iron in northern Wisconsin. The most recent developments are in the region east of Hayward. A drill in that region will start operations within a few days. It is understood to be owned by the Edson interest of Duluth. Other syndicates are also reported to be in process of formation for the purpose of carrying on exploration.

Biwabik, Minn.

Because of excessive costs and greater amount of water at depth but little diamond drilling is being done in this district. The Ruddy mine which filled with water during the strike has been closed and the owners say it will remain idle until mines in that vicinity assist in lifting the water from the basin in which it is located. It has considerable ore developed.

Iron Mountain, Mich.

Stripping has been finished at the Antoine and the company now has several million tons of ore exposed and during the winter will employ a considerable force in development. The work will include a 2-track drift 500 ft. long and the opening of five more "mills" from the bottom of the drift to surface.

MISSOURI-KANSAS.

Joplin, Mo.

A jump of \$10 a ton was recorded in blende for this week over last week's high price, and \$90 was paid for first-class zinc ores, with an average price of \$82.50. While the situation as to the electric current has not been entirely cleared up, most plants are resuming operations that have been forced to close down.

A good strike has been made by Lackey and associates on a lease of the Stokes-Shoemaker tract of the Missouri Lead & Zinc Co. land, southeast of Joplin. A shaft that is being sunk by the company went into ore at 155 ft. Drill hole records showed a good face of ore at about the depth in which the shaft of the company showed ore at the 155 level.

Several rich mines have been opened in the vicinity of this new mine. The Bumble Bee Mining Co. has a shaft in rich ore less than 100 ft. east of the new shaft and 3 shafts in other sections of a tract, which are all in good ore. This company is also completing a new 150-ton mill.

Excellent dirt is being brought out of the Tuxedo Mining Co.'s property on West Seventh Street, just east of the Paragon mine. There is a face of rich dirt 33 ft. high by 20 ft. wide developed. Last week 100 tons were milled and an output of more than 10 tons of high-grade blende resulted. The Tuxedo is one of the J. M. Short properties, and a mill is planned for it in the near future.

The Joplin Ramage plant resumed operations Nov. 11. This mine had been closed down for the past 2 months. It is one of the best properties in Joplin, the mill having a capacity of 1000 tons per day. Work is carried on in a sheet-ground formation at a depth of about 175 ft. H. H. Hartzell is superintendent, having formerly had charge of the Granby Mining & Smelting Co.

The Kenefick Zinc Co. is making steady progress on their new shaft north of the Coyote Mine in West Joplin. A depth of about 80 ft. has been made and most of the way has been extremely hard. The ore formation is expected to be about that which is now being mined successfully by the other Kenefick companies to the south, the Coyote and the Airedale.

Eakman & Co., on the Gregg land in Jackson Hollow southwest of Joplin, are developing a mine that looks promising. The company is composed of relatives. They are Riley, Alex. Arthur, William and Harvey Eakman, all of Jackson Hollow. Operation was started a month ago. The property is on the same ground as the old M. I. & O. mine, which several years ago was one of the biggest producers in the Jackson Hollow camp.

Webb City, Mo.

Not only is the bonanza face of rich sheet ground ore opened up some 3 weeks ago at the Evans-Hall-Soy mine at Duenweg continuing as rich and promising, but another good strike has been made in a drift to the north of the mill.

Cartersville, Mo.

Operations have been started at the Mont B. Mine, north of Cartersville, after a shut-down of about 2 months. The drifts were drained and men put to work in the drifts early this week. Twelve new sludge tables have been installed and new engines substituted or added to those already in use, and the mill building was overhauled and enlarged.

Galena, Kans.

Good production is being recorded at the Wayland mine, at Galena. Last week the total output from the tract under control of this company was 150 tons of blende and 5 tons of lead. The construction of the Murphy flume is gradually bringing back into the producing column many properties that were put out of business by flooding.

The Lone Elm ground is now being completely opened as a result of the rebuilding of the Murphy Flume. Also, the Premium Mining Co. just got into the ground again last week, after a long, hard fight with pumps, and several small subleasing companies are getting busy once more.

The Mustain Mining Co. is having good success with mining operations at Cave Springs where it has a lease of the Hartley land. This company recently did away with its horse hoister and has installed a complete steam rig. J. W. Mustain is general manager.

MONTANA.

Butte.

The Mines Operating Co., said to be connected with the Guggenheims, has been formed to operate the Butte Duluth, and have a 5 years' lease on the property. The president and general manager will be Al Frank. Salt Lake; Charles W. Whitney and E. L. Newhouse, Jr., Salt Lake, and John MacGinnis and H. A. Frank of Butte will assist the president.

Whitney will be vice president and E. L. Newhouse, Jr., secretary.

Bannack.

Machinery is now being shipped and installed at the Original Bannack. The main shaft is to be put down to the 300 level. John F. Cowan is in charge. The miners have opened at a depth of 150 ft. a 50-ft. vein that carries $1\frac{1}{2}$ to 2% copper and \$2 in gold. There is such an unlimited quantity of this low-grade ore already demonstrated, said Mr. Cowan, that the blocking out will be continued during the winter and the management of the company will arrange for the erection of a plant early next year.

Corbin.

G. F. Ferris has ground which is producing Danish pebbles used in various types of revolving crushing machinery at mills. They were \$10 per ton before the war, but since have gone up to \$33. Ferris is selling the pebbles at \$30 per ton.

Wisdom.

It is said that the Saginaw is now the only mine in the district operating on a paying basis. About 8 tons of high-grade ore now being shipped daily.

Clinton.

In reporting on a recent strike of bismuth here, Fred G. Bond, Missoula, Mont., says: "The vein is 6 ft. wide. It is composed of crystalline matter in banded form containing metallic bismuth. The dimensions of some of the larger cubes are $\frac{1}{4}$ by $\frac{1}{8}$ by 1-16 of an inch. Ore was drifted on 45 ft. before discovery of bismuth. It was at first mistaken for lead-silver ore. The hanging-wall is quartzite and the foot-wall Butte granite. About 2 tons are on the dump. The apex of the vein is traceable for 2000 ft., and the property is owned by W. H. H. Dickinson and myself."

Saltese.

H. M. Lancaster, retiring superintendent of the Richmond states that about \$1,000,000 in ore is blocked out. The values are higher than indicated by an early sampling. This is shown by returns on shipments, 1 carload having been settled for on a basis of $15\frac{1}{2}$ % copper, yielding \$1300 after the deduction of treatment and transportation charges. The returns include gold, which runs \$4 to \$5 a ton. Seventeen cars shipped between Sept. 13 and Oct. 20 brought \$20,000 net. These shipments were made from the upper level. The block probably contains 10,000 tons of ore of 10% copper, while there may be as much more in value between the upper and lower levels. There is probably \$400,000 net above the upper level. The lower level, which opens on the Idaho side of the property, has been run to a point under the shaft, where a depth of 320 ft. is attained, and lacks only a short distance of connection.

Superior.

At the annual meeting of the Intermountain Copper Mining Co., held in Spokane on the 2d, Edward Evans was elected president, W. J. Griffith, vice-president; Harold M. Childs, treasurer; Harve H. Phipps, secretary, and Oscar Nordquist, general manager. The officers also compose the directorate. A dividend of a half a cent a share, or \$8250, was declared, payable Nov. 20 to stockholders of record Nov. 10. This is the second dividend by the company, one of equal amount having been authorized for Oct. 20. The company owns and is operating the old Amador mine and recently contracted its output to the B. C. Copper Co. at Greenwood, B. C., securing a very satisfactory rate. Its new mill, a 100-ton daily capacity plant, is in service, and reports state there is sufficient ore to keep the plant supplied for from 3 to 5 years.

NEVADA.

Goldfield.

The shaft of the Silver Pick has gained a depth of 1100 ft. and for about 200 ft. has been in a broken formation largely consisting of quartz. Intrusions of alaskite and shale have been numerous, and several seams of rich ore

have been intersected. A station is being cut and preparations made for extensive crosscutting to the west.

Goldfield Con. reports new equipment for the 1000-ton flotation plant in transit, and installation of the additional thickeners and filters will begin shortly. The underground electric haulage system is complete, and with the flotation plant in commission all ore will be hoisted through the Combination and Clermont shafts. Late development work in the lower workings has been satisfactory.

Rochester.

An agreement has been ratified between the Rochester Merger and Nenzel Crown Point companies, whereby the latter is permitted to develop its holdings through the Pitt tunnel of the Merger. A crosscut will be driven from the tunnel to cut through Nenzel hill, and is expected to intersect a series of promising shoots, that have been indicated by surface prospecting. A substantial interest has been purchased in the Rochester Merger by Clyde A. Heller, president of the Tonopah-Belmont Co.

Bullionville.

The new mill of the Prince Con. is making a satisfactory gold and silver extraction. The plant has a rated capacity of 100 tons and the management states 120,000 tons of tailings are available. Milling tests indicate the material will net approximately \$5 per ton. Some difficulty has been experienced in removing the weeds that have grown luxuriously on the old dumps, and a tube-mill has been provided to remove the weeds and reject them from the mill feed. The mine, at Pioche, is shipping about 400 tons daily, with developments keeping reserves well ahead of extraction. President A. H. Godbie has just concluded an inspection of mine and mill, and expresses himself well pleased.

Las Vegas.

Important development in Eldorado Canyon recently is the discovery of platinum on the Eldorado Enterprise G. M. Co.'s property.

The first assay for platinum was made by H. H. Wheeler, Needles, California. The second assay was also submitted to Wheeler for a check and was found to carry 0.20 oz. platinum per ton, or \$20.10. Much higher assays are anticipated as the samples referred to were mostly surface ore from the gold bearing ledge. Assays from this property showed also good values in gold and silver.

The property has a well defined ledge. It is opened for intervals of 500 ft. along the vein. E. P. Jeanes is president.

Ore carrying values high in gold was uncovered on the Woods lease which adjoins the Carnation claim. The body is an extension of the Carnation and promises to be quite as interesting.

The recent strike on the Carnation cannot be over-estimated. Spencer, Kerchener and Welk, leasers, now have assays which show good values per ton in gold and silver and increasing in value as development proceeds. The general samples across the ledge, which is now $4\frac{1}{2}$ ft. wide, are said to show high values in gold and silver.

German, Fisher & Herman, leasers on the Lombard claim which adjoins the Carnation are now securing figures preparatory to installing a stamp mill and cyanide plant in the near future to mill their ores taken from this property.

Spencer, Kerchener and Welk have taken a bond and lease on a group of claims adjoining the Quaker City Mine, a large producer of gold in the past. The Quaker City belongs to the Wharton Estate. A company known as the Fifth Avenue Gold Mining Co. is now in the process of organization. E. P. Jeanes, owner of the McKinley Group, is erecting new camp buildings on this property. Several new leases have been taken by parties from Good Springs and elsewhere during the past week.

Tonopah.

Sinking of the Victor shaft of the Tonopah Extension is proceeding satisfactorily and lateral work from the new level will begin shortly. On the 1540 level stoping is proceeding on the Murray and North Merger veins.

Denio.

Numerous improvements are being made at the Ashdown mine, a few miles southwest of Denio. The mill is crushing

40 tons daily, and its capacity will be doubled soon. The 2-mile pipeline is being covered and other precautions taken to prevent interference by winter storms with activities. Good ore is coming from a number of levels. Operations are carried on by way of tunnel No. 10, the main working level. The 10 different tunnels are all connected.

Rawhide.

The ore body lately encountered at a depth of 650 ft. in the Nevada New Mines group continues to develop splendidly. It was struck in the drift from the Victor shaft and has broadened from its original 12 ins. to 4 ft. It is largely of sulphide character with assays averaging around \$60. Silver is largely in the predominance. At several other points in the property good ore is being mined and the outlook is decidedly good. The two mills are running at capacity. The group forms a merger of the Rawhide Queen and Rawhide Coalition mines.

Late discoveries in the Nevada New Mines property, formerly the Rawhide Coalition and Queen mines, have been particularly satisfactory. Near the 600 point the Victor and Phoenix veins have formed a junction the ore is being followed by a winze. Gold-silver specimen ore shows, and the general run of mill ore is stated to be averaging around \$15. In the Black Eagle mine a strong shoot of \$13 ore, 2 ft. wide, has been struck near surface in virgin ground. The 20-stamp Black Eagle mill is running on ore from both properties. E. W. King is manager.

Gold Mountain.

Thomas Grimes and Gus Hansen have started shipping from their lease on the Tonopah Divide mine to the West End mill at Tonopah. The ore is coming from the tunnel at a depth of 100 ft. and averages around \$40 in gold. The first shipment contained 50 tons. Several properties are being worked in this locality and indications are considered promising for development of a number of producers. Most of the work is done by lessees.

NEW MEXICO.

Santa Rita.

The September output of the Chino Copper Co., 7,397,000 lbs., notwithstanding a short month, represents an increase of 1,000,000 lbs. over the August production, and 2,000,000 lbs. over the corresponding month a year ago.

With the inauguration of a new and more extensive plan of development the Santa Rita Development Co. is having its property examined by Walter Harvey Weed. In connection with development considerable diamond drilling will be done. The capital stock of the company is \$1,000,000. Of this amount 300,000 shares have been underwritten and sold. H. W. Loomis is superintendent and James E. Suits has been elected secretary and manager. Suits was the original promoter of the El Tigre gold mines in northern Sonora, Mexico.

Lordsburg.

Development through No. 3 shaft is to be commenced at the Bonney Co.'s mine which was recently taken over by Chicago capitalists. The company was incorporated as the Western Mining & Development Co. Most of the stock is held by D. J. Evans, Chicago. Development will be continued at the 4th level and a drift run to connect with the No. 2 shaft. Crosscutting will be done and underhand stopes raised from the 4th level. Hoisting will be done from the lower station. The company has closed a contract with the Copper Queen smelter, Douglas, Arizona, for the shipment of 1000 tons monthly. In order to hold to this mark the company plans to block out ore at all possible places.

Mogollon.

Socorro Mining & Milling Co. shipped 23 bars of gold and silver bullion from clean-up for last half of October, a total of 41 bars or a little over 2 tons for the month, from a reduction of 7000 tons of ore.

The product of Mogollon Mines Co. for latter half of month was 13 bars gold and silver bullion, making 28 bars for October, from a treatment of 4100 tons of ore. In addition,

several tons concentrate were shipped to Smelter at El Paso.

The Oaks Co.'s last shipment of ore to custom mill from exploratory work on Clifton mine indicated a value of \$14 per ton. This rock came from the Queen Vein and emphasizes the latent possibilities on this lode that may be expected from adequate and systematic development.

At the Gold Dust properties, on which work was lately resumed, the main tunnel is being retimbered and raises and drifts extended.

Earl C. Cleaveland, who for some time has been acquiring data relative to hydro-electric power possibilities in this locality, has just returned from West Fork of Gila River, where he and associates have run surveys and taken water readings over a period of two years. Thus far the average flow found, under available head, if sufficiently developed, will take care of both present and prospective power requirements of the district. When some such project is consummated the camp will be able to treat profitably an almost unlimited tonnage of low grade ores that otherwise are unavailable under present high power costs.

Lee's Peak.

The Octo Mining Co. has contracted with Wright Bros. to sink a shaft 570 ft. on its property near Lee's Peak, work to begin at once.

SOUTH DAKOTA.

Hill City.

The Hill City mill is now handling ores left in the bins of the Harney Peak Tin Co. as well as custom tungsten ores. A fair extraction is being made and a run of this ore resulted in cleaning up 1500 lbs. of tin concentrates. The company has erected a smelter near its mill which has commenced successful operation.

The immediate reopening and further development of the Gladiator and Pennsylvania mines is being rumored. It is also stated that the owners of the Gladiator intend erecting a mill.

Custer City.

At the Golden West 200 ft. of crosscutting has been completed. The company will now drift about 150 ft. south and then resume crosscutting. Work was started in the spring. At 400 ft. from the portal the foot-wall of the vein was encountered. Further west the ore-formation was encountered, but as yet the hanging wall has not been reached. The south work will be in the direction of, and eventually immediately beneath, the open-cut from which several thousand tons of ore have been milled.

Keystone.

According to Superintendent F. H. Gira of the Cuyahoga Mining Co., development work has been completed and production started. The ore is sent to the Cleveland Chemical Co., Cleveland, O., and treated for sulphuric acid. It is said that the entire output which runs over 40% sulphur, has been contracted for.

TEXAS.

Terlingua.

Several new cinnabar claims in the Terlingua district are to be developed as soon as the necessary equipment can be brought in and installed. It is stated that a syndicate of Houston men, headed by Morris Wexler, has acquired several sections of land in this part of the Big Bend region upon which there are outcroppings of cinnabar. It is expected that within a short time all of the mines at and near Terlingua which were idle for the last few years will have been placed in active operation. While the principal output of quicksilver now comes from the furnaces of the Chisos Mining Co., of which Howard E. Perry of Chicago is president, several other companies have resumed development work and are getting out considerable quantities of rich ore. The

principal mines are those of the Chisos Co., Mariposa Mining Co., of which James Normand of Marfa, Tex., is president; Texas-Almenden Mining Co., of which Henry Hill of Clifton, Ariz., is president; Study-Butte Mining Co., of which W. B. Burcham is manager, and the Big Bend Mining Co.

Outcroppings of cinnabar ore have been discovered to the east of Terlingua about 60 miles; but, so far, no steps have been taken towards their exploration or development. The quicksilver belt also extends across the river into Mexico from Terlingua. At the time the revolutionary period began in that country several promising claims of cinnabar had been filed upon and were about to be developed.

Sierra Blanca.

The Southwestern Mining Co. is developing a zinc, lead and silver mine near here. It has been making regular shipments of ore to the smelter for some time past. In the 300 level a large body of ore that runs high in lead and zinc and about 50 ozs. of silver was encountered.

Toyah.

The West Texas Sulphur Co. is preparing to exploit two large sulphur deposits which it owns near here. It will install retorts for the treatment of the sulphur-bearing material and a plant for refining the product. It is stated that the beds of sulphur outcrop upon the surface and extend down to unknown depth.

Van Horn.

A. D. Hudson of El Paso and associates, who own a large deposit of turquoise, situated near here, are producing considerable quantities of the gems.

Austin.

The large deposit of celestite ore which is located about 3 miles from Austin may be developed in the near future. It is owned by Judge R. C. Walker of this city. He plans to install a plant for the mining and utilization of the ore.

UTAH.

American Fork.

With the completion of the electric power line to this camp by the Utah Power & Light Co. a new era in mining is expected and it is said that no less than 18 properties will operate through the winter. The line will first be run to the Pacific mine, under bond and lease for 10 years to the Fissures Exploration Co., and also to the mill built by the company on Dutchman flat. The mill is now practically completed.

At the South Park two tunnels are being driven and these will be equipped with power drills just as soon as the power reaches the camp. Some high-grade samples of lead-silver have been found, and the officials of the company are confident that they have the continuation of the Pacific fissure.

The Earl Eagle property has its tunnel in better than 500 ft. and expects that the Miller fissure will be encountered soon.

The Beck Tunnel is in 130 ft. Within the next 70 ft. it is expected that a large ledge will be cut. The front tunnel, which is closed to the Pacific mine, is in 110 ft. It is expected that it will reach its objective in about 200 ft. This work has been stopped until the power line is in.

Garfield.

Into the present tailings pond there has been dumped 50,000,000 tons, besides something like 1,500,000 tons of waste. The latter was used in making the embankment.

The tailings from the Arthur and Magna plants are to be retreated. In behalf of this work part of the \$2,500,000 set aside by the Utah Copper Co. for improvements will be used. The new tailings pond will include 1400 acres located north of the existing tailings pond. Buildings and structures are now being moved to make way for the new pond. With leaching and new methods of concentration it is believed that the tailings can be treated again at a profit. The old pond contains 3500 acres and is $3\frac{3}{4}$ miles long by $1\frac{1}{2}$ wide. The embankment is from 12 to 20 ft. high and it was figured that the ultimate height would at some time reach 80 ft., which

would be equal to two square miles covered to a depth of 90 ft.

Park City.

Judge Smelting & Mining Co. is now developing and blocking ore between the 900 and 1200 levels. The ore was first opened up on the 1200 level. It has been followed for 300 ft. Raises were run on the ore to the 900 level and there the ore continues up. It is a high-grade milling ore, much of the value being in zinc, and if it were not for the high percentage of zinc, much of it could be shipped direct. It varies in thickness from 15 ins. to 15 ft. About 4000 ft. from the shaft a splendid body of ore is being developed above the 1200 and has been followed for 250 ft. Preparations are being made to extend the shaft to the 1900 level. At present it is down 1650 ft. It is the intention to raise from the 1900 level, which is opened up through the Daly West.

At the mill all the steel work is completed and machinery is being installed, which, when in operation, will be run by electricity.

The Broadwater mill has resumed operations on tailings, the installation of new machinery and remodeling having been completed.

By flotation it is shown that the savings on the tailings at the Big Four can be brought up to 90% as compared with the present savings by table concentration of around 60%. The company has also been making tests with an electrolytic process that also shows a saving of better than 90%. In a short time one of the new methods will be installed. The tailing beds have been thoroughly sampled. They were laid out in 100-ft. squares and a sample taken at each corner. About 1000 samples were taken. The samples show 4.1% zinc, while the mill run shows it is about 1% higher than the samples showed. About 800 tons are now being treated daily.

Eureka.

The North Lily Co. is intending to immediately start a shaft on the Wicklow property which is part of its ground. Work done some years ago proved a good vein but greater depth will be attained before exploring this vein.

A new shaft, for the completing of which it will take about 7 months, has been started at the Tintic Standard. The shaft will be 3-compartment and will be sunk to 1300 ft. The site of the shaft is 1700 ft. northeast from the old 1000-ft. shaft. Production of the mine in October was 12 cars, bringing \$1400 to \$1500 each. The values are mainly in lead and silver. A blower is being installed to give better ventilation in the lower workings, where a body of commercial ore is being developed.

Sinking on the recently encountered fissure at Sioux Con. is progressing, and the fissure seems to remain as when first encountered. The winze has reached 100 ft. below the 600 level and sinking is still in progress. Owing to the scarcity of men the company is using but one shift but as soon as possible the force will be increased. Contractors, Duncan & Allen, have put the shaft down about 60 ft. since work started Oct. 17. They are using three shifts.

The South Standard Mining Co., recently formed to take over ground of the old Montreal Co., will commence work on a vein which was encountered by the latter company while driving a 500-ft. tunnel.

Milford.

Beaver Lake Metals Mining Co. is developing in the Beaver Lake district, northwest of here, a group of 12 claims. On the property is an east-west contact between monzonite and limestone. Operations are in the lime, where there is a fissure running parallel to the contact, 150 ft. north of it; and from this fissure there are lateral veins cutting northward through the lime. Present development is confined mostly to one of these lateral veins. An inclined shaft was sunk 90 ft. in ore, and exploration from this showed a vein of well mineralized gangue, from which some ore is being shipped, running about 62% lead, 30% iron and 20 ozs. silver. To operate to better advantage, a working shaft was sunk 150 ft. on the west side of vein. By crosscutting 200 ft. east from the bottom of the shaft to the vein gives a depth of 200 ft. on ore. The crosscut is about completed. Power is supplied by a semi-Diesel engine, which drives an air com-

pressor, and the two hoists over shaft and incline are operated by compressed air. The property is under the management of Lewis Merriam, also manager of Yankee Con. in Tintic district.

WASHINGTON.

Spokane.

The Coeur d'Alene Mine Owners' Association, of which Stanly A. Easton, general manager of the Bunker Hill & Sullivan Mining Co., is secretary, will install a comprehensive display of the minerals of the northern Idaho district in the new quarters in the Spokane hotel of the Northwestern Mining Men's Association, a reorganization of the Spokane Mining Men's Club, the pioneer society in the northwest of men interested in the mining industry. The association has taken a long-term lease on a ground floor apartment in the Spokane hotel building, adjoining the Silver Grill, and connected with it, and is fitting it up as a permanent home for the organization, where open house will be maintained for visiting mining men. Several thousand dollars will be expended renovating the quarters and furnishing them, and the formal opening will take place on the return of the Spokane delegates to the American Mining Congress convention in Chicago. In a letter to President Graham B. Dennis and Secretary Frank C. Bailey of the Northwestern Mining Men's Association, Secretary Easton states that the Idaho Mine Owners' Association has subscribed funds to provide three mineral cabinets in which to display specimens from the Idaho mines. A check for the amount accompanied the communication, and Secretary Bailey was authorized to purchase the cases. "The purpose of the Northwestern Mining Men's Association is to bring into closer relationship the mining men of the different districts in the surrounding territory and to endeavor to secure legislation, both state and national, beneficial to the mining industry," said Secretary Bailey. "Our membership includes all the prominent mine managers and owners and all the reputable mining engineers of our jurisdiction, and in addition there are scores of bankers, business and professional men and newspaper men, a combination of interests that assures representative influence in any movement we may inaugurate."

Republic.

The Lone Pine-Surprise Mining Co. is preparing to begin sinking a 500 ft. shaft on its Last Chance claim, and a 5-drill compressor, hoist and a 100-hp. boiler have been ordered for the work. The contract has been let to C. S. Cox and J. E. Henwood of Kellogg, Ida., and sinking will begin as soon as the machinery is delivered and installed. The Last Chance has been entered from the workings of the Insurgent mine, adjoining, and the ore bodies have been proven to the 540 level. It is believed that the Insurgent vein, from which several hundred thousands of dollars worth of ore were extracted by leasers and option holders, dips into the Last Chance lines, and the company plans to explore the ground thoroughly from the proposed shaft. The Co. is a Spokane corporation, and the most of the stockholders are residents of the Inland Empire. Sufficient capital to finance the development planned already is available, and it is believed that the property will be placed on a producing basis again in the next few months.

Chewelah.

Under C. F. Weist the Silver Queen group is to be exploited during the winter months. Jake Schoenberg has also taken a crew in to explore the ground of the Silver Antimony Co.

The Blue Star lead-silver mine has been leased to Spokane interests. Heavier equipment has been installed at the Juno-Echo and will sink to 150 ft. Conditions have been improved and the shipment of several cars of copper has been made. The company is said to have a good treasury fund. This, with the returns on further shipments, is expected to provide all of the money for development.

Since completion of its shaft to the 500 level the Security Copper Co. has cut a station there. Sinking was resumed with the 550 level as the objective. It is believed

the additional 50 ft. will care for the water when the veins are crosscut without the addition of other machinery. Two shifts are engaged.

Casper.

The Midwest Oil & Midwest Refining companies recently purchased a half interest in the production of the Elkhorn for \$25,000, besides agreeing to put down four shallow wells, the aggregate expenditure of this being an additional \$5000.

Recently the Elkhorn Oil Co. brought in its second oil well on the north side of Platte. The sand was penetrated by the Green Distilling Co. at a depth of 938 ft. and was drilled into only 11 ft. The well filled immediately with a fine quality of light oil, and did so in such a short time that it was necessary to pull the tools. Tankage capacity is being rushed to the scene. The oil from the well is temporarily run into tankage south of the river to prevent loss.

Colville.

The Surprise mine of the Walla Walla Copper Co. is to be opened soon. Manager Malin says: "As soon as the power plant is tested out, a transmission line will be constructed to the main workings of the mine where an engine house and a new blacksmith shop is now under construction. The property will be equipped with a compressor, electrically driven, machine drills, hoist, etc. The adit tunnel will be wired for electric lights and the station at Surprise shaft will be enlarged for the construction of a head frame. The ore deposits will be developed from the Surprise shaft, which will be sunk to the 100 level and crosscuts run. The mine will be operated with two shifts within the next month."

WISCONSIN-ILLINOIS.

Highland.

Saxe-Lampe Mining Co. shipped 1 car to Mineral Point Zinc Co. and 1 car mixed blende to National Zinc Co., Springfield, Ill. The Eagle-Picher Lead Co. closed on several lots of carbonate zinc, 3 cars, 112 tons.

Platteville.

Delivery of ore for the month of October was shown as follows: Zinc, 4,525,400 lbs.; lead, 766,000 lbs., and pyrite, 6,408,000 lbs. The gross recovery of crude concentrate was much lighter than usually reported, 35,640,000 lbs. being reported for the month, while net deliveries were fair, the total clearing the field going 25,580,000 lbs. The Mineral Point Zinc Co. delivered 70 cars of high-grade separator ore to smelter at DePue, 5,232,000 lbs.

Returns for the field for week of Nov. 11 show deliveries of 140 cars of zinc concentrate, 5407 tons. A feature of the week's buying was shown in the sales made to the Eagle-Picher Lead Co. which managed to secure secure 23 cars of choice ore, 1012 tons, some of which had been carried for months. Among the lot was mixed lots of high grade carbonate zinc ore. Shipments of lead were light, only 2 cars being sold, 69 tons. Shipments of pyrites also showed up poorly in the face of higher prices for acid and a better demand for ore, 654 tons clearing. The gross recovery of crude ore for the week was 4453 tons; net deliveries to smelter 3513 tons. Mineral Point Zinc Co. to DePue 14 cars high grade, 518 tons.

A sharp gain in price of blende was noted at the outset of the week, the base jumping from \$75 to \$85 per ton for standard and premium grades of ore with the range down to \$80 for medium and second grades. A better demand was shown for low grade concentrate much of which found its way to separating plants from independent producers. Lead ore was bid up to \$87 per ton base of 80% metal content.

The West End Mining Co. is driving a level into the hillside on lands west of the Klar-Piquette mine both to drain the property and open up a deposit of zinc recently proven and said to be 6 ft. thick.

Shipments from Platteville mines were limited, the Klar-Piquette sending in 1 car recovered from tailings re-milled.

Hodge mine to Cuba 3 cars, 131 tons. Block-House Mining Co., running on medium grade mine run ore is operating its own separating plant and last week shipped 3 cars of 62% blende to Edgar Zinc Co., 118 tons and 2 cars to Eagle-Picher Lead Co. smelter at Collinsville, Ill.; 80 tons.

Linden.

The Milwaukee-Linden Development Co., which closed a deal 2 weeks ago for 1000 tons of concentrates cleared 8 cars last week to Mineral Point, 248 tons. Optimo mines to local refinery 2 cars, 80 tons; Linden Zinc Co. high-grade to Eagle-Picher Lead Co., 40 tons; Ross Bros. to Mineral Point, 30 tons.

Active resumption of zinc ore refining by the Linden Zinc Co. called out 13 cars of ore from nearby mines, 495 tons. Two cars high-grade blende were shipped to smelter, 80 tons. Ross Bros. mine, a consistent producer for 10 years, is reputed to have nearly run its course. Heavy pump equipment is being installed at the Weigle mine for the Milwaukee-Linden Development Co.

The splendid showing made here the first half of the year has been followed by an apparent season of depression. Shipments of zinc ore are light and much ore is held in bin and prospects from the market standpoint are not bright. These drawbacks do not discourage new projects, two of which, recently developed and equipped, are now in running order.

Miffin.

A better condition prevailed last week regarding shipment of zinc ore, all independent producers being accounted for with one car each while the Coker mines made their usual showing 7 cars to Mineral Point, 280 tons. Local producers in the Barreldown district delivered small lots to furnace, 30 tons in all.

Montfort.

The O. P. David mine, in charge of Theo. A. Waesch, Supt., is now in splendid operating order, running on sharp shift of the range toward the north and producing steadily. Two cars of 55% ore were shipped to M. & H. Zinc Co., LaSalle, 80 tons.

Shullsburg.

Rodhams Mining Co. shipped 1 car high-grade jack last week to Lanyon Zinc Co., 41 tons; the Winskill mine sent 11 cars to Wisconsin Zinc Co. separators, 430 tons. Oliver Mining Co. is making ore and has covered its initial consignment.

Dodgeville.

This district, little heard from recently, has several fairly good zinc mines but operators were holding for better prices and shipments for week ending Nov. 11; included 7 cars from the Lucky Five Mining Co., 275 tons, and 3 cars from the Carl Guthrie Mining Co., 106 tons, all to the Eagle-Picher Lead Co. Other producers continue to hold and about 300 tons more remain ready for shipment.

Cuba City.

National Separators Co. received 54 cars crude ore in the past 2 weeks. Shipments for week of Nov. 11, of high-grade refinery ore were made to Illinois Zinc Co., 6 cars, 224 tons; American Zinc Co., 5 cars, 217 tons. The latter is now more active on buying and is cutting in appreciably on other large buying firms. Linden Zinc Co., operating a refinery here as well as at Linden, shipped 1 car high-grade, 40 tons.

Hazel Green.

The regular shippers, Kennedy, Cleveland and Lawrence mines, gave their weekly accounting for Nov. 11; 8 cars, 310 tons. The Monmouth Zinc Mining Co., one of the new projects of the year with full equipment, suspended operations and is giving attention to more thorough exploration of the leasehold. The McMillan Zinc Co., with new equipment, extensive exploration work, etc., has so far failed to report shipment of zinc ore.

Benton.

Two new producers have been ushered into active co-operation with regular performers, one for the Wisconsin Zinc Co. on the Longhorn farm which began trial run on

Nov. 15. The plant will be able to handle 400 tons daily and will have an auxiliary mine to draw from on the Murphy land adjoining where a new shaft is in ore and is now being equipped with necessary machinery. A surface tram is being laid between this new producer and the main Longhorn.

Reports handed in for week of Nov. 11 showed shipments of 55 cars of zinc concentrate, 4,344,000 lbs.

Another new producer is now producing on the Grotkin land for J. H. Billingsley, et al; the mill houses a 9 cell jig. The new plant is known as Mill No. 2; and provides an outlet for a large run of ore found just under the flint and 80 ft. above the oil rock, where the Grotkin range is exceptionally strong. Should this top run not prove as profitable as now calculated the shaft will be dropped down 80 ft., picking up the oil rock range.

Potosi.

A. B. Patterson, Supt. of the Tiffany Zinc Co., successors to Tiffany Mining Syndicate, and in charge as General Manager for the Chicago Zinc Co., reports the new 500-ton power and concentrating plant nearing completion and scheduled to make its trial run the first week in December. A rich strike of lead ore on the Horse-Shoe property is one of Patterson's latest finds. The land is being explored with drills at the same time the mine is being opened up. Shipments of high-grade wet concentrates came from the Wilson mine last week, 1 car to LaSalle, 44 tons, and 1 car to Grasselli Chemical Co., 42 tons. All zinc ore deposits found in this section of the Mississippi River valley are practically free of marcasite and a high-grade concentrate is made obviating the necessity of magnetic separator treatment entirely.

CANADA.

BRITISH COLUMBIA.

Silverton.

Two feet of clean galena ore has been opened in the lower tunnel of the Echo mine, which adjoins the Alpha claims of the Standard mine, according to L. J. McAtee of Spokane, who is associated with John Jordan in the operation of the property. Drifts have proved the shoot for about 40 ft., and preparations are being made for crosscutting and raising. The tunnel is in about 700 ft., and gives a depth of 700 ft. The lower tunnel on the Echo is No. 1 tunnel of the Alpha, and was run to the Alpha lines by the Standard people, who found ore. The Standard, McAtee said, is now stopping from a 16-ft. shoot of clean ore which is said to run around 200 ozs. silver. Both the Echo and Alpha properties are in the same big ore zone in which the Standard has found its big shoots. Arrangements are being completed for the winter's work, and it has been decided to increase the force of men employed to 10. Work at the Echo is facilitated by the courtesy of the Standard people, whose tramway runs within 1500 ft. of the operations on the property.

Recent reports state that 3 ft. of clean lead ore has been encountered in the No. 5 tunnel of the Standard mine. This is the third important strike in the property in the last few weeks, two exposures of high-grade lead-silver ore having been made in the upper tunnels of the Alpha claim in September, and these now are being drifted on. A winze now is being sunk on the galena shoot struck a number of months ago in the No. 7 level, and which has been extensively developed on the discovery level.

Both the new tunnels in the upper portion of the Alpha claim of the Standard Silver-Lead Mining Co.'s group continue to show solid galena ore from 3 to 4 ft. wide, according to Charles Hussey, secretary-treasurer. They are on levels only about 40 ft. apart, and the ore body is so twisted that until the workings have been connected up it is impossible to estimate the probable tonnage of ore they will yield. Every one who has inspected the showings is confident that they constitute the apex of another bonanza ore body and the management is now laying out development work which will disclose the extent and trend of the ore shoot. Besides the clean galena, which is unusually high in silver as well as lead, there is a considerable body of fine concentrating ore

disclosed in the new workings. On the No. 7 tunnel level, which has long been in a body of zinc ore, a crosscut was recently driven to the north 100 ft., resulting in the disclosure of a parallel vein which is now believed to be the ledge in which the main workings of the mine are situated. An up-raise in the new vein has opened a stringer of clean galena on the hanging wall which is identical in character with the ore heretofore produced from the bonanza ore shoot. Near the mouth of the No. 7 tunnel is a body of clean galena about 100 ft. long and 3 ft. wide to which no attention has been devoted beyond stoping out the ore which occurred above the tunnel level. A winze is now being sunk on this ore. The company is consequently developing shoots of clean ore in the two extremes of its ground, at the same time that its workings in the No. 7 tunnel are either opening up a new ledge or are for the first time exploring on that level the ledge from which all the mine's production to date has come.

A winze is being sunk in the No. 7 level of the Standard on clean galena which was recently encountered. The new ore body in the Alpha claim is maintaining itself under development and a new find of 3 ft. of clean lead ore has been made in No. 5 tunnel.

Ferguson.

At the Triune mines in No. 3 tunnel, 400 ft. from the portal, a crosscut was made and a new vein of high-grade struck. The ore assays 300 ozs. silver, besides gold and lead values. The lead gives a stoping ground of over 300 ft., and will be caught again by No. 4 tunnel, which is now in 600 ft. It is estimated 50 ft. further in No. 4 will strike the new vein. Next season is expected to see the Triune a steady shipper. Next year Manager Battey hopes to be able to put in an aerial tram from the mine down Triune creek to the wagon road at Eleven-Mile and from there deliver it by auto trucks to the head of navigation.

Rambler-Cariboo recently received a check for \$4587 for a shipment of ore running 101.7 ozs. silver and 46.6% lead. In addition to the payment just received, the company received a check recently for \$14,260 in payment for 513 tons of zinc concentrates shipped to the Kusa Smelter Co. in April. The gross value was \$21,197, the freight \$5431, and the duty \$1504. The company has a further asset in its possession of 1000 tons in the zinc stockpile, valued at \$28,000 net, to which a production of \$2000 a month may be added. A sale of the zinc will be negotiated by A. F. McClaine, president, while in the east this month. The zinc content of the spring shipment was 33.09% and silver 28.43 ozs. The duty was \$2.80 and freight \$10.10 per ton.

Sudbury.

The International Nickel Co. produced in August 7,600,000 lbs. of nickel. This is a great increase over any previous month. During the year ending June 30, 1916, Canada exported to the United States 52,742 tons nickel-copper matte containing 64,622,286 lbs. nickel, and worth about \$16,000,000. During the same period Canada exported a large quantity of nickel-copper matte to Wales. The nickel contents of matte shipped to both countries will total about 76,000,000 lbs., worth about \$19,000,000. In other words, there was shipped during the year ended June 30, 1916, from the smelters in Ontario, matte worth about \$24,000,008. The metals in the matte when refined would be worth about \$40,000,000.

Vancouver.

The Coast Copper Co., capitalized for 1,000,000 shares at \$1 each, has been organized in British Columbia, and the headquarters of the corporation will be at Trail. The stated purpose of the company is to acquire from M. W. Bacon and W. E. Cullen of Spokane by purchase, 31 mineral claims and an option on 14 others, together with the equipment already installed, in the Quatsino district, Vancouver island. Reports received from Nelson state that the Coast Copper Co. is a subsidiary of the Consolidated Mining & Smelting Co. of Canada, and that the holdings mentioned are those of the Quatsino Copper Co., in which other Spokane men than Bacon and Cullen are extensively interested. If this report is correct, and there is every reason to believe that it is, it means that important development is assured for the Quatsino district, as the Consolidated has the capital and the talent to bring into production the immense copper deposits in that

field. The Quatsino holdings at one time were under option to the Stewart Mining Co., but, following an adverse report from an engineer the option was allowed to lapse. During the life of the option considerable development was done, and it is said that immense bodies of low-grade copper ore were proven. No deep development was done, however, and the belief prevails that only work at depth will reveal ore bodies worth while for operations on an extensive scale. It is said that in recent months engineers representing the Consolidated have made exhaustive examinations of the groups, and that their reports were satisfactory. The Quatsino holdings are several miles inland from June Landing on Quatsino Sound, but a railway line has been surveyed from tidewater to the mine workings, and there is no doubt but that this line will be constructed if the Consolidated makes the purchase. Nearly the entire distance will be heavy construction, owing to the mountainous nature of the region, but there are no particularly difficult engineering problems to solve. June Bay is an excellent harbor, and deep-sea vessels can easily berth at the landing, a condition that assures cheap transportation to the smelters for the output of the property.

ONTARIO.

Cobalt.

As a result of favorable returns from a recent thorough sampling the Little Nipissing is to be worked by Detroit and Toronto interests which have a lease on it. The workings are connected with those of Peterson Lake and Seneca on the 155 level. When this level was reached through the 325-ft. Little Nipissing shaft considerable water came in from the other properties. A concrete bulkhead was put in so that now one pump working 3 hrs. a day can handle the water. Pumping has been resumed and the shaft will be unwatered a few feet further. On the 100 and 155 levels some high-grade has been found in three veins in the old workings, also a considerable amount of low-grade in the old stope at the 100 level. It is understood that operations will be under way on a large scale in the very near future.

Port Colborne.

The Foundation Co. Ltd., Montreal, is to start work at once on the refinery which the International Nickel Co. is to put up near here. It will cost about \$5,000,000. The plant is being erected $\frac{1}{2}$ mile southeast of the lake city. Eight hundred men will be put to work immediately to rush the reinforced concrete foundations to completion before snow comes. Work, however, will be continued through the winter.

Kirkland Lake.

Labelle-Kirkland intends further development and sinking of its shaft which is now down 275 ft. At the present level the ore body is a good milling grade. A contract for 5000 ft. of diamond drilling has been let for the purpose of ascertaining the extent of the bodies at lower levels, so that plans for the mill, which will probably be installed within the next few months, can be arranged for. It is the intention of the management to put in a mill that will not have to undergo any material changes owing to the volume or the nature of the ore. The property is under the management of Frank C. Loring.

Porcupine.

The installation of a new compressor is now under way at the West Dome Con. and a new shaft will be started immediately 1500 ft. west of the old shaft. About 250 ft. of lateral work has been done at the 300-ft. level. Both east and west drifts are in ore which it is estimated will average \$10. The vein is about 7 ft. wide. In a crosscut on the same level the vein is 5 ft. wide and the ore runs from about \$2.50 to \$10.

Timmins.

The ore treated during September at the Porcupine Crown was considerably higher than during previous months. A lot of ore from the section of the vein lately opened up at one of the lower levels ran very high. Development work is confined to sinking the winze now at the 880 level. It was intended, for a time, to cease sinking and run drifts at the 800. Diamond drilling was resumed at the end of September. Because not enough air could be provided to carry on both operations, development in various levels was stopped.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

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(I) METALS AND ORES

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Fearnside, W. G.—*The Coal Seams of South Yorkshire*. [A paper read before the Sheffield Soc. of Eng.].—Coll'y. Guard. Oct. 20 1916; p 749; pp 1½*; 35c.

Husband, R. H.—*Practical Notes on the Various Systems of Underground Haulage Applicable to Indian Mines*.—Trans. Mg. & Geol. Inst. of India Sept. 1916; p 63; pp 14; \$1.25.

Mathews, P. L.—*Making a Cost Profile*. [Method for plotting costs in curve form].—Coal Age Nov. 4 1916; p 751; pp 1¾*; 20c.

Parr, S. W.—*Chemical Study of Illinois Coals*. [Methods of sampling in the field and laboratory are given with a review of the results of analyses].—Ills. Geol. Surv. Bull. 3; pp 86*.

Shumway, Ralph W.—*The Coal Industry of Colorado*. [A general review of the industry in Colorado and the coal production].—Colo. School of Mines Q'tly April 1916; p 26; pp 7; 35c.

Walker, Sydney F.—*Coal-Face Conveyors Employed in the United Kingdom*. [Describes two styles of conveyors of this type for use in handling coal from the face in thin beds].—Coal Age Nov. 4 1916; p 744; pp 5*; 20c.

Warden Stevens, F. J.—*Coaling at the Panama Canal*. [Describes coaling docks and methods of operation there].—Coll'y. Guard. Oct. 20 1916; p 745; pp 3*; 35c.

—*Mines Inspector's Reports for 1915*. [A report of accidents, operations and labor conditions at mines in Great Britain, being confined mostly to coal].—I. & C. Tr. Rev. Oct. 20 1916; p 483; pp 1; 35c.

Petroleum

Ball, L. C.—*Oil Shales in the Port Curtis District, Queensland, Australia*.—Queen. Geol. Surv. Report.

Cameron, W. E.—*Petroleum and Natural Gas Prospects at Roma, Queensland*.—Queen. Geol. Surv. Report.

Conkling, Richard A.—*The Influence of the Movement of Shales on the Area of Oil Production*.—Bull. A. I. M. E. Nov. 1916; p 1969; pp 4*; 35c.

Natural Gas

Cameron, W. E.—*Petroleum and Natural Gas Prospects at Roma, Queensland*.—Queen. Geol. Surv. Report.

Lewis, James O.; McMurray, W. F.—*The Use of Mud-Laden Fluid in Oil and Gas Wells*. [Describes the system and other methods of details in drilling for the purpose of stopping waste of gas in drilling for oil wells].—U. S. Bur. of Mines Bull. 134; pp 86*; 25c.

(B) STRUCTURALS AND CERAMICS

Concrete

Kirkland, H. B.—*Pneumatic Concreting of the Van Buren Street Tunnel*. [Some tables of details are given].—Mine & Quarry Oct. 1916; p 937; pp 2½*; 20c.

Rossback, N. J.—*Tunnel Construction on the Mill Creek Sewer*. [Methods of operating, drilling, compressed air equipment, lining with concrete and brick, etc., are among things described].—Mine & Quarry; Oct. 1916; p 907; pp 11*; 20c.

(C) OTHER NON-METALS

Fertilizer

Phalen, W. C.—*The Conservation of Phosphate Rock in the United States*. [Published by permission of the U. S. G. S. A detailed description of the deposits and methods of operation in U. S.].—Bull. A. I. M. E. Nov. 1916; p 1901; pp 34*; 35c.

Phalen, W. C.; Hicks, W. B.—*Phosphate Rock in 1915*. [On the market, production, methods of making soluble phosphates and chemical tests for the minerals].—Min. Res. of U. S. II:18; pp 18.

III. TECHNOLOGY

MINES AND MINING

Drilling and Boring

Austin, W. R.—*Boulder Breaking at a Placer Mine, British Columbia*. [Hand feed hammer drills are used for this work].—Mine & Quarry; Oct. 1916; p 922; pp 2*; 20c.

Rossback, E. J.—*Tunnel Construction on the Mill Creek Sewer*. [Methods of operating, drilling, compressed air equipment, lining with concrete and brick, etc., are among things described].—Mine & Quarry; Oct. 1916; p 907; pp 11*; 20c.

Shafts and Shaft Sinking

Cooper, Lloyd D.—*Sinking the Walenberg Shaft, Norway*. [The work was contracted for by E. J. Longyear Co. Operations and methods are described].—E. & M. J. Nov. 4 1916; p 811; pp 3*; 25c.

Rossback, E. J.—*Tunnel Construction on the Mill Creek Sewer*. [Methods of operating, drilling, compressed air equipment, lining with concrete and brick, etc., are among things described].—Mine & Quarry; Oct. 1916; p 907; pp 11*; 20c.

Taylor, M. T.—*Deep-Lead and Drift Mining in Victoria, Australia*. [Describes methods and details of methods used in

going underground for gravel].—Mg. Mag. Oct. 1916; p 207; pp 12*; 50c.

Labor and Management

Bain, Foster H.—*Labor Problems in African Mines*. [Treats on the question of working and living conditions, with respect to sanitation].—Mg. Mag. Oct. 1916; p 199; pp 10; 50c.

— *Mines Inspector's Reports for 1915*. [A report of accidents, operations and labor conditions at mines in Great Britain, being confined mostly to coal].—I. & C. Tr. Rev. Oct. 20 1916; p 483; pp 3; 35c.

Dredging

Payne, H. M.—*Mining the Frozen Gravels of Siberia and the Yukon*. [Details of methods used, results obtained and costs of carrying on operations].—Bull. Mg. & Met. Soc. of Amer. Sept. 30 1916; p 204; pp 11½; 35c.

— *Placer Mining in Yukon, Methods and Costs of*. [Extract of a report published by the Minister of Interior, Ottawa, Ont.].—Canadian Mg. Jnl. Nov. 1 1916; p 506; pp 3¾; 35c.

Tunnels and Tunneling

Rossback, E. J.—*Tunnel Construction on the Mill Creek Sewer*. [Methods of operating, drilling, compressed air equipment, lining with concrete and brick, etc., are among things described].—Mine & Quarry Oct. 1916; p 907; pp 11*; 20c.

Taylor, M. T.—*Deep-Lead and Drift Mining in Victoria, Australia*. [Describes methods and details of methods used in going underground for gravel].—Mg. Mag. Oct. 1916; p 207; pp 12*; 50c.

Haulage and Conveying

Husband, R. H.—*Practical Notes on the Various Systems of Underground Haulage Applicable to Indian Mines*.—Trans. Mg. & Geol. Inst. of India Sept. 1916; p 63; pp 14; \$1.25.

Walker, Sydney F.—*Coal-Face Conveyors Employed in the United Kingdom*. [Describes two styles of conveyors of this type for use in handling coal from the face in thin beds].—Coal Age Nov. 4 1916; p 744; pp 5*; 20c.

Production

Burchard, Ernest F.—*Iron Ore, Pig Iron and Steel in 1915*. [A general review of the industry, with details and a chapter on Lake Superior ores].—Min. Res. of U. S. I:12; pp 54.

Cole, A. A.—*Mining Industry in that Part of Northern Ontario Served by the Temiskaming and Northern Ontario Railroad*.—T. & N. O. Commission; Report.

Henderson, Charles W.—*Gold, Silver, Copper and Lead in South Dakota and Wyoming in 1915*. [The report is made by counties, each state being considered separately].—Min. Res. of U. S. I:13; pp 13.

Hill, James M.—*Barytes and Strontium in 1915*. [Reviews by states and inclusion of a map showing location of deposits].—Min. Res. of U. S. II:15; pp 27.

Phalen, W. C.; Hicks, W. B.—*Phosphate Rock in 1915*. [On the market, production, methods of making soluble phosphates and chemical tests for the mineral].—Min. Res. of U. S. II:18; pp 18.

Schaller, Waldemar T.—*Mica in 1915*. [Production by countries for the world with notes on the occurrence of the mineral].—Min. Res. of U. S. II:21; pp 14.

Schrader, Frank C.—*Geology and Ore*

Deposits of Mohave County, Arizona. [Published by permission of the U. S. G. S. Geology of the district and of several of the mines, with figures on their production is given].—Bull. A. I. M. E. Nov. 1916; p 1935; pp 33*; 35c.

Shumway, Ralph W.—*The Coal Industry of Colorado*. [A general review of the industry in Colorado and the coal production].—Colo. School of Mines Q'tly April 1916; p 26; pp 7; 35c.

Smith, E. A.—*The Development of the Spelter Industry*. [Treats on the production and conditions of the market for the year].—Jnl. Soc. of Chem. Ind. Oct. 16 1916; p 996; pp 2½; 60c.

— *Transvaal Chamber of Mines Report for 1915*. [A general account of the mineral industry in the state].—Transvaal Chamber of Mines Report.

Mining Costs

Davies, R. S.—*Hydraulic Packing at Ballapur Colliery, India*. [Costs and details of operation are given].—Trans. Mg. & Geol. Inst. of India Sept. 1916; p 53; pp 10; \$1.25.

Mathews, P. L.—*Making a Cost Profile*. [Method for plotting costs in curve form].—Coal Age Nov. 4 1916; p 751; pp 1¾*; 20c.

Payne, H. M.—*Mining the Frozen Gravels of Siberia and the Yukon*. [Details of methods used, results obtained and costs of carrying on operations].—Bull. Mg. & Met. Soc. of Amer. Sept. 30 1916; p 204; pp 11½; 35c.

— *Placer Mining in Yukon, Methods and Costs of*. [Extract of a report published by the Minister of Interior, Ottawa, Ont.].—Canadian Mg. Jnl. Nov. 1 1916; p 506; pp 3¾; 35c.

MILL AND MILLING

Flotation

Pilgrim, Earl R.—*Flotation Tests on an Antimony Gold Ore*. [Tests conducted at the Washington College of Mines].—E. & M. J. Nov. 4 1916; p 820; pp ¾; 25c.

Wright, W. H.—*Flotation Experiments, Department of Research and Testing, Colorado School of Mines*. [Tables and curves showing the results of tests made on a lead-zinc-gold-silver-copper ore with many different oils].—Colo. School of Mines Q'tly April 1916; p 1; pp 25*; 35c.

— *A New Flotation Oil and a New Source of Flotative Agents*. [Discussion of papers by Maxwell Adams and G. H. Clevenger].—Bull. A. I. M. E. Nov. 1916; p 1897; pp 3; 35c.

— *Inspiration, History of Its Flotation Process*. [Discussion of a paper by Rudolph Gahl].—Bull. A. I. M. E. Nov. 1916; p 1879; pp 18; 35c.

Concentration: Sorting, Sizing, Washing

Fleck, Herman.—*A Treatise on Molybdenum*. [An account of its mineralogy and places of occurrence is followed by a description of general methods of concentrating and smelting the ores. Uses of the metal are given].—Colo. School of Mines Q'tly July 1916; p 22; pp 11; 35c.

Jobke, August F.—*Improved Magnetic Separator*. [A description of the author's improvement in magnetic separators. It is brought out that inertia of the particle causes it to pass the magnetic zone].—E. & M. J. Nov. 4 1916; p 817; pp 3*; 25c.

Loomis, Albert G.; Schlundt, Herman.—*Some Experiments on the Concentration of Radium in Carnotite Ores*. [A

general description of processes, with details].—Jnl. Ind. & Engg. Chem. Nov. 1916; p 990; pp 6; 60c.

CHEMISTRY AND ASSAYING

Chemistry

Broderick, T. M.—*Some Experiments Bearing on the Secondary Enrichment of Mercury Deposits*. [Deals mostly with the geochemistry of this process of genesis].—Eco. Geol. Nov. 1916; p 645; pp 7; 60c.

Johnson, J. E., Jr.—*The Chemical and Physical Properties of Foundry Irons*. [On the properties as varied by the carbon content].—Met. & Chem. Eng. Nov. 1 1916; p 7½*; 35c.

Parr, S. W.—*Chemical Study of Illinois Coals*. [Methods of sampling in the field and laboratory are given, with a review of the results of analyses].—Ill. Geol. Surv. Bull. 3; pp 86*.

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Waddell, J.—*The Volumetric Determination of Lead*.—Analyst No. 16 1916; p 270; pp 3; 35c.

Assaying

Heath, George L.—*The Analysis of Copper and Its Ores and Alloys*. [Methods of analysis and assay for different products containing copper].—McGraw-Hill; book; pp 292*; \$3.

King, J. T.—*Pulp and Metallic Assays*. [Abstract from the Jnl. of Am. Chem. Soc. Derives a formula for computing the value per ton from the assay of metallics which carry the ore's values and is separated from the pulp].—E. & M. J. Nov. 1 1916; p 827; pp ¾; 25c.

Analysis

Parr, S. W.—*Chemical Study of Illinois Coals*. [Methods of sampling in the field and laboratory are given, with a review of the results of analyses].—Ill. Geol. Surv. Bull. 3; pp 86*.

Waddell, J.—*The Volumetric Determination of Lead*.—Analyst No. 16 1916; p 270; pp 3; 35c.

METALLURGY

Electrometallurgy

Morse, E. C.—*Electrolytic Precipitation*. [Gives details of equipment and methods used in operating and testing a combination cyanide and amalgamation system as regards depositing the gold and silver with electricity].—M. & S. P. Oct. 28 1916; p 622; pp 2¾*; 20c.

Uhler, Horace S.; Browning, Philip E.—*On the Electrolysis and Purification of Gallium*. [Details of procedure are given].—Amer. Jnl. of Sci. Nov. 1916; p 389; pp 10*; 60c.

Thermic Metallurgy

Fleck, Herman.—*A Treatise on Molybdenum*. [An account of its mineralogy and places of occurrence is followed by a description of general methods of concentrating and smelting the ores. Uses of the metal are given].—Colo. School of Mines Q'tly July 1916; p 22; pp 11; 35c.

Gillett, H. W.; James, G. M.—*Melting Aluminum Chips*. [Tests and methods of smelting, particularly in the electric furnace. Methods of testing and practical methods of procedure are given].—U. S. Bur. of Mines Bull. 108; pp 88; 20c.

Henrich, Carl.—*The Function of Alumina in Slags*.—Bull. A. I. M. E. Nov. 1916; p 2081; pp 6; 35c.

Lindau, S. Paul.—*Matte Granulation at Herculaneum, Mo.* [Method used by the St. Joseph Lead Co., Mo.].—Bull. A. I. M. E. Nov. 1916; p 2057; pp 5*; 35c.

Refractories

Dudley, Boyd, Jr.—*The Thermal Conductivity of Refractories*. [Data, tests and formulas for making computations with are given].—Amer. Electrochem. Soc. Adv. Paper 2; pp 44*; 35c.

McDowell, J. Spots.—*A Study of the Silica Refractories*. [Published by permission of the Massachusetts Inst. of Tech.].—Bull. A. I. M. E. Nov. 1916; p 1999; pp 57*; 35c.

POWER AND MACHINERY

Electricity

Jobke, August F.—*Improved Magnetic Separator*. [A description of the author's improvement in magnetic separators. It is brought out that inertia of the particle causes it to pass the magnetic zone].—E. & M. J. Nov. 4 1916; p 817; pp 3*; 25c.

Compressed Air

Kirkland, H. B.—*Pneumatic Concreting of the Van Buren Street Tunnel*. [Some tables of details are given].—Mine & Quarry Oct. 1916; p 937; pp 2½*; 20c.

Lucht, F. W., Jr.—*A Study of the Compressor Indicator Diagram*. [Discusses theory principally].—Colo. School of Mines Q'tly July 1916; p 16; pp 4*; 35c.

Rossback, E. J.—*Tunnel Construction on the Mill Creek Sewer*. [Methods of operating, drilling, compressed air equipment, lining with concrete and brick, etc., are among things described].—Mine & Quarry Oct. 1916; p 907; pp 11*; 20c.

Schultz, J. E. M.—*Central Air Plant at a Georgia Quarry*. [The quarry, compressor plant and equipment are described].—Mine & Quarry Oct. 1916; p 924; pp 5*; 20c.

Recent Improvement in Air Compressors.—Mine & Quarry Oct. 1916; p 930; pp 5½*; 20c.

Combustion Engines

Daugherty, S. R.—*Heavy-Oil Engines*. [Abstract of a paper read before the A. I. of Mech. Eng.].—Canadian Eng. Nov. 2 1916; p 362; pp 1¾; 35c.

Gas Producers, Producer Gas

Greaves-Walker, A. F.—*The Operation of a Producer Gas Fired Chamber Kilm.*—B. & C. Rec. Oct. 3; p 595; pp 3½*; Oct. 17 1916; p 711; pp 2½*; 70c.

IV. MISCELLANEOUS

Miscellaneous Costs

Rain, Foster H.—*Labor Problems in African Mines*. [Treats on the question of working and living conditions, with respect to sanitation].—Mg. Mag. Oct. 1916; p 199; pp 10; 50c.

Testing

Gillett, H. W.; James, G. M.—*Melting Aluminum Chips*. [Tests and methods of smelting, particularly in the electric furnace. Methods of testing and practical methods of procedure are given].—U. S. Bur. of Mines Bull. 108; pp 88; 20c.

Lucht, F. W., Jr.—*A Study of the*

Compressor Indicator Diagram. [Discusses theory principally].—Colo. School of Mines Q'tly July 1916; p 16; pp 4*; 35c.

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Wright, W. H.—*Flotation Experiments, Department of Research and Testing, Colorado School of Mines*. [Tables and curves showing the results of tests made on a lead-zinc-gold-silver-copper ore with many different oils].—Colo. School of Mines Q'tly April 1916; p 1; pp 25*; 35c.

Metallography

Jeffries, Zay.—*Grain Growth Phenomena in Metals*.—Bull. A. I. M. E. Nov. 1916; p 2063; pp 11*; 35c.

Law, Legislation, Taxation

Revision of the Mining Law. [Proposals of the Mining & Met. Soc. of America regarding the law, with correspondence and discussion by members].—Bull. Mg. & Met. Soc. of Amer. Sept. 30 1916; p 185; pp 19; 35c.

Conservation

Cady, Gilbert H.—*Cool Resources of District VI*. [Describes details of the formation of small areas separately].—Ills. Geol. Surv. Bull. 15; pp 94*.

Phalen, W. C.—*The Conservation of Phosphate Rock in the United States*. [Published by permission of the U. S. G. S. A detailed description of the deposits and methods of operation in U. S.].—Bull. A. I. M. E. Nov. 1916; p 1901; pp 34*; 35c.

History

American Mining Congress, the Formation and Achievements of. [An account of the Congress, its meetings, etc., from its beginning in 1897].—Mg. World Nov. 4 1916; p 775; pp 9*; 10c.

Inspiration, History of Its Flotation Process. [Discussion of a paper by Rudolph Gahl].—Bull. A. I. M. E. Nov. 1916; p 1879; pp 18; 35c.

Societies

Hall, R. Dawson.—*Concluding Sessions of National Safety Council*.—Coal Age Nov. 4 1916; p 749; pp 2; 20c.

American Mining Congress, What Will Be Done at the Chicago Meeting.—Mg. World Nov. 4 1916; p 786; pp 6*; 10c.

American Mining Congress, the Formation and Achievements of. [An account of the Congress, its meetings, etc., from its beginning in 1897].—Mg. World Nov. 4 1916; p 775; pp 9*; 10c.

South Staffordshire and Warwickshire Institute of Mining Engineers. [The 49th annual meeting].—Coll'y Guard. Oct. 20 1916; p 748; pp 1; 35c.

General Miscellany

Park, James.—*A Text Book of Practical Hydraulics*. [A college text and reference for practical engineers].—J. B. Lipincott; book; pp 284*; \$4.

Jos A. Holmes Safety Association, Who's Who in.—Mg. World Nov. 4 1916; p 795; pp 2¾*; 10c.

Ore and Metal Markets; Prices-Current

New York, Nov. 16, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London during the week ended Nov. 15 were as follows:

	New York, cents.	London, pence.
Nov. 9.....	71½	34¼
10.....	71½	34¼
11.....	71½	34 1/16
13.....	71½	34 3/16
14.....	71½	34 3/16
15.....	71½	34 3/10

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London		Standard Oz.
	1916	1915.		1916.	1915.	
	High.	Low.	Avg.	Avg.	Avg.	
January	57½	55½	56.775	48.890	26.875	22.744
February	57	56½	56.755	48.477	27.000	22.759
March	60½	56½	57.935	49.926	27.080	23.650
April	73½	60½	64.415	50.034	31.375	23.259
May	77½	68½	74.27	49.915	34.182	23.560
June	68½	62½	65.02	49.072	31.038	21.577
July	65	60	62.94	47.519	29.870	22.950
August	67	64	65.50	47.178	31.25	22.750
September	69½	67½	68.515	48.68	32.18	23.600
October	69½	67½	67.855	49.385	32.21	23.923
November .....	.....	.....	.....	51.713	.....	24.640
December .....	.....	.....	.....	55.038	.....	26.232
Year .....	.....	.....	49.690	.....	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Business in copper last week was in itself tremendous. Orders for 350,000,000 lbs. were taken. One purchase involving 100,000,000 lbs. for delivery in the first quarter of next year started the market on a sharp upward reach to higher prices. The French inquiry will become active very shortly. As yet producers have not been definitely approached, although they have been informed of the fact that such an inquiry is in the market. When England bought 448,000,000 lbs. only a month ago the trade thought that foreign buying was completed for some time to come. The decision of the French government to buy 225,000,000 lbs. at this time is likely to influence England to do the same thing. Therefore the copper market instead of merely enjoying a temporary demand for second half business is likely to experience a tremendous absorption of the red metal. Some important producers assert that very heavy selling for the second half is in prospect. One authority predicted that before the movement came to a close the producers will have written orders for at least 75% of their second half output into their books.

Prices are extremely difficult to quote. All copper for delivery prior to June is subject to negotiations. Sellers will not give quotations except on firm inquiries. While spot sold at 32¼ cts., it is stated that business at 35 cts. could now be done. Casting copper has sold freely for the first quarter at 29 cts. Sellers of lake copper have also obtained a very large business at prices ranging from 30 to 31 cts.

Acting under the influence of the strong cables from this side, the London market has advanced electrolytic going up to £152 for spot. Standard copper has advanced to £128 10s for spot and £123 10s for futures.

Quotations for copper per pound at New York for the week ended Nov. 15 were as follows:

(For first quarter delivery.)

	Lake.	Electrolytic.	Casting.
Nov. 9.....	29½ @ 30	29½ @ 30	27½ @ 28½
10.....	30 @ 30½	30 @ 30½	28 @ 28½
11.....	30½ @ 31	30½ @ 31	29 @ 29½
13.....	30¾ @ 31½	30¾ @ 31½	29 @ 29½
14.....	31 @	31 @	29½ @ 30
15.....	31 @	31 @	29½ @ 30

Quotations for copper per ton at London for the week ended Nov. 15 were as follows:

	Standard		Electrolytic.
	Spot.	Futures.	
Nov. 9.....	£124 10s	£120 10s	£148
10.....	124 10	120 10	148
11.....	124 10	120 10	148
13.....	126 10	121 10	149
14.....	128 10	123 10	152
15.....	129 10	125	153

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	28.00	28.75	17.758
October	29½	29.00	29.18	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	
January	25.50	23.00	24.101	13.707
February	28.60	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	28.00	28.75	17.705
October	29½	29.00	29.18	17.859
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	27.00	25.50	26.40	116.10	68.560
October	28.50	27.00	27.31	117.25	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—Small arrivals and difficulty in obtaining export permits from the English government have acted to send tin to higher levels. Spot straits has sold up to 43½ cts., with spot Banka selling at 42½ to 43 cts. The spot position is very strong. Although the statistics showed a large stock on hand on the first of the month, it is ascertained that the bulk of this tin in store is for the account of leading consumers. There was a fair demand for January, February and March arrivals, but sellers could not offer, as London cables told of the difficulty in securing permission to make shipments. Some of the tin on the Glenlogan was for American account. Banka tin ex steamer Rotti due in January sold at 41¼ cts. London offered December arrival at 42¼ cts. and the trade quickly took up these offers, the price later advancing to 43½ cts. Limits from the east for April, May and June shipments ranged from 41¼ to 42¼ cts., but con-

sumers were mainly interested in nearer shipments. Arrivals of tin since the first of the month total only 500 tons. The stock afloat to this country totals 4202 tons, of which 2952 tons are on unnamed steamers, so that the outlook for November imports is not very good. Last week straits tin at London advanced £2 5s to £185, with further advances this week.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Nov. 15 were as follows:

	New York		London, Straits, spot.	Singapore shipments.
	Spot.	November.		
Nov. 9.....	43c	42½c	£184 5s	£186 10s
10.....	43½	43	185	186 10
11.....	43½	43	185	186 10
13.....	43½	43½	186 5	187 5
14.....	44½	44½	188	189
15.....	44½	44½	188	189

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.68	34.586
September	39.50	38.00	39.00	33.13
October	44.00	39.37½	41.17	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—Demand for lead has failed to show any improvement since our last report. Producers attribute the inactivity to an effort on the part of certain large consumers to test the strength of the market. As yet no seller has offered at concessions. With all of the producers sold out for November delivery and holding good orders against their December output, it is not likely that there will be a weakening in the situation. Producers are waiting for a renewal of demand and in the meantime are quoting 7 to 7.05 cts. New York for December delivery. It is suggested in certain quarters that these quotations will not prevail very long after buying is resumed. Dealers did a small business in spot metal. Generally, however, the market has been extremely quiet. At London the market fails to show any sign of life. London advices do not throw much light on the inactivity. Since Oct. 13 the London market for lead has remained at £30 20s for spot and £20 10s for futures. Information as to what the A. S. & R. Co. contemplates along the line of price changes appears to indicate that the prevailing figures of 7 cts. New York and 6.92½ cts. St. Louis will be continued.

Quotations for lead per pound at New York and per ton at London for the week ended Nov. 15 were as follows:

	New York		London—	
	Indpts.	A.S.&R.Co.	Spot.	Futures.
Nov. 9.....	7.02½c	7.00c	£30 10s	£29 10s
10.....	7.02½	7.00	30 10	29 10
11.....	7.02½	7.00	30 10	29 10
13.....	7.02½	7.00	30 10	29 10
14.....	7.02½	7.00	30 10	29 10
15.....	7.02½	7.00	30 10	29 10

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London—	
	High.	Low.	Avg.	1916.	1915.
January	6.20	5.50	5.926	5.730	31.92
February	6.56	6.10	6.271	3.350	23.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	4.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August	6.70	5.95	6.32	4.750	20.260
September	7.10	6.70	6.88	4.627	31.25
October	7.10	7.00	7.05	4.612	30.20
November .....	.....	.....	.....	5.152	.....
December .....	.....	.....	.....	5.346	.....
Year .....	.....	.....	.....	4.675	23.099

Lead Ore.—Strength was the predominating feature in the ore markets of the Missouri-Kansas-Oklahoma district during the week ended Nov. 11, but even for this prices of lead ore remained at from \$83 to \$87 as during the previous week. Sales during the week amounted to \$45,353 from 1,223,820 lbs. of concentrates. This brought the total for the year to date at 88,746,702 lbs., valued at \$3,674,610 lbs.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	78.35	50.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	48.25
October	87.00	70.50	79.875	61.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—Zinc ores in the district partook of the prevailing strength and prices jumped \$10, bringing the top price up to \$90 per ton and the lower grades at \$75. Sales of 15,328,532 lbs. of concentrates during the week amounted to \$632,720. Ores produced and sold during the year to date amounted to 607,296,772 lbs., valued at \$24,178,783.

Calamine.—Prices of this ore were also up and ranged from \$45 to \$50. There were 1,664,020 lbs. of concentrates sold during the week and this amount was valued at \$39,895. The total for the year to that date was 32,053,605 lbs., valued at \$970,322.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	58.75	60.25
September	65.00	45.00	55.00	76.75
October	75.50	50.00	63.375	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—A very large business has been done in spelter for delivery over the first quarter of next year and a fair amount of selling has also been done for delivery in the second quarter. Domestic consumers were steady, but latterly export buyers came into the market and took considerable amounts for delivery over the entire first half of next year. As a result spelter prices have advanced. With first quarter delivery of prime western selling at 11 cts., producers have become sellers. Hitherto producers limited selling, but with buyers willing to pay 11 cts. they have started to take orders. Galvanizers were the principal buyers, but brass makers have also been in the market. Spot prime western has advanced to 11.50 cts. New York and 11¼ cts. St. Louis. Since our last report business for the first quarter has been done at prices ranging from 10¼ cts. up to 11 cts., with the outside price now prevailing. The sharp advances in zinc ores are in a measure responsible for the active demand for spelter, but consumers were not covered at all for the first quarter and the reasonably low prices that were available a fortnight ago were also factors. Brass special has held steady at 11 cts. St. Louis for spot. Zinc sheets were advanced to 17 cts. base. At London spelter has advanced, going up £2 5s in spot and £1 15s in futures last week, with further gains this week.

	New York.		London	
	Spot.		Spot.	Futures.
Nov. 9.....	11.25c		£54 5s	£53
10.....	11.37½		55	53 10s
11.....	11.40		55	53 10
13.....	11.50		55 15	53 10
14.....	11.50		56	54 5
15.....	11.75		56 15	54 5

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	1916	1915	1916	1915	
	High.	Low.	Avg.	Avg.	Avg.
January	19.42½	17.30	18.801	6.519	89.840
February	21.17½	18.67½	20.094	8.866	97.840
March	20.50	16.50	18.40	10.125	100.720
April	19.37½	17.75	18.76	11.48	98.103
May	17.50	13.75	15.98	15.825	89.507
June	13.62½	11.25	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August	9.75	8.37½	9.11½	16.110	56.00
September	9.70	8.12½	9.22	14.493	51.30
October	10.42½	9.42½	9.99	14.196	53.15
November				16.875	
December				16.675	
Year				13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Antimony.—Continued inactivity has resulted in first hands shading prices on spot and forward metal. Spot antimony has been offered at 13 cts. duty paid and some sellers indicate that they would accept a shade under this price. November and December shipments are being offered at 11¼ to 11½ cts. in bond. It must be borne in mind that leading antimony producers are still filling contracts that were made around 30 to 35 cts. and, therefore, they are in a position to disregard the spot market. Other producers, however, are not so fortunate and the low prices are beginning to result in the closing of plants. Needle antimony holds at 11 to 11½ cts. A fair demand for antimony ore is reported, with the market steady at \$1.60.

Molybdenite.—Sellers report a good demand for prompt molybdenite, but the supply is very small and business is restricted. Prompt is quoted at \$1.70 to \$1.80 per lb. for MoS₂. There has been a good business done in ferromolybdenite at \$4 for prompt and \$3.65 for forward contracts.

Quicksilver.—Business continues of fair volume, with the market steady and unchanged at \$80 per flask. There are numerous reports of an early advance in price, based on difficulty in obtaining supplies, but leading sellers assert that the market will continue on its present basis for some time to come.

Sheet Zinc.—The price of sheet zinc has been advanced 1 ct. to 17 cts. base as a result of the upward movement in the primary market.

Copper Wire.—Wire drawers are quoting a wide range of prices. Some makers are quoting 32½ cts., while others report sales at 34 cts.

Tungsten.—Demand continues quite active for spot and forward tungsten, but sellers report that future business is difficult to close. Spot business has again been done at \$17 to \$18 per unit, the price depending on grade. Arrivals are being easily absorbed, sellers reporting that only a small quantity remains on the market. Ferro tungsten continues at \$2.60 per lb.

Pig Iron.—Sensational price advances continue in pig iron. At Buffalo high silicon irons have sold at \$28 furnace. At Pittsburgh Bessemer has sold at \$27.50 and basic at \$24. Ohio furnaces have done business at \$25 and Chicago furnaces at \$26. Foundry and malleable grades have sold in the valleys at \$24.50 to \$25. At Birmingham the situation is very strong, with No. 2 iron selling at \$20.50.

Coke.—The situation in coke is alarming. Spot foundry coke has sold at \$11 a ton ovens. Spot furnace fuel has sold at \$7 ovens. Coke producers report a very active demand for 1917 contracts from blast furnace interests.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06¼	to	.06½
Nitric, 40 deg.....	.06¼	to	.07
Alcohol—U. S. P., gal., Grain, 190 proof.....	2.74	to	2.75
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.75	to	.80
Denatured. bbl.....	.60	to	.62
Alum—Powdered, lb.....	.06¼	to	.06½
Lump, lb.....	.05¼	to	.05½
Ground, lbs.....	.06	to	.06¼
Ammonia—			
Muriate, white grain, lb.....	.11½	to	.12½
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06	to	.06¼
Red, lb.....	.62½	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	7.00	to	8.00
Foundry.....	10.00	to	11.00
Copperas—Spot, bbl.....	1.35	to	1.50
Ferrosilicon, 50%.....			100.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.55
Lead—Granulated, lb.....	.14½	to	.15½
Brown sugar.....	.11½	to	.11¾
White crystals.....	.13	to	.13½
Broken, cakes.....	.12½	to	.13
Powdered.....	.13½	to	.14
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.23	to	.28½
Nickel Salt, double.....	.07½	to	.08½
Single.....	.10½	to	.11
Petroleum—			
Crude (Jobbing), gal.....	.15	to	.18
Platinum—Oz. ref.....	90.00	to	96.00
Potash Fertilizer Salts—			
Kahtit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
Refined, bbl.....			.12
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.40	to	.42
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.73	to	.75
Prussiate, red.....	2.00	to	2.50
Salt-peter—Crude, lb.....	.12	to	.14
Refined.....	.31	to	.31½
Soda—Ash, 48% (43% basis), bbl.....	3.00	to	3.60
Strontia Nitrate, casks, lb.....	.32	to	.35
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.14¼	to	.14¾
Crystals, bbls., lb.....	.29	to	.29½
Oxide, lb.....	.46	to	.48
Zinc Chloride.....	.10¼	to	.11¼

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

Dividends on Issued Capitalization							Dividends on Issued Capitalization						
NAME OF COMPANY	Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest		NAME OF COMPANY	Number Shares Issued	Par Val	Paid in 1916	Total to date	Latest	
					Date	Amt.						Date	Amt.
Acacia, g.	1,438,989	\$1	\$.....	\$138,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	480,916	\$1	\$.....	\$98,916	Sept. '01	\$0.01
Adams, s l c.	100,000	10	.....	778,000	Dec. 18, '09	.04	Golden Star, g.	400,000	5	.....	120,000	Mar. 15, '10	.06
Adventure, c.	200,000	25	50,000	50,000	July 1, '10	.50	Gold Com. Fra. g.	922,000	1	.....	92,111	Oct. 15, '09	.10
Ahmeeck, c.	250,000	25	2,000,000	6,050,000	Oct. 10, '16	4.00	Goldfield Con.	3,559,148	10	.....	28,999,831	Oct. 31, '16	.10
Alaska Goldfield, g.	180,000	6	.....	403,250	Jan. 10, '16	.15	Good Hope, g. s.	600	100	.....	941,250	Jan. '03	.25
Alaska Mexican, g.	500,000	5	.....	3,507,381	Nov. 28, '15	.10	Good Sp. Anchor, z.s.	550,000	1	33,000	119,755	June 15, '16	.01
Alaska Mines Sec.	200,000	25	250,000	80,000	Nov. 1, '06	.....	Grand Central, g.	500,000	1	20,000	1,635,250	Oct. 25, '16	.04
Alaska Treadwell, g.	180,200	5	54,060	16,780,000	May 19, '16	.50	Grand Gulch, c. s.	233,845	2.50	17,790	19,187	Sept. 8, '16	.03
Alaska United, g.	100,000	25	700,000	2,045,270	Feb. 28, '18	.30	Granite, g.	430,000	1	17,200	17,200	May 10, '16	.02
Allouez, c.	1,538,929	100	.....	800,000	Oct. 4, '16	2.50	Gwin, g.	100,000	10	.....	481,500	Feb. '06	.25
Amalgamated, c.	600,000	100	2,500,000	103,444,933	Aug. 30, '15	3.77	Hazel, g.	900,000	1	.....	1,114,000	Jan. 5, '16	.15
Am. Sm. & R. com	600,000	100	2,625,000	31,833,333	Sept. 1, '16	1.50	Hecle, s l.	1,000,000	0.25	1,250,000	5,005,000	Oct. 16, '16	.15
Am. Sm. & R. pf.	170,000	100	1,020,000	57,421,336	Sept. 1, '15	1.75	Hercules,	1,000,000	1	2,430,000	15,000,000	Oct. 15, '16	.10
Am. Sm. Sec. A. pl.	300,000	100	1,400,000	11,720,000	Oct. 2, '16	1.50	Hidden Treasure, g.	30,000	10	.....	457,450	Sept. '00	.10
Am. Sm. Sec. B. pl.	158,120	25	2,758,180	17,010,000	Aug. 2, '16	1.25	Holy Terror, g.	800,000	100	.....	172,000	Jan. '00	.01
Am. Zinc, L. & Sm	2,331,250	60	11,656,250	3,805,000	Aug. 1, '16	1.60	Honestah, g.	251,160	100	1,832,540	37,338,248	Oct. 25, '16	.65
Anaconda, c.	100,000	100	.....	175,914,271	Aug. 28, '16	2.00	Horn Dove,	500,000	1	.....	5,000	Dec. 31, '16	.01
Antioch, g.	250,000	100	.....	439,561	Apr. 22, '05	.50	Horn Silver, l. s. z.	400,000	1	40,000	5,182,000	June 30, '16	.06
Argonne, g.	200,000	6	55,000	1,695,000	Sept. 25, '16	.07%	Imperial, c.	500,000	10	.....	300,000	June 14, '07	.20
Arizona, c. ....	.....	.....	621,154	20,212,164	Apr. 1, '16	.....	Inspiration Con.	920,657	20	5,454,989	5,454,989	Oct. 31, '16	2.00
Atlantic, c.	100,000	25	.....	990,000	Feb. 21, '05	.50	Intermountain, c.	1,515,020	1	8,075	8,075	Oct. 20, '16	.005
Bagdad-Chase, g. pf.	84,819	5	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, com.	1,673,354	25	7,948,574	33,451,414	Sept. 1, '16	2.00
Bald Butte, g. s.	250,000	1	.....	1,354,648	Nov. 1, '07	.04	Inter'l Nickel, pf.	89,126	100	401,067	6,748,513	Aug. 1, '16	1.50
Baltic, c.	100,000	25	.....	7,960,000	Dec. 31, '12	2.00	Intern'l Sm. & Ref.	100,000	100	.....	4,100,000	May 2, '16	2.00
Barnes-King, g.	40,000	5	80,000	60,000	June 1, '16	.07%	Interstate-Calahan	464,990	10	2,092,455	4,649,990	Sept. 30, '16	1.60
Beck Tunnel Con.	1,000,000	0.10	.....	940,000	Nov. 16, '07	.02	Iowa, g. s. l.	1,666,667	1	.....	270,167	Dec. 31, '16	.00%
Big Four Expt.	400,000	1	100,000	110,000	Sept. 4, '16	.06	Iowa Tiger, g. s. t.	3,000	1	.....	25,175	Jan. 15, '16	.50
Board of Trade, z.	120,000	1	.....	78,000	Jan. 15, '11	.06	Iron Blowsom, l. s. g.	1,000,000	1	360,000	2,850,000	Sept. 30, '16	2.50
Bonanza Dev.	100,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Cap, pf. c.	33,481	10	6,422	29,803	July 1, '16	.35
Booth (Reorganized)	998,295	6	349,949	349,949	June 28, '16	.05	Iron Clad, g.	1,000,000	10	.....	50,000	Nov. '06	.06
Boss, R.	408,600	1	.....	40,850	Dec. 10, '14	.10	Iron Silver,	500,000	20	.....	5,050,000	Dec. 31, '16	.10
Boston & Colo. Sm.	15,000	10	.....	402,350	Oct. '02	.76	Isabella, g.	2,250,000	1	.....	742,500	Mar. '01	.01
Breeca, l. s.	100,000	25	.....	63,225,000	May 16, '11	4.00	Isle Royale, c.	160,000	25	450,000	600,000	Oct. 31, '16	2.00
Brunswick Con. g.	300,000	1	.....	220,000	Dec. 15, '13	.08	Jamison, g.	390,000	10	.....	378,300	Jan. '11	.02
Bullion-B & Champ	100,000	10	.....	203,315	Sept. 15, '15	.08	Jerry Johnson, g.	2,500,000	.10	.....	187,500	Nov. 5, '14	.00%
Bunker Hill Con. g.	200,000	1	50,000	2,768,400	July 11, '08	.10	Jim Butler,	1,718,020	1	343,604	615,405	Aug. 1, '16	.10
Bunker Hill & Sull.	327,000	10	1,397,750	871,000	Oct. 4, '16	.02%	John Ore & Spelter	400,000	5	82,000	62,000	July 22, '18	.04%
Butte Alex Scott,	75,000	10	844,662	18,162,750	Oct. 5, '16	.20	Jumbo Ext. g.	1,650,000	1	194,000	684,998	June 30, '16	.05
Butte-Ballaklava, c.	250,000	10	.....	1,064,119	Apr. 10, '18	10.60	Kendall, g.	500,000	5	60,000	1,656,000	Apr. 3, '16	.10
Butte Coalition, c.	1,000,000	16	.....	125,000	Aug. 1, '10	.50	Kennecott Zinc,	200,000	.....	80,000	60,000	June 20, '16	.10
Butte & Superior, s.	272,887	10	7,676,734	4,700,000	Dec. 1, '11	.25	Kennecott, c.	3,780,898	10	11,200,000	16,200,000	Sept. 30, '16	1.60
Caladonia, l. s. c.	3,605,000	1	781,500	13,196,758	Sept. 30, '16	6.25	Kenny, g. s.	100,000	100	.....	1,801,001	June '06	.06
Calumet & Ariz. c.	641,923	10	3,648,522	1,664,231	Oct. 5, '16	.30	King of Arizona, g.	200,000	1	.....	396,000	Apr. 23, '06	.12
Calumet & Hecla, c.	100,000	25	5,000,000	26,997,847	Sept. 25, '16	2.00	Klar Piquett, z.	20,000	1	.....	167,500	Dec. 15, '12	.25
Camp Bird, g.	1,750,000	25	113,584	134,250,000	Sept. 22, '16	20.00	Knob Hill, g.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%
Cardiff, s.	600,000	1	375,000	10,243,564	Jan. 1, '16	.17%	La Fortuna, g.	250,000	1	.....	1,200,500	Oct. '02	.01%
Carlisle, g. s. c.	600,000	25	.....	600,000	Sept. 19, '15	.25	Lake View,	500,000	.05	80,000	114,500	June 12, '16	.01
Centennial, c.	1,000,000	1	100,000	80,000	Dec. '06	.01	Last Dollar, g.	1,600,000	1	.....	180,000	Feb. 23, '03	.02
Centennial Eureka,	100,000	25	100,000	100,000	Sept. 1, '16	1.00	Liberty Bell, g.	133,551	6	.....	1,752,795	Jan. 31, '16	.05
Center Creek, l. s.	100,000	10	85,000	4,000,000	Apr. 25, '18	1.00	Lightner, g.	102,255	1	.....	331,179	June '06	.06
Central Eureka, g.	100,000	1	.....	750,000	Oct. 1, '16	.15	Linden, z.	1,020	10	15,000	11,200	Dec. 31, '15	3.00
Century, g. s l.	1,000,000	1	44,000	799,159	Mar. 6, '06	.05	Little Bell, s l.	300,000	1	15,000	75,000	Apr. 22, '18	.06
Cerro Gordo, l. s. s.	1,000,000	1	75,000	392,087	Feb. 16, '16	.06	Little Florence,	1,000,000	1	.....	450,000	Jan. '08	.03
Champion, c.	882,960	25	6,280,000	25,000	Sept. 23, '16	.02%	Lost Packer,	1,000,000	1	.....	37,500	Oct. 23, '16	.50
Chibul Con.	882,960	1	132,323	16,280,000	Oct. 8, '16	6.40	Lower Mammoth,	1,000,000	1	.....	67,000	Dec. 15, '16	.01
Chino Copper, N. M.	869,980	6	5,002,385	483,360	Aug. 2, '16	.25	MacNamara, g. s.	734,576	1	.....	46,800	Apr. 23, '06	12.00
C. K. & N. g.	1,431,900	1	.....	11,371,000	Sept. 30, '16	2.25	Magma, c.	240,000	5.00	360,000	600,000	Sept. 30, '16	.60
Chif. s l.	100,000	1	.....	171,828	Nov. '04	.01	Mammoth, g. s. c.	400,000	.10	60,000	2,380,000	Sept. 30, '16	.05
Clinton, g. s.	1,000	10	.....	115,000	Feb. 5, '14	.06	Manhattan-Big 4, g.	762,400	1	.....	30,248	Aug. 16, '11	.02
Colo. G. Dredging,	200,000	10	106,000	90,000	Jan. 1, '13	.10	Mary McKinney, g.	1,309,262	1	.....	1,169,306	July 28, '14	.02
Colorado, s t.	1,000,000	0.20	.....	80,000	Dec. '03	.30	Mary Murphy, g. s. l.	370,000	6	25,087	93,106	May 1, '16	.07
Columbus Con. l. s. c.	283,540	5	.....	425,000	Feb. 23, '16	.05	Mass Con. c.	100,000	25	100,000	100,000	Aug. 15, '16	1.00
Combination, g.	1,000,000	1	.....	2,800,000	Mar. 15, '13	.03	May Day,	800,000	0.25	40,000	284,000	May 26, '16	.02
Comstock-Phoenix,	785,000	1	.....	212,623	Oct. 14, '07	.15	Mexican, g. s.	201,600	3	.....	171,360	June 4, '14	.75
Con. Mercur, g.	1,000,000	1	.....	873,000	Dec. '08	.15	Miami, c.	747,114	5	3,175,234	8,675,113	Aug. 15, '16	1.50
Consolidated, g.	2,600,000	1	.....	60,0									

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1918	Total to Date	Latest						Paid in 1918	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah	600,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success	Ida.	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03
Pharmacist, g.	Colo.	1,500,000	1	.....	91,600	Feb. 1, '10	0.00%	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Oct. 10, '16	1.00
Phelps, Dodge & Co	U. S.	450,000	100	9,000,000	67,371,527	Sept. 30, '16	8.00	Superior & Pitta, c.	Ariz.	1,499,792	10	.....	10,318,568	Dec. 21, '15	.33
Pioneer, g.	Alaska	6,000,000	1	.....	2,041,526	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	.....	9,420,000	July 23, '07	4.00
Pittsburg, I. z.	Mo.	1,000,000	1	.....	20,000	July 15, '07	.02	Tamarack-Custer	Idaho	2,000,000	1	71,050	71,050	Aug. 30, '16	.02
Pittsburgh-Idaho, I.	Ida.	1,000,000	1	42,500	291,004	Oct. 2, '18	.04%	Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75
Pitts Silver Peak	Nev.	2,790,000	1	.....	840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100	.....	160,000	Jan. 3, '14	.....
Platteville, I. z.	Wis.	600	60	.....	179,500	June 15, '07	10.00	Tomboy, g. s.	Colo.	310,000	5	74,400	3,861,555	June 30, '15	.24
Plumas Eureka, g.	Cal.	150,620	10	.....	2,831,294	Apr. 8, '01	.08	Tom Reed, g.	Ariz.	909,655	1	.....	2,555,934	Sept. 5, '15	.01
Plymouth Con.	Cal.	240,000	5	116,500	289,300	Aug. 10, '15	.24	Ton-Belmont, g.	Nev.	1,500,000	1	750,000	8,393,027	Oct. 2, '16	.12%
Portland, g.	Colo.	3,000,000	1	36,000	10,637,080	Oct. 20, '16	.03	Ton-Extension, g. s.	Nev.	1,272,501	1	604,580	1,591,776	Oct. 1, '16	.15
Prince Con., s. l.	Nev.	1,000,000	2	200,000	325,000	Oct. 5, '16	.02%	Tomopah, g. s.	Nev.	1,000,000	1	600,000	13,600,000	Oct. 21, '15	.15
Quartzite, g. s.	Nev.	100,000	10	.....	375,000	July 31, '07	.80	Tomopah Midway, g	Nev.	1,000,000	1	.....	250,000	Jan. 1, '07	.05%
Quicksilver, pf.	Cal.	45,000	100	.....	1,931,411	Apr. 8, '03	.60	Tremont	Cal.	200,000	2.50	.....	234,000	Apr. 25, '15	.02
Quip, g.	Wash.	1,600,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	.....	1,000,000	Oct. 30, '12	3.00
Quincy, c.	Mich.	110,000	25	1,210,000	22,987,500	Sept. 25, '16	4.00	Tuolumne, c.	Mont.	800,000	1	.....	495,525	Apr. 15, '13	.10
Ray Con., c.	Ariz.	1,571,279	10	2,743,748	7,322,675	Sept. 30, '16	.75	Uncle Sam Con. s.	Utah	600,000	1	.....	470,000	Sept. 20, '11	.06
Red Metal, c.	Mont.	100,000	10	.....	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	.....	167,070	Nov. 16, '16	.10
Red Top, g.	Nev.	1,000,000	1	.....	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	.....	1,500,000	Apr. 15, '07	3.00
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	.....	6,125,000	Aug. 6, '07	1.75
Richmond, g. s. l.	Nev.	54,000	1	.....	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,555	25	.....	211,827	Oct. 15, '07	.60
Rocco-Home, I. s.	Nev.	300,000	1	.....	152,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	41,000	Dec. 21, '12	.01
Rochester Id. & L.	Mo.	4,900	100	.....	190,465	July 1, '12	.60	United (Crip. Ck.)	Colo.	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev.	859,018	1	.....	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	1,173,000	3,749,000	Sept. 30, '16	18.00
Sacramento, g.	Utah	1,000,000	5	.....	308,000	Oct. 22, '08	.00%	United Metals Sell.	U. S.	50,000	100	.....	11,000,000	Sept. 23, '10	6.00
St. Joseph, I.	Mo.	1,409,466	10	1,761,830	12,029,728	Sept. 20, '16	.75	United Verde, c.	Ariz.	300,000	10	3,150,000	38,947,000	Oct. 1, '15	.75
St. Mary's M. L.	Mich.	150,000	25	2,720,000	7,520,000	Oct. 14, '16	2.00	United Verde Ext.	Ariz.	1,000,000	50	600,000	800,000	Aug. 1, '15	.60
Schoenck'r-Wal'n.z.l	Mo.	10,000	10	.....	90,000	Sept. 20, '11	.20	U. S. Red & R. com.	Colo.	69,188	100	.....	1,775,336	Oct. 9, '03	1.00
Scratch Gravel, c.	Cal.	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	3,459	100	.....	7,915,660	Oct. 15, '16	1.50
Seven Tro. Ch. g. s.	Nev.	1,443,077	1	56,076	252,632	Apr. 1, '15	.02%	U. S. S. R. & M. com	USMx	351,115	60	1,316,581	13,813,922	Oct. 25, '16	.87%
Shannon, c.	Ariz.	300,000	10	.....	750,000	Jan. 30, '13	.60	U. S. S. R. & M. pf.	USMx	486,350	60	7,118,224	66,300,162	Sept. 30, '16	3.00
Shattuck-Ariz, c.	Ariz.	350,000	10	1,663,300	4,637,000	Oct. 20, '14	1.26	Utah, c.	Utah	1,624,490	10	13,808,165	46,300,027	Sept. 30, '16	3.00
Silver Hill, g. s.	Nev.	108,000	1	.....	88,200	June 24, '07	.06	Utah-Apex, s. l.	Utah	528,200	5	396,154	462,179	Sept. 30, '16	.25
*Silver King Coal'n	Utah	1,250,000	5	750,000	14,334,985	Oct. 1, '16	.15	Utah Con., c.	Utah	300,000	5	675,000	9,825,000	Sept. 26, '15	.75
Silver King Con.	Utah	637,582	1	191,274	1,006,131	Oct. 22, '15	.10	Utah M. & T. f.	Utah	750,000	1	325,000	1,285,482	Aug. 15, '16	.60
Silver Mines Expl.	N. Y.	10,000	100	.....	250,000	June 15, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00
Sioux Cons., I. s. c.	Utah	745,389	1	.....	872,105	July 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	.....	207,600	Apr. 23, '10	.04
Skidoo, g.	Cal.	1,000,000	6	.....	365,000	Oct. 2, '14	.01	Vindicator Con., g.	Colo.	1,500,000	1	225,000	3,487,500	Oct. 25, '16	.06
Smuggler, s. l. z.	Colo.	1,000,000	1	.....	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D.	500,000	1	100,000	549,466	May 15, '16	.02%
Snowstorm, c.	Idaho	1,800,000	1	.....	1,189,010	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,000,000	1	600,000	1,250,000	Oct. 1, '15	.02
Socorro, c.	N. M.	377,342	5	56,599	198,070	Sept. 1, '16	.06	West End Con.	Nev.	1,785,485	1	89,424	625,969	Oct. 24, '16	.05
South Eureka, g.	Cal.	299,381	1	157,820	1,408,754	Aug. 15, '16	.07	West Hill	Wis.	20,000	1	8,000	40,000	June 29, '16	.20
South Hecla, c.	Ida.	800,000	1	39,450	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal.	200,000	10	60,000	180,000	Aug. 25, '16	.10
So. Swansea, g. s. l.	Utah	300,000	1	.....	237,500	Apr. 3, '04	.01%	Wilbert	Ida.	1,000,000	1	30,000	9,320,000	Oct. 15, '15	.01
Spears, g.	S. D.	1,500,000	1	.....	165,600	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	720,000	9,320,000	Oct. 15, '15	.01
Standard Con., g. s.	Cal.	178,394	10	.....	5,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,674	15	.....	63,403	Dec. 15, '15	.25
Standard, c.	Ariz.	425,000	1	.....	69,600	Sept. 8, '05	.50%	Work, g.	Colo.	1,500,000	1	.....	1,597,685	Apr. 31, '12	.02
Stewart, I. z.	Idaho	1,238,362	1	.....	2,043,297	Dec. 31, '15	.05	Yak.	Colo.	1,000,000	1	190,000	2,197,685	Sept. 30, '16	.07
Stratton's Crip. Ck.	Colo.	2,000,000	1	.....	300,000	Sept. 6, '08	.02%	Yellow Aster, g. s. l.	Cal.	1,000,000	1	.....	167,500	Feb. 1, '13	.01
Stratton's Ind.	Colo.	1,000,000	6	.....	5,023,568	Dec. 23, '06	.12	Yellow Pine, z. I. s.	Nev.	1,000,000	1	800,000	1,693,008	Oct. 25, '16	.10
Str'n's Ind. (new) g	Colo.	1,000,000	.30	160,000	691,250	Jan. 31, '15	.18	Yosemite Dredg.	Cal.	24,000	10	.....	102,583	July 15, '14	.10
Strong, c.	Colo.	1,000,000	1	.....	2,275,000	July 9, '05	.02								

Corrected to November 1, 1916

*Includes dividends paid by Silver King Mfg. Co. to 1907—\$10,675.00.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Ajuchitlan	Mex.	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabilas	Mex.	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00
Amistad y Concordia g	Mex.	9,600	50	.....	429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25	.....	1,627,320	Dec. 15, '16	\$0.24
Amparo, s. g.	Mex.	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.06	Lucky Tiger	Mex.	715,337	10	386,281	3,649,673	Oct. 20, '16	.10
Barlo de Medina Mill	Mex.	2,000	25	.....	103,591	Aug. 1, '07	.60	McKinley-Darragh-Sav.	Ont.	2,247,892	1	289,724	4,877,492	Oct. 2, '16	.03
Batopilas, s.	Mex.	446,268	20	.....	55,870	Dec. 31, '07	.12%	Mexican, I. pf.	Mex.	12,600	100	.....	1,018,750	May 1, '12	3.60
Beaver Con., s.	Mex.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex.	240,000	10	.....	660,000	Mar. 10, '05	.25
Boleo, g.	Mex.	120,000	20	.....	721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex.	180,000	6	.....	4,478,500	June 25, '14	.96
British Columbia, c.	B. C.	591,709	5	.....	615,399	Jan. 5, '13	.15	Minas Pedrazzini	Mex.	1,000,000	1	.....	497,500	Jan. 23, '11	.06%
Buena Tierra	Mex.	330,000	5	.....	160,380	Jan. 30, '16	.24	Mines Co. of Am.	Mex.	900,000	10	.....	4,958,600	July 25, '13	.12%
Bufalo, Ont.	Ont.	1,000,000	1	.....	2,787,000	July 1, '14	.06	Mining Corp. of Canada	Can.	2,075,000	1	670,625	1,348,750	Sept. 30, '15	.15
Canadian Goldfields	Can.	600,000	0.10	.....	237,099	July 15, '14	.01%	Montezuma, I. pf.	Mex.	5,000	100	.....	402,500	Nov. 15, '12	3.50
Cananea Central, c.	Mex.	800,000	10	.....	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex.	500,000	1	.....	100,000	July 20, '09	.04
Cariboo-Cobalt	Ont.	1,000,000	1	.....	295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11
Cariboo-McKinney, g.	B. C.	1,250,000	1	.....	68,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex.	100	300	.....	3,190,000	Oct. 11, '09	\$283
City of Cobalt	Ont.	500,000	1	.....	138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	300,000	4,050,000	Oct. 28, '16	.60
Cobalt Central, s.	Ont.	4,761,600	1	.....	192,645	Aug. 24, '09	.01	Nipissing, s.	Ont.	1,200,000	5	1,500,000	14,940,000	Oct. 20, '16	.60
Cobalt Lake, s.	Ont.	3,400,000	1	.....	39,000	May 23, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	.....	633,000	Feb. 1, '10	.02
Cobalt Silver Queen	Ont.	1,500,000	1	.....	315,000	Dec. 1, '08	.03	Paloma, g.	Mex.	3,000	.....	.....	98,600	Dec. 1, '11	6.00
Cobalt Township, s.	Ont.	198,282	5	.....	1,042,259	Aug. 20, '14	.24	Panuco, g.	Mex.	10,000	.....	.....	7,465,000	Nov. 4, '09	5.00
Coniagua, s.	Ont.	800,000	5	400 000	8,240,000	Aug. 5, '18	.25	Panoles, s. g.	Mex.	120,000	20	.....	6,451,687	Sept. 13, '15	.25
Con. Mg. & Sm., g. s. c.	B. C.	65,050	100	631,204	2,951,341	Oct. 1, '16	2.60	Petragina, pf.	Mex.	10,000	100	.....	328,655	Sept. 1, '10	3.50
Crown Reserve, s.	Ont.	1,999,957	1	.....	6,102,408	July 15, '15	.03	Peterson Lake	Ont.	2,401,820	1	126,096	382,319	Oct. 2, '16	.01
Dolores	Mex.	400,000	5	.....	1,374,865	July 24, '11	.22%	Pinguico, pf.	Mex.	20,000	100	.....	780,000	Apr. 15, '13	3.00
Dome Mines, s.	Ont.	400,000	10	600 000	1,000,000	Sept. 1, '18	.50	Porcupine Crown	Ont.	2,000,000	1	240,000	660,000	Oct. 2, '16	.03
Dos Estrellas, (El Oro)	Mex.	300,000	0.50	.....	15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex.	6,000	15	.....	963,360	Apr. 1, '05	1.00
El Favor	Mex.	3,600,000	1	.....	210,000	Apr. 30, '14	.01	Rambler-Cariboo	B. C.	17,600	100	70,000	490,000	Aug. 15, '16	.01
El Oro, g. s.	Mex.	1,147,600	5	.....	9,138,442	July 11, '13	.34	Rea Mines, Leasing	Ont.	200,000	1	.....	12,750	Feb. 20, '15	.06%
El Rayo, g. s.	Mex.	250,020	2	.....	190,410	Apr. 24, '11	.15	Right of Way	Ont.	1,653,600	1	25,291	689,690	Sept. 16, '16	.00%
El Triunfo, c.	Mex.	2,000,000	1	.....	30,000	Aug. 28, '11	.01	Rio Pato	Mex.	374,518	5	.....	345,744	Feb. 1, '13	.06
Esperanza, s. g.	Mex.	400,000	1	.....	12,521,250	Dec. 31, '15	10	Santa Francisco Mill	Mex.	5,000	25	.....	445,085	Oct. 15, '08	2.00
Granby Con., g. s. c.	B. C.	148,985	100	749,926	6,350,311	Aug. 1, '16	2.00	San Rafael	Mex.	2,400	25	.....	5,798,260	Jan. 11, '12	1.00
Greene-Cananea, c.	Mex.	474,411	100	2,431,405	6,666,850	Aug. 28, '16	2.00	San Toy, s. l.	Mex.	5,000,000	1.00	.....	540,000	July 24, '13	.01
Greene Con., c.	Mex.	1,000,000	10	3,500,000	13,544,000	Oct. 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex.	1,500,000	6	364,500	2,819,772	June 16, '16	.24
Greene Gold-Silver, pf.	Mex.	300,000	10	.....	194,871	Mar. 28, '07	.40	Sta. Gertr'y Guadalupe, g. s.	Mex.	60,000	.....	.....	3,960,000	Mar. 27, '09	1.00
Guanaquato Con.	Mex.	540,000	5	.....	600,000	Oct. 8, '06	.07%	Sta. Maria del Paz	Mex.	9,600	12%	.....	5,360,000	Jan. 2, '13	2.60
Guanaquato Dev., pf.	Mex.	10,000	100	.....	274,356	Jan. 1, '11	3.00	Seneca-Superior	Ont.	478,844	1	861,982	1,783,194	Oct. 14, '15	.20
Guggenheim Explorat.	Mex.	833,732	25	10,713,456	34,032,760	Apr. 5, '16	11.85	Soledad, s. l.	Mex.	960	20	.....	4,439,540	July 17, '11	8.00
Hallebury, s.	Ont.	50,000	1	.....	50,000	Apr. 6, '11	.50	Sorpresa, g. s.	Mex.	19,200	20	.....	3,979,240	Jan. 5, '11	34.00
Hedley	B. C.	120,000	1	180,000	2,003,520	Sept. 30, '16	.60	Standard, s. l.	B. C.	2,000,000	1	600,000	2,300,000	Oct. 10, '16	.02%
Hinds Con., g. s. l.	Mex.	5,000,000	1	.....	85,000	Feb. 27, '03	.02	Teismiscam'g & Hud. Bay	Ont.	7,761	.....	.....	1,840,250	Nov. 10, '14	3.00
Imperial	Ont.	4,000,000	1	1,680,000	5,680,000	Feb. 2, '11	.00	Teismiscam'g, s.	Ont.	2,560,000	1	150,000	1,189,000	Oct. 27, '13	.03
Imulco, c.	Mex.	10,000	100	.....	975,000	Feb. 2, '11	.00	Tezuitlan, c.	Mex.	8,000	100	.....	1,955,000	Jan. 1, '09	1.00
Kerr Lake, s.	Ont.	600,000	5	450,000	5,670,000	Sept. 15, '18	.25	Tough-Oake	Ont.	531,600	5	255,748	332,187	Oct. 3, '16	.12
La Blanca	Mex.	140,000	20	.....	2,775,700	Mar. 31, '13	.90	Tretheway, s.	Ont.	1,000,000	.....	.....	1,061,988	July 15, '14	.05%
La Republica, s.	Mex.	400,000	5	.....	110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.	Ont.	1,416,690	1	.....	656,366	Oct. 20, '13	.05
La Rose Con., s.	Ont.	1,498,827	5	299,724	6,586,844	Oct. 20, '16	.06	Yukon, g.	Y. T.	3,600,000	5	787,500	8,370,610	Sept. 30, '16	.07

NEW YORK

35 Nassau Street
Phone Cortland 7331

MINING WORLD

AND
ENGINEERING

DENVER

403 First National
Bank Building

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Nineteenth Annual Meeting American Mining Congress

The American Mining Congress held its 19th annual meeting in Chicago last week. Much interest was manifested in the various sectional gatherings and many of the topics discussed were exceptionally interesting; however more to the scientific rather than to the practical end of the industry.

Mining has a bearing on all the industrial activity of mankind. Modern industry, including practically all our manufacturing and construction industries, railroads and transportation, represents largely the working and reworking of the substances to which mining has given birth. Our buildings, our structural materials, our metals, our utensils and machinery, our inorganic chemicals—all these things the world owes in the first instance to the mining industry.

In the United States in the year 1915 it is estimated there was employed in the mines and quarries no less than 1,750,000 men, 1,000,000 being employed in the metal and non-metal mines. On the mine owners, operators and investors who are responsible for the means of livelihood of so vast a number, who alone supply industry and commerce with all their coal, oil and metals, stone, cement and clays, etc., there rests a great responsibility that has been well borne.

General Session.

Monday, Nov. 13, 1916, 2:30 p. m.

The meeting was called to order at 2:30 p. m. by Harry C. Adams, chairman committee of arrangements and chairman of the executive committee.

Harry Atwood, attorney for the Board of Local Improvements of the city of Chicago, representing Mayor William Hale Thompson, greeted the Congress with an appropriate welcome.

J. W. O'Leary, on behalf of the commercial interests, in welcoming the Congress to Chicago stated that Chicago consumes something like 25,000,000 tons of coal and in it manufactures tons and tons of metals. Illinois, as you know, produces something like 60,000,000 tons of coal a year. He added:

Yours is rather a wonderful industry. Your product began forming before history began. It is the greatest commercial necessity, including the metals, the greatest commercial necessity of today. It is absolutely essential to our industrial progress and Chicago particularly is under obligations to you for what your mines have produced, for we are, a manufacturing and industrial center fundamentally. That is the basis of Chicago's greatness today.

We are rather proud of Chicago. Some folks say we boast of it. I prefer to say that we boast it. We are rather proud of our parks and our boulevards and we invite your attention to

our development of the small park idea. We think we are leaders in it. You will enjoy it. We are rather proud of our art institutions, our educational institutions. You may have noted through the papers within the last few days that Chicago is to be the medical center of the United States, and we hope with the co-operation of the rest of our nation, of the world. We are rather proud of our commercial establishments, our manufacturing establishments; and I am sure that you will find it well worth your while to visit our great manufacturing institutions. You will find that the open door policy prevails towards such men as you. We are proud of our mercantile establishments. You will find them ready to receive you, whether you spend money or not.

Chairman Adams said:

The year closing in the metal and mining business has been a remarkable year in many respects. It has been a very prosperous year in a great many of the metal industries. We have had a good deal of bad and a good deal of good business in the coal business. We do not know how long the good business is going to last in the coal business. Usually it does not last very long. The attention of this Congress, in my judgment, should be given largely or at least a large part of it should be given and consideration should be given to the standardization of cost accounting, both as to minerals and to the coal mining. After we pass through the abnormal conditions that are surrounding us now we certainly will be in bad shape, so far as marketing coal is concerned, or marketing metals is concerned, unless we know, all of us, what our product is going to cost and what it does cost.

The program as outlined here is a pretty long one. It is going to take lots of work to get through. Your committees have made some efforts along the lines of entertainment and we hope that you will have a pleasant time and a profitable time while you stay in Chicago.

I think the Association is fortunate in having the guidance of such an expert mining man as Carl Scholz, the president, to whom I now turn over the convention.

Short responses were made by delegates from the various states represented, including Arizona, California, Colorado, Idaho, Indiana, Illinois, Iowa, Minnesota, Missouri, Montana, Kansas, Kentucky, North Dakota, Pennsylvania, South Dakota, Tennessee, Utah, Virginia, Washington, West Virginia and Wisconsin.

Tuesday, Nov. 14, 1916, 10 a. m.

At this meeting it was announced by Secretary Callbreath a memorial volume to the late Dr. Joseph A. Holmes had been printed.

The selection of a committee on resolutions, owing to a misunderstanding, was deferred to a later session.

It was announced by the secretary that the proceedings of the Congress will be sent to all members without additional charge. Non-members will be supplied at a cost of \$1.

At this session Hon. Edward N. Hurley, chairman of the Federal Trade Commission, read a paper on the relation of the Commission to the mining industry.

Albert H. Fay, of the United States Bureau of Mines, outlined the work and gave a summary of the records of the mine safety work conducted by the U. S. Bureau of Mines. Mr. Fay said in part:

The United States occupies the unique position of producing more coal than any other country in the world, uses more mining machines and produces a larger percentage of coal by mining machines than any other country. It produces more coal per man employed than does any other country and also produces more coal per fatality than any other country. But, unfortunately, we produce more fatalities per thousand men employed than does any other country, except possibly British Columbia, which is not much larger than one of our own states.

In 1870 Pennsylvania introduced mine inspection in the anthracite field. The production of coal that year in the anthra-

site field represented 47% of the coal produced in the United States. Therefore, in 1870 we have 47% of the coal produced under mine inspection. In the next year, 1871, we only had about 44%. In 1875 one or two other states had come in with inspections and we had about 52 or 53% under inspection, and so on year by year until in 1880 we have 75% under inspection. The percentage increases up to 1895, when we have about 99% under inspection. Other states have come in until at last there is less than one-tenth of 1% of coal that is produced without any inspection service whatever.

Thus is shown the growth of inspection service in reference to the production of coal in a period of forty-odd years. In 1870 the fatalities per million tons of coal mined were 13. In 1875 the fatalities per million tons of coal mined were about 9. In 1880 it was a little above 5. Since that period it has remained around 5 per 1,000,000 tons until in 1907 it was almost 7. From 1907 the rate has declined very noticeably until in 1909 we produced 234,000 tons for each fatality.

Now, based on the number of men employed, in 1870 we had six men killed per thousand men employed. The inspection service has grown and the rates have declined until for a long period of years it remained in the neighborhood of 3 per 1,000 men employed. Beginning with about 1895 the rate has gradually increased year by year, until it culminated in 1907 with a fatality rate of 4.81 per thousand. From 1907 that rate showed a decrease, also a decrease in the number of men employed.

In his paper on "State Mining Rescue Stations," Prof. H. H. Stock, of the University of Illinois, reviewed the work carried on in the state of Illinois, saying in part:

In 1909 the Technologic Branch of the United States Geological Survey, now the United States Bureau of Mines, in co-operation with the Illinois Geological Survey and the College of Engineering of the University of Illinois, established at the University of Illinois in Urbana, a rescue station for the training of miners and mining officials in the Middle West coal fields.

One of the results of the Cherry disaster was a strong demand for greater safety measures in the state and during the winter of 1910, the State Legislature upon the suggestion of the Illinois Mining Investigation Commission, not only added a number of safety provisions to the state law, but also appropriated \$75,000, for the erection, equipment and maintenance of three rescue stations, placing the administration of the stations in the hands of the Illinois Mine Rescue Station Commission, consisting of seven members, including two coal mine operators, two coal miners, one state mine inspector, one representative of the Department of Mining Engineering of the University of Illinois, and one representative of the Federal Bureau of Mines. The stations are located at LaSalle for the northern part of the state, at Springfield for the central part and at Benton for the southern section. The work of the Commission is at present being carried on in the following manner:

At each state station there is maintained in addition to the two permanent employees, a team of five men who train twice a week at the rescue station and are paid for their time. These men work in nearby mines and can be quickly assembled at the stations if needed.

Three sub-stations have been established in districts where there is the most called-for assistance and insofar as funds will permit and the demands of such stations seem justified, it is planned to establish other sub-stations. One or two permanent employees are in charge of each sub-station and at each sub-station there is maintained in addition a team of five men under the same conditions as the regular paid teams at the main stations. These stations are at present located at Herrin, Harrisburg, and Duquoin.

First aid classes have been organized in towns so near the main stations that the superintendent or assistant can reach such towns though living at the main station.

In addition to training men about the mines, a number of first aid classes have been formed in the public schools and in connection with various associations of men and women in mining towns. City firemen have also been trained and it is the policy of the Commission to encourage such training of persons not connected with the mines as much as possible if it does not interfere with the regular training of mine employees. The rescue men have also assisted the city firemen in fighting fires where it was impossible to enter a burning building without the use of breathing apparatus.

In a discussion of the "Responsibilities and Duties in Mine Safety Work," as devolving upon the operator, the miner and the public, Thomas M. Gann, Knoxville, Tenn., spoke for the operators, whose responsibilities he claimed were if possible greater than the others. In his opinion cheap coal is the principal cause for the awful destruction of life incident to the development of the industry.

At this part of the program the members and guests were asked to rise as a mark of respect to the late David Ross, of Springfield, who passed away since the program was made up. Mr. Ross was to have discussed "Mine Safety Work" from the standpoint of the miner.

Thos. L. Lewis, of West Virginia, discussed the question from the point of the miner, calling attention to the fact that the danger surrounding the work of the miner can be classified into two classes—the unknown, the generation of any quantity of fire damp and the known dangers, such as undermining under the old pick system.

Dr. F. W. McNair, president of the Michigan School of Mines, was called on to represent the public in the discussion. He was of the opinion that the most effective way in which the public can influence the mine operator and the miner was through the workmen's compensation law. It was through this that the mine operators and miners were influenced in

the matter of safety-first. He did not, however, feel like holding the public responsible for any very direct result until the facts can be put to them much more efficiently than they have been in the past.

Committee on Resolutions.—The following committee on resolutions was selected by the various state delegations:

Alabama—W. E. Henley.	Montana—James Needham.
Alaska—B. F. Millard.	Nevada—A. A. Codd.
Arizona—J. H. Robinson.	New Mexico—T. H. O'Brien.
Arkansas—Ransome Gulley.	New York—Chrissay Morrison.
California—Jas. M. Gillette.	North Carolina—H. R. Smith.
Colorado—Geo. E. Collins.	Ohio—W. R. Woodford.
Dist. of Col.—Van H. Manning.	Oregon—F. Wallace White.
Idaho—Eugene Thomas.	Pennsylvania—E. W. Parker.
Indiana—W. S. Bogle.	South Carolina—Mr. Chambers.
Illinois—F. C. Honnold.	South Dakota—M. S. Brede.
Iowa—Joshua Norwood.	Tennessee—A. H. Purdue.
Kansas—Mr. Skidmore.	Utah—Mark P. Braffet.
Kentucky—F. P. Wyatt.	Virginia—J. S. Grasty.
Michigan—F. W. McNair.	West Virginia—D. C. Kennedy.
Minnesota—J. E. Hodge.	Washington—Sydney Norman.
Missouri—W. B. Shackelford.	

Wednesday, Nov. 15, 1916, 10:00 a. m.

Dr. James E. Talmage, of Salt Lake City, Utah, presided as chairman, and called the meeting to order.

Dr. David T. Day, chairman of the Joseph A. Holmes Memorial Committee and also secretary of the Joseph A. Holmes Safety Association, reported on the work of that committee as follows:

At the meeting of this Congress a year ago you appointed a committee which conferred with a similar committee of the American Institute of Mining Engineers to organize a suitable memorial for Dr. Joseph A. Holmes, first director of the Bureau of Mines.

The two committees agreed that the most suitable memorial would consist in perpetuating Dr. Holmes' work of benefiting mining, an organization having such a purpose, and we found all the national societies glad to join in a national safety movement. The year has been spent in bringing them into an organization. They are now joined in the Joseph A. Holmes Safety Association.

In the Nov. 4 issue of Mining and Engineering World you will find Dr. Holmes' own recognition of what the Bureau of Mines owes to the Mining Congress in the organization of that bureau: "This movement for appropriate recognition and aid for the mining industry from the national government has been under way for many years. Among its early and most active supporters have been the California Miners' Association and the American Mining Congress. It is, therefore, eminently appropriate that at the first session of the American Mining Congress, following the creation of the Bureau of Mines, at a session held in California, something should be said of the policy and purposes of the new bureau."

And I believe that the American Mining Congress by the way that it stood for federal recognition of mining from the beginning of the Congress really is more the father of the Bureau of Mines than any other organization in the United States and can point to that magnificent bureau as more its child than that of any other organization.

We found that all national societies were glad to come into a co-operative movement which would benefit mining in the same way that Dr. Holmes had undertaken to make that his life work. That was a very gratifying thing. We got representatives of these societies together, altogether 22 of them. It was easy to form an organization of this character. It was particularly fortunate that the members to represent the representatives of these different national societies were chosen with a great deal of care, forming a magnificent body as the foundation of this organization. From that body they chose as officers the director of the Bureau of Mines as president and thereby secured at once the co-operation of that great Bureau in our work, and also made it easy to avoid any duplication of work which could be carried out through the instrumentality of the Bureau of Mines. As vice-presidents they chose Dr. Charles D. Walcott, the former director of the U. S. Geological Survey, and now the secretary of the Smithsonian Institution; and Mr. Gompers, president of the American Federation of Labor. Thereby, we laid the possibility at once for such co-operation in this work with labor itself as would enable us to begin right at the bottom of the difficulties of safeguarding mining, that make the miner come into this thing in a way which would begin where we ought to. The miner's greatest enemy, as we all must admit, as the miner himself will admit, is the miner; and we have gone to these miners in a very practical way. The Federation of Labor is going to them and getting each miner in the country to contribute something toward the fund of this Association, a permanent fund, the interest from which is to carry on the work of the organization. Now, so soon as a miner has invested 50 cents or \$1 in something and has received a statement, a certificate of membership, he is not going to forget to inquire what became of that money and where he gets something back; and just as soon as he does that his education in safety in mining has been begun and we have a means of getting at that man to keep up his education. If this Association could succeed that way in simply making each miner a little safer to his fellow miner, then what a great step forward this national movement would have accomplished. And then when we think that by the appointment of this Committee last year this Association becomes the father of this new movement, you can recognize that only second to the formation of the Bureau of Mines itself is the initiative taken by this body in forming the Joseph A. Holmes Safety Association. We have here, in other words, an association by the name of which we honor Dr. Holmes, by the purposes of which we are going ahead to make mining safer.

How are we going to do it? That is a matter which is

shown very well in an announcement which all of you will receive, a copy of which I hold in my hand. It is an announcement of the membership, the officers and such purposes as have been decided upon at the present time as the work of this association. We propose to make mining safer by bestowing on any man or any number of men a prize for anything contributed in the way of safety in mining. I have an example in mind, without mentioning any names, of a man in Illinois, who was formerly a coal miner and has become the superintendent of a mine. That man posted a notice in letters about 6 in. in height, at the mouth of the mine, that a certain man had been injured. It stated the injury and it stated the way it happened. It stated then that the man would be compensated in due course, his illness would be taken care of, his family would be taken care of as best they could and the man would return to work in as well and as fit condition as they could make him; but nothing they could do would compensate him for the pain he had actually suffered, for the shock to his family and for the permanent loss of efficiency when he went back to work with one arm. That was all. There was not a word of moral. There wasn't any preaching. There wasn't any scolding. But that notice has been talked about by the miners on the street cars and elsewhere in that town more than anything else that has been posted of that sort for a long time. The idea of posting such a notice is to my notion; just as an individual of this Association, something well worthy of a prize as being a contribution to safety in mining. It does not mean that a man has to get up a new safety cage or some device for stopping a cage if it happens to get loose going down the shaft.

We propose also to give a medal to any man or any hundreds of men where one man contributes to the safety of another miner at the risk of his own safety, and we are giving that a definition of a hero for the purposes of this organization; and we believe that when such a man has received some recognition of that sort and his fellow-workers recognize it that we can also take that man, as has been suggested in California, where this Association was discussed a few days ago, we believe that we can take that man and send him around to his fellows in his own part of the country and by his own talks—we hope that he will not be a good lecturer; we believe that he will be just a plain talker, and heroes are not usually very much on talking—we believe by his own talks that he will further the movement of safety in mining. Now, we propose that that man shall spread the ideas of safety that he has received by a visit to us in Washington to receive this medal. In beginning that way we can really get at the miners themselves.

So far has the Association gone. This is no more than equivalent to the announcement which you will receive, and is the report of your committee at the present time, to which I wish to add this statement: The purposes as far as they have gone have been set forth. The further purposes, what shall be done by this Association, are in the hands of those who compose it, the members of the American Mining Congress, the Mining Engineers and the other composing bodies. We will carry out, and I believe these men who are certainly well chosen as national officers will carry out, the work that you entrust to them well.

To carry it out it must be supported. There must be a fund, and here is where we come to that question. What that fund shall be, how much it shall be, how little it shall be is to be measured by your idea of what a national organization to represent the great mining interests of the United States shall have. You can make it large or small, according to what you think it should do. To do that, in the first place, our primary fund will be obtained by the personal contribution of the members of the American Institute of Mining Engineers, the members of the American Mining Congress and others, and there will come to you in due course a small blank with the announcement on it that we want your personal subscription for whatever you think you should give.

In his paper on "Federal Aid to Mining Efficiency," Van H. Manning compared the national importance of agriculture and mining and the aid rendered by the government. He finds that the government in the present year has donated to the farmers \$1 for every \$295 worth of the products of the farm. It has donated to mining \$1 for every \$1017 worth of products from the mines. "While the value of the agricultural production of the country is less than five times that of the mineral production, the per capita appropriation for agricultural investigations is 15 times the per capita." He said further:

No country in the world has such vast and varied mineral resources as the United States. The development of these industries has been rapid and on an enormous scale. In 1880 the value of the mineral products of this country, according to the Tenth Census, was \$364,000,000; in 1900 the value had risen to \$1,063,600,000; in 1910 to \$1,991,200,000, and in 1915 to \$2,373,000,000.

From 1880 to 1915 the population of the United States increased about 100 per cent, whereas the value of its mineral production increased nearly seven-fold.

But this tremendous increase in production has been accompanied by unparalleled waste, in both the production and utilization of our mineral wealth, and altogether too little regard for the health and safety of the men whose labor converted the natural resources into the commercial products. A people of restless energy, individualistic, eager for immediate success, and having little regard for the lessons of the past, we have indulged in an orgy of hasty exploitation, with the result that already we are nearing the limit of maximum production of some minerals, although the original supply, if wisely mined and utilized, would have lasted us many years longer and would have brought us ten times the wealth.

To conserve our remaining supplies, that is, to extract, prepare, and utilize the minerals and ores in such manner as will be of most benefit to the nation, is clearly not a simple nor an easy task. Our mineral resources are many and extend throughout great areas, occur under widely varying geological conditions, and are subject in large part to state laws that differ greatly.

In citing the needs of the mining industry Mr. Manning pointed out one in particular—the development of electro-metallurgical processes for the reduction of the base metals. In certain parts of the country, as the Pacific Northwest, vast water power, he stated, is available and electricity can be generated at a minimum cost. There a satisfactory electro-metallurgical process would make commercially profitable the working of millions of tons of mineral deposits that can not now be worked at a profit.

E. W. Parker, director of the Anthracite Bureau of Information, in his paper on "Co-operation, Conservation and Competition," claimed that it was encouraging to note that there is at last established under the Federal Government at Washington a tribunal whose words and deeds so far have shown that it realizes not only the desirability but the necessity for a higher degree of co-operation among the producers of coal, to the end that some stability may be given to the industry and we may hope before long to see coal mining given as fair a chance to exist under the Federal Trade Commission as railroading is under the Interstate Commerce Commission. He further claimed that:

It is reasonable to believe the time is not far distant when coal operators may and will co-operate in an exchange of information relating to trade conditions, car and labor supply, etc., so that production may be regulated somewhat in accordance with demand even as now the California fruit growers regulate their shipments with entire satisfaction to the consumers, and with a stabilizing of the industry from the growers' standpoint which was not dreamed of 20 years ago.

There is no branch of industry in which there is greater need of co-operation than among the retailers in any specialty—coal among the rest. Why should a coal dealer whose yard is in one part of a city deliver coal to a consumer two or three miles distant when another dealer could reach the same consumer by a haul of as many blocks? The coal merchants themselves are beginning to realize this, as is evinced by the discussions which constitute the larger part of the proceedings in their conventions. There is a disposition to get together and talk over matters affecting the economies of their business, to discuss candidly the problems that confront them, and to try by co-operative methods to improve their service to their patrons and incidentally to attempt to achieve a better return on their investment of capital, labor and brain.

The securing of a higher degree of co-operation between employer and employee, or between capital and labor, is perhaps a matter more difficult of accomplishment, but we can afford to be optimistic. If both sides contend honestly and strenuously for the strict observance of their agreements, each will have a higher respect for the other and be more willing to work in co-operation rather than in antagonism.

Much of our very best bituminous and semi-bituminous coals, as well as anthracite, have been lost through methods that must be deemed wasteful in the light of present knowledge, but which under the circumstances could not be avoided. It is not through reckless competition but through properly regulated co-operation that the highest possible recovery may be obtained, waste in mining, preparation, distribution, and utilization, reduced to a minimum, the public adequately served and protected, labor receive its just reward, and capital a fair return.

Competition, if it is to be the life of trade, must be competition that constructs and not that which destroys. Price cutting to secure an order and thus to injure the business of a competitor is not according to a high standard of business ethics. It is injurious to the trade as a whole. The rivalry among anthracite operators (for it is a rivalry) in the securing of better living conditions for their employees, to which I have already referred, is a competition of service. Its object, as I have stated, is through the improved living conditions to develop a better grade of workmen, who by rendering better service to their employers, will enable the latter to render better service to the public.

In his paper on "The Sherman Law and Its Relation to Mining," read by title only, Glenn W. Traer of Chicago defined the Clayton Act and the Trade Commission Act, the amendments to the Federal anti-trust laws of 1914, as being deficient in a practical understanding of the problems of industry or a spirit of helpfulness. He was of the opinion that they reflected a spirit of ossified suspicion, harshness and increased restraint.

Thursday, Nov. 16, 1916, 2:00 p. m.

S. A. Taylor, Pittsburgh, Pennsylvania, presided as chairman and called the meeting to order. The report of the Committee on Forest Relations, prepared by Carney Hartley, was read by title.

The committee devoted much time to the dissemination of information covering the rules for prospecting on forest reserves. Commenting on complaints the committee through its chairman, says:

From various conversations and other sources of information, it would appear that the intent of the Forestry Service is being very well carried out by the field officials. In some localities, at least, where there has been some complaint on this score, the difficulty has been that unfair advantage has been taken of the rules in various ways, compelling the For-

estry officials to exercise the letter of the law in order to carry out instructions. In some cases this has been due to a lack of appreciation of the spirit, in a few cases through an attempt to take unfair and unlawful advantage of the solution. It is generally believed, however, that by this time the situation is quite well understood and the principal need for the regulations is to show the prospector what his rights are under them, rather than to serve as information to cause friction.

Hon. Frank H. Short of California read a paper on "Conservation: Its Purpose, Its Effect, and Who Should Pay For It." He said, in part:

It is now about 20 years that I have been with considerable activity representing a good many men that have been endeavoring to develop the resources of the western states under the laws of the United States and the western states. And at times we have found that both difficult and troublesome and although we were engaged in doing nothing that wasn't being done in the open, although we were engaged in the construction of canals for the appropriation of water for the irrigation of land and reservoirs and canals and aqueducts for the development of hydro-electric power, and we were engaged in the development of mines and oil territories, I have frequently found myself in public gatherings placed in a position of wicked enemy of the people, desiring to do something wholly wrong, wholly undesirable and wholly inimicable to the public interests.

Now in mining out West, mining on the public lands, before much of the public lands of the West was disposed of it was provided by law that the mineral lands and latterly including the oil lands could not be disposed of except under the mineral law, and that meant upon the discovery and development of mineral justifying the patenting of the land by the government or the working of the land. So that while many of you people are from the East and you do not think of any land or title problems in connection with mining, that is about two-thirds of what the western miner has to think about, especially in recent years, or he finds himself in trouble.

As we first learned to understand the subject, conservation meant the saving and holding and better protection of the resources of the country and especially with respect to timber. And you know I never have seen a subject that divided itself as clearly as conservation does. Up to a certain point everybody agrees. We of the West have had no quarrel with conservation in the sense that it meant a better protection of the soil, of the timber, of the mineral resources of the country, and all of those resources, the conservation of water flow, and that sort of thing. We were always desirous of co-operating with it. But conservation grew and Jonah's gourd was not anything in comparison with what finally we were confronted with when we came to observe conservation in its final developments.

In concluding his paper Mr. Short said:

I want to say to you, gentlemen, that what I want to emphasize is this, that we people of the western states never come anywhere in the United States asking anything more than a square deal and absolute equalities. We talk about liberty and justice but without equality there can be no liberty, because if I am not equal with you I am not as free as you are. And without equality there can be no justice, because unequal justice is not justice at all. But we do believe that the western states and the pioneers who have settled them are entitled to be as free and as respected as those who developed the eastern and the central and the southern portions of this country. We believe that and we think you agree to it. The West was the left-over part of the country. Most of you, no doubt, have seen it, but for 30 years I have traveled on foot and on horseback through the mountains of that great region. I have seen its deserts and its fertile places and its great mountains. I wish that every man in America could get the spirit of the West in his veins, there, where real rivers find their sources in real mountains and flow through wide and fertile valleys into the world's most majestic sea. We want every American to view this from the equal standpoint, not of the West, not of the East, not of the South, but from the broad and equal rights of American citizenship, so that it does not make any difference what section of the country a man may live in but as an American citizen he has the same right to develop his home and enjoy the surrounding resources and live under the laws of his state as any other man in any other section of the American union.

A. H. Purdue, state geologist of Tennessee, read a paper defining the relationship between the state geologist and conservation. In the line of duties falling to the state geologist, according to Dr. Purdue, it is his duty to study and inform the public upon the occurrence, quality, quantity and uses of the natural resources of the state he serves. He divided his paper into four sections: The Inexhaustible Resources, the Exhaustible Resources, Soil and Timber Conservation, Legislation and Conservation and the Scientific Spirit. In conclusion he said that the state geologist should be a man who can make his work practical, but he should at the same time be a scientist with irresistible inclinations toward the purely scientific problems that confront him. Only such geologists, he said, can effectively serve a state.

Recently there has been impressed upon me the lesson that it is a duty of the state geologist to look carefully into developed mines, not only to ascertain if there is not a waste of the ore for which the mine is worked, or of some possible by-product, but of material that is too important to be classed as a by-product.

The object of most legislators in supporting geological surveys is to develop the natural resources; that is, to increase the wealth of the state. We have no fault to find with this attitude, and we willingly exert our energies to that end; but geological work, whether for economic or scientific purposes, requires the

strictly scientific spirit as its impelling force, without which no results can be relied upon.

The state geologist should be a man who can make his work practical, but he should at the same time be a scientist with irresistible inclinations towards the purely scientific problems that confront him. Only such a geologist can effectually serve a state.

Secretary Callbreath announced the election of the following members as directors to serve a term of three years: W. J. Richards, M. S. Kemmerer, George H. Crosby and W. J. Snyder. At the directors' meeting the following officers were elected: President, Walter Douglas; first vice-president, Charles M. Moderwell; second vice-president, George H. Crosby; third vice-president, L. A. Friedman; executive committee, Walter Douglas, Carl Scholz and C. M. Moderwell.

While waiting for a report of the committee on resolutions the subject of "Waste in the Mining Industry, in Mining, in Distribution and in Use—and the Relation of These Wastes to the Operators, the Consumer and the Public," was discussed. Among the speakers on this subject were S. A. Taylor, W. J. Snyder, and W. J. Kelley.

Resolutions Adopted.

The report of the Resolutions Committee was then taken up and the following resolutions adopted:

Federal Income Tax Law, Introduced by George E. Collins.

Whereas, The Federal Income Tax Law, as it applies to the output of mines, has been so construed by the Internal Revenue Department of the Federal Government as to work a grave injustice to operators, in that the deductions allowed from the gross income on account of depletion are not based on the gross value but on what is virtually the net value of the ore produced; and,

Whereas, Congress by a later amendment of the Act has shown its intention to permit more conservative deductions to be made on account of depletion of mines than was permitted under the law of 1913, now, therefore, be it

Resolved, That this Congress expresses appreciation of the intent of the Congress to be fair to the mining industry; and be it further

Resolved, That this question be referred to the regular Mining Taxation Committee of this Congress for investigation and recommendation; and be it further

Resolved, That such committee be instructed to take proper means to see that the construction placed upon this law by the Internal Revenue Department shall be in accordance with the plain intention of Congress in enacting the Act.

Mine Safety Work, Introduced by T. L. Lewis.

Whereas, In mine safety work, one of the most serious problems encountered, is the lack of personal co-operation on the part of some operators and also on the part of some miners, thus preventing the success of the work of promoting mine safety and reducing the number of accidents and fatalities in the mining industry; and

Whereas, While much has been accomplished, it is believed to be vastly important that every possible agency looking to greater safety in mining operations shall be enlisted and that efforts should be made to secure the active co-operation of those agencies which thus far have not voluntarily given their best support to the movement; now, therefore, be it

Resolved, That a standing committee of seven be appointed, which shall investigate this important subject and report its findings and recommendations to the next annual convention of the American Mining Congress.

Undeveloped Water Powers, Introduced by Frank H. Short, California.

Whereas, Conflict of laws and jurisdiction covering the development of water powers in the United States makes the use of vast undeveloped water power commercially difficult if not impossible, be it

Resolved, That it is the sense of the American Mining Congress in meeting assembled at Chicago, Illinois, November 18, 1916, that the Government of the United States of America and the several states be urged to enact such laws and regulations as shall facilitate to the greatest degree and safeguard the utilization of existing undeveloped water powers for industrial and domestic purposes, thus conserving and permitting the developing of our natural resources; and be it further

Resolved, That such laws should encourage and permit development of this resource and all of the other resources of the public land states without discrimination and under laws and conditions in all respects as favorable as those applicable in the states having no public lands; and be it further

Resolved, That copies of this resolution be transmitted to Congress, the legislatures of the states and the government and state departments having present jurisdiction.

Mining Laws, Introduced by J. N. Gillett.

Whereas, This Congress is deeply interested in the just operation of the mining laws, and

Whereas, As a result of certain land withdrawal orders by the President of the United States and of legislation by Congress many persons who at great expense and, as adjudged by the courts, have in good faith developed the oil lands of

the country are threatened with ejectment and forfeiture of their developed lands and their investments, therefore, be it

Resolved, That in all such cases we urge prompt and appropriate legislative relief so that those who have in good faith developed such lands shall be protected.

Uniform Systems of Accounting, Introduced by Carl Scholz.

Whereas, The information which the Federal Trade Commission has acquired within the time of its existence has placed it in possession of data and other information on costs which will enable it to do much toward the improvement in conditions of the employees, aid the mine owners and at the same time subserve the interests of the public; and

Whereas, The American Mining Congress, recognizing the many difficulties which confront the mining industry and believes the conservation of life and mineral resources are vital to the welfare of the nation; therefore, be it

Resolved, That we recommend that the Congress of the United States be requested to enact such legislation and make such appropriation as will enable the Federal Trade Commission to devise uniform systems of accounting applicable to the different branches of the mining industry.

Public Land Laws, Introduced by L. W. Trumbull.

Whereas, The increasing expense of courts, schools, asylums, hospitals and other state institutions, the building and maintenance of roads, and the administration of law over its whole area, cannot be supported by a tax levied upon less than one-half of the area of the several states without undue and unfair burden; and

Whereas, The policy laid down by Abraham Lincoln that "The public lands are an impermanent national possession held in trust for the maturing states," and the liberal administration of laws framed to make such policy effective have worked great advantage to the West and to the nation; and

Whereas, The recent restrictive administration of the public land laws and the efforts to make more difficult the acquisition of title to mineral and other public lands in the West have been largely instrumental in preventing settlement, in restricting development and hampering the progress of the mining industry and preventing it from keeping pace with industrial advancement in other lines of effort; and

Whereas, The proposed policy for the Federal leasing of mineral and other lands will keep from the state taxing power valuable property, which should contribute to the support of state institutions, will prevent investment, restrict development, foster monopoly in the hands of those who have already acquired title to the public domain and make necessary a system of Federal control and espionage subversive of free institutions, expensive of administrations and repugnant to the feelings of a free people, therefore, be it

Resolved, That we urge upon the Department of Interior of the United States a more liberal administration of our public land laws, that we disfavor the adoption at this time of any system of Federal leasing of mineral and other lands, or the enactment by Congress of any laws relating to public lands having a tendency to restrict the development of the West.

Resolutions of Condolence, Introduced by Committee on Resolutions.

Whereas, During the past year several members of this Association have been called to the Great Beyond; therefore, be it

Resolved, That this Congress wishes to express, through its Secretary, to the families of the deceased the condolence and sympathy of this Congress.

Vote of Appreciation—Introduced by the Committee on Resolutions.

Whereas, The Nineteenth Session of the American Mining Congress, one of the most successful in its history, is this day drawing to a close; therefore, be it

Resolved, By the Congress in session that we extend to the exhibitors and advertisers, who have come here to bring to our attention their respective products, our deep appreciation; to the La Salle Hotel our thanks for the uniform courtesy extended to all of our members; to the committees who have diligently labored for the best interest of the Congress our sincere appreciation; to the coal operators of this state our heartfelt esteem for the many and continued courtesies they have shown us.

Secretary Callbreath was asked to present the paper of Henry Sturgis Drinker on "The Position of Engineers Towards the Questions of Water Power Developments in the West." The situation was summarized as follows:

It is folly for a man untrained in engineering to venture opinions on questions like the conservation, development and economic utilization of our minerals and our water powers which require the judgment and experience of engineers. The trouble with many of the plans for coal and water power conservation proposed by men untrained and inexperienced in engineering and in business methods, is, that their plans are ideal rather than real, their dicta negative rather than positive, and their remedies theoretical rather than practical. You have doubtless observed that the fear that is uppermost with such men is often rather than our public resources will pass into the control of what they term the "monopolistic interests of the few," than the crucial question of what is the best plan or system for the economic winning of our natural resources in the interest of the public. What engineers should urge and impress upon the public mind is the importance of looking at these industrial questions in a wholly cold-blooded, business way—without any obsession or oppression of undefined hysterical fear of the results or dangers of a so-called corporate monopoly that are often as visionary as the nursery tales of bogies to frighten children into being good. Corporations, as we know, are, as a rule, only aggregations of capital to promote some useful industrial or transportation purpose; they are, like other agencies of the day, capable of use and of abuse.

The difficulty, and the probable error, in criticising all large development enterprises as being so-called monopolies is that the superficial critic is apt to consider and discuss the situation on one side only. The conservation,—the careful mining,—of our minerals, and the economic development of our latent water powers, for instance, can only be managed properly by the investment of large capital, and this can today be supplied only by the association of many individuals having capital to invest, into large corporations controlling such aggregate capital, or by the Utopian plan of state or Federal ownership and the use of the public funds in an industrial enterprise. As to corporations, the stronger they are the more surely are they in a position to handle mining and water-power problems conservatively and economically. The economic mining of minerals—the proper development of a water power site, involve purely expert questions, but it takes capital to command the best expert talent and the investment of large capital to economically develop and erect a plant to produce economical results. Any other course raises the cost of production, and the consumer ultimately pays. As a rule, operations on a large scale, lawfully exercised and regulated (and with the Public Service Commission of today they are surely abundantly regulated), result in conserving our resources for the benefit and service of the consumer and save their waste by the producer.

Dr. Willis R. Whitney, who is doing much of the research work for the General Electric Company in its laboratory at Schenectady, sounded a new keynote in the program of "National Preparedness." "I think I am right," he began, "in saying that the preparation of men for scientific research in America has been inadequate."

May it not be that we are in a state of coma, induced by superficial prosperity and prolonged by the relatively scattered and disorganized conditions of our more recent past? For apparently good reasons, we have of late years entered upon a policy of discouraging the growth of corporations, of strangling the railroads, and of forcibly stopping large water power developments, and now we learn from the press that Germany and England are busy bringing about the union of competing manufacturing companies in order to strengthen home industry.

I want to emphasize the necessity which confronts us of devoting greater attention to natural sciences and to the unearthing of those values of natural knowledge which nothing but mining in fact will provide. I want to see our country get out of the habit of too exclusively awaiting fundamental discoveries from abroad and merely developing them by the application of brute force and high speed.

We need more information on the properties of materials of all sorts in order to suggest their use in places where the needs are often already well in sight. The trial of promising applications is usually easy and not long delayed. It is the fundamental search for properties that is slow and neglected. Our trouble is not that we will not try promising combinations but that we do not know how to project those which are not obvious.

It seems to be the rule that the valuable results come from what appear to be the most insignificant observations of natural phenomena. It was not the density of nitrogen that disclosed all the rare gases, but the small difference which was found between the densities of nitrogen from different origins. It was not the active properties of argon which put it into our incandescent lamps of today but its poor thermal conductivity and the peculiar fact that it did not have the chemical activity of other gases. These are really by-products of properties.

We can all agree on the importance of determining the properties of the chemical elements, because they are few in number and in material things we believe we shall always be confined to them, but the useful properties are infinite in number and the aid we may get from the knowledge acquired by actual experiment or contact with them, is also infinite. One of the most terrible explosives of this superlatively terrible war is a mixture containing apparently harmless metallic aluminum and ammonium nitrate.

In case of danger to our country from war we quickly learn the importance of increasing our navy and our armament, of meeting in kind and degree the menace we imagine can prevail. We all believe in enormously increased expenditure for those plans and devices which students of our situation suggest. We take an industrial inventory and determine where best can be produced the materials most needed in war time. This is only ordinary foresight and in democratic government must be done about as it is being done now.

But even in this undertaking we cannot help noting how dependent we are on foreign nations. This is painfully true for many materials of trade. It has been sufficiently aired in the press. Potash and dyes, nitre and alloys are peculiarly foreign products. In some such cases the cure may easily be affected, in others it may be difficult.

It is well known by mining engineers that the only considerable nitre deposits are in Chile and in case of war we might be prevented from drawing on this supply. For all explosives now used in war, whether it be the old black powder, gun cotton, or the modern tri-nitrotoluol and deadly ammonal, the one indispensable material is nitrate.

But if we would do more research for ourselves we must first look to the training of more of our young men so that they may be fitted and encouraged to take up such work. We must plan for more general scientific education and for training in research. The thousands of young men who take 4 years of study in our colleges must have among them very many whose cultivated instincts would make them tend in this direction if properly directed and encouraged.

Members' Meeting.

Wednesday Evening, Nov. 15, 1916.

President Scholz presiding, the financial report of the secretary and treasurer was read and adopted. The report shows \$1400 in the bank.

Plans for the creation of a Bureau of Mining Economics and a Bureau of Publicity at Washington were discussed.

A nominating committee was appointed consisting of H. Evsmith of Minnesota, S. A. Taylor of Pennsylvania, and A. H. Purdue of Virginia.

Coal Section.

Tuesday Afternoon, Nov. 14, 1916.

C. M. Moderwell of Chicago presided and Alexander Blair acted as secretary.

Papers were read as follows:

"Co-operation in the Marketing of Coal," by Ralph Crewes, Chicago. Discussion was participated in by Dr. F. C. Honnald, C. P. White, Jas. E. McCoy, Thos. L. Lewis, Carl Fletcher, S. A. Taylor, Geo. Otis Smith.

Wednesday Afternoon, Nov. 15, 1916.

Dr. I. C. White of West Virginia presided and Mr. Blair served as secretary. Papers were presented as follows: "The Duties of Mine Inspectors," by J. W. Paul of Pennsylvania; "What Becomes of the Benefits of Production Efficiency," by George H. Cushing, Chicago.

An open discussion followed on "The Closed Shop and the Check-off as Related to Efficiency in Mining Operations," and was participated in by T. H. O'Brien, New Mexico; Carl Scholz, Illinois; J. K. Dering; W. J. Snyder, Indiana; Senator Clarkson, Iowa, George H. Cushing, Illinois; F. P. Wright, Kentucky; E. H. Weitzel, Colorado; John P. Reece; S. A. Taylor, Pennsylvania; Mr. Newberger, Pennsylvania; E. W. Parker.

Thursday Morning, Nov. 16, 1916.

W. C. Tucker of Kentucky presided; Mr. Blair acted as secretary. Papers were presented as follows:

"Difficulties I Have Met in Coal Litigation and the Remedies," by R. W. Ropiequet of Belleville, Ill. Discussion was participated in by J. E. Williams, Illinois, and John P. Reece.

A paper on "World Trade Conditions of the Future," was presented by Charles L. Dering, Illinois.

Banquet.

Thursday Evening, Nov. 16, 1916.

Col. George T. Buckingham of Chicago acted as toast-master.

President Scholz in calling the session to order, announced his retirement as president of the Congress and took occasion to thank the delegates and members for their attendance, and to the Chicago committee for their entertainment and arrangements.

In his address on "Co-operation, the Basis of Safety, Efficiency and Conservatism in the Use of the National Mineral Resources," Carl Scholz, said in part:

We are left with the naked truth that we have become a manufacturing nation forbidden at home to regulate output to need and, by commercial treaties abroad, stripped of an overseas market for our factory output. As a nation then we have work to do in setting our own house in order. What are we to do when our tottering business cannot lean upon war orders?

This Congress, which represents the mining industry, cannot evade the responsibilities ahead of it. Much harder work must be done than ever before to secure merely a continuance of conditions, however trying they were, which prevailed before the war. The metal trades must feel especially the new conditions because those who are now our best customers will, when the war is over, become our competitors. They will compete being seasoned by war experience in handling metals and will have acquired that efficiency which is born of hardships. They will practice economy taught by poverty and will display endurance and courage which comes from years of struggle with death as the adversary. Meanwhile, America has had the opposite of these experiences, being satisfied by ease and luxury. How can we face the future unless we pass through some such great change as was suggested by a prominent bishop when he said: "You must be born again." Maybe we must say that to our industries.

It is unfortunate that in suggesting we seize upon the only remedy at hand, I must use a word which has come to be popu-

lar under another and an impossible meaning. Men cannot co-operate successfully if the sole aim is the satisfaction of selfishness. The line between proper co-operation and restraint of trade is as clearly defined as is that between community action to reduce waste and monopoly. That cleavage must be maintained, even as we must differentiate between socialism and democracy, which are in no sense synonymous.

In this larger and better sense, the Congress stands for co-operation. It construes it to be a form of community action participated in equally by the Government, the employer and worker. It must be literally a case of all for one and one for all with the common aim of mutual helpfulness.

In this time, I can think of no greater need we have as citizens, as workers, and as employers, than that which is to work out a plan by which we can co-operate without harm to anyone but with good for all and to be as considerate of those who are to follow as we are to those now here.

The speaker was here interrupted by E. W. Parker, who asked for a portion of the time of Mr. Scholz, and in his usual happy manner made the following appropriate remarks:

Because I always like to speak, I have asked for a portion of Mr. Scholz' time. Now, time is the thing which poets and writers and songsters and speakers have discussed for ages. No subject has received more attention than time. Time and again they speak of springtime, they speak of the gentle spring-time. One poet even wrote a poem about the banks on which the wild "time" grows. Another has said that time was made for slaves, and certainly the object of this attack or spasm has been a slave of duty, a slave to his friends, a slave to his business, a slave to this organization, and surely if time were made for slaves, then time belongs to him.

Mr. Scholz, we hope time will deal gently with you, and in behalf of your friends, the American Mining Congress, I wish to present to you a little piece of time. This little piece of time, which someone has called a repeater, is presented to you. I do not know whether it will repeat, but it has a repeater on the inside. It is engraved and I think I remember what it says: It is:

* *
PRESENTED TO CARL SCHOLZ, THREE TIMES PRESIDENT OF
THE AMERICAN MINING CONGRESS, IN RECOGNITION OF HIS
SERVICES TO THE MINING INDUSTRY.
* *

Mr. Scholz acknowledged receipt of the timely gift in his usual graceful manner.

In an address on "The Federal Government in Its Relation to the Public Land Laws of the West," Frank H. Short of Fresno, Calif., claimed that those of us in the west who have studied this subject believe in conservation in a common-sense way and there is no question but what intelligence should be used in preserving the forests.

We of the West never object to anything that the United States government may do under its constitutional grant of power, but when through the ownership of the public lands they seek to levy upon the industries of our state charges and taxes that they can't levy upon other states, when they seek to impose laws and regulations upon us through those lands, we say that this is an inseparable union of equal and indestructible states and we demand equal treatment, no more and no less.

At this time I want to say to you that I think we are facing some very serious and important problems in America. We all like to talk of prosperity and I am sure I don't like to bring up any ideas of adversity, but I do not think we ought or could afford to quarrel on sectional and divided problems. You know this is the only constitutional form of government of law that exists in the world that has ruled any considerable number of people for any considerable length of time; and with the gathering forces of destruction and with the menace from the outside world, it may be, it may well be, that whether it be on the Atlantic or on the Pacific, we must fight as men have seldom fought before for the preservation of constitutional government, civil liberty and free institutions in this country. It may be so. Let me say to you that while you hear a great deal of talk in campaigns about how rich we have grown, some of the others, and how soft and indulgent and given over to luxury the American people are, I think that is all on the surface. I like to remember that we had our origin as a distinctive race some thousands of years ago, away back beneath the oak forests of Germany and Britain, and while we have yielded to the domination of king or priestly rule sometimes, while we have erred in one direction or another, we have always risen safely over every obstacle, and that all in all we are the most liberty-loving, the most resistless, the bravest, the freest, most intelligent and best race of men that ever peopled the earth in all the tides of time. It makes no difference whether an American citizen comes from Hartford, Connecticut, or from California, it makes no difference, you may talk of the East and the West and the North and the South, but, after all, this is America, dedicated to American institutions, to a free and constitutional government; no matter which way we go—east, north, or south or west—we are side by side at the same little gate when all is done. The ways of Americans may be many but our end will be common and one.

The addresses of Col. George Pope of Hartford, Conn., on "Organized Capital and Organized Labor and Their Relation to Efficiency, Conservation, Better Wages, Better Living Conditions, Lawlessness, Strike Disorders and Industrial Freedom," was an unusually interesting exposition of the conditions that govern employment and labor in the United States today.

Metalliferous Section.

Tuesday, Nov. 14, 1916, 2 p. m.

George E. Collins, of Denver, Colo., presiding.

The paper by C. E. Siebenthal of the U. S. Geological Survey, was read by Geo. Otis Smith in summary form:

The lead content of the ore mined raised from 500,000 tons in the year 1913 to 523,000 tons in the year 1914, which was hardly more than a normal increase, but it went to 562,000 in the year 1915. The recoverable zinc content of ore mined was 406,000 tons in 1913, as against 407,000 tons in 1914; it was 606,000 tons in 1915—a 50 per cent increase, due to the demand from Europe. Both the lead and the zinc industries have been cleaning up in the year of 1916, and there will doubtless be a notable increase in the output each year, more especially in zinc.

The increase in the output of zinc was noticeable, or is expected in the states of New York, New Jersey, Virginia, Tennessee, the Upper Mississippi Valley region, the Joplin region, New Mexico, Montana, Idaho and California. About the only important state I have omitted from this is Colorado. In the Down Town district of Leadville, when that district is drained, the work has begun in the mines there—the zinc output of that district and of that state will be increased, but that will not happen until the year of 1917.

Mr. Siebenthal then gives a full table of the amount of production for 1914 and 1915, and then he summarizes the development in the eastern states.

Mr. Siebenthal this year has been trying especially to work up the reserves to see just how long the United States can keep on with this present high rate of production, or a rate approximating that. Of course, he does not expect it to get a very exact result.

C. A. Tupper of Mining and Engineering World, in his paper on "The Mining Industry—Its Magnitude," gave facts and figures proving the importance of the mining industry and its great earning powers. Mr. Tupper said:

Mining is the second great basic industry of the country. Its magnitude may be partially shown by the fact that for ten years preceding the European war, or up to the beginning of 1915, the value of mineral products in the United States was \$19,793,928,955, or an average of nearly \$1,980,000,000 per year. In the last normal year, which was 1913, it had risen to \$2,439,159,728.

The totals for the several years are as follows:

1905.....	\$1,623,664,785	1911.....	\$1,926,284,008
1906.....	1,903,229,387	1912.....	2,244,033,833
1907.....	2,069,941,398	1913.....	2,439,159,728
1908.....	1,594,696,842	1914.....	2,114,946,024
1909.....	1,886,756,730		
1910.....	1,991,216,220	Total	\$19,793,928,955

This represents the amount directly contributed to the wealth of the nation, which, under the stress of war demand and war prices has now increased to approximately \$4,300,000,000 per annum.

But that is only the beginning. In the workings necessary for the recovery of such values together with others which failed to yield returns, a great quantity of equipment and supplies were utilized, exclusive of food, miners' clothing and living necessities which are naturally covered by wages. Such items cannot be determined with absolute accuracy, but it is possible to compute them approximately—and quite closely—by figuring on a series of average percentage costs for the various years. During the decade mentioned purchases of equipment and supplies made by the mineral properties of this country aggregated not less than \$7,200,000,000, being at present on a basis of \$900,000,000 per annum or more. An amount somewhat in excess of material costs is normally expended in wages, and such proportion for most of the full ten-year period has been greater, so that the total wages paid would be over \$14,000,000,000. Based on the figures thus far available for 1916, it is reliably estimated that about 1,825,000 men are employed in the mines and oil fields of the country. [Taking only the principal items of development, equipment, wages and output, the amount of money put in circulation by the mineral industries of the United States in ten years has exceeded \$39,000,000,000, of which the bulk stands for wealth newly created.]

Even with this magnificent sum, however, only a start has been made; for it will be remembered that the mineral industry is essentially basic, being the broad foundation upon which great structures of other industries are reared. In this respect, while mining stands below agriculture in original output, it far overtops it in secondary products; and the further derivatives of those products reach a total value which is simply stupendous.

Probably few people, even among our leading manufacturers, have tried to realize what the condition of this country would be without its mineral resources or without the development of those resources on an adequate scale.

In the first instance, if manufacturing had been in progress for many years, we would be situated as France is today, utterly dependent on importations for all raw material except what is grown from the soil—with, however, this difference, that manufacturing on a large scale would never have gotten a start in the United States at all. We would have remained essentially an agricultural people.

In the second instance, had our mineral resources not been well developed, we would find ourselves today in the position of Russia.

Does the present situation of either France or Russia—even apart from their war problems—appeal to Americans? If not, we owe it to ourselves to get in mind some proper appreciation of what the mineral industries of this country mean to it.

[One of the most important lessons for the people of the United States, as the late Dr. Holmes pointed out, is to realize the importance of the mining industry; and a means of teaching them some part of this lesson has been found in the publication of dividends paid by the principal mining companies.] The

only earnings ever made public in this manner are those of certain metal mining corporations whose stock is widely distributed, and these, of course, represent a mere fraction of the total mineral production of the country; but, even so, they are sufficiently impressive.

The wonderful earning capacity of American mines can be well illustrated by referring to the dividend disbursements made by 167 companies (all that make their dividends public) during the ten months of 1916 just past. These companies between Jan. 1, 1916, and Oct. 31, 1916, divided among shareholders the sum of \$184,830,127. If the dividend payments of the securities-holding corporations were to be included (as they could righteously be) the year's total would reach \$223,433,208—a most convincing argument that mining, as now carried on, is the principal reason for our present standing at the head of the world's great industrial countries.

That these companies not only enjoyed a remarkable prosperity during the past 10 months, but also in previous years, is shown by reports made to Mining and Engineering World, that these companies previously paid dividends amounting to \$1,067,277,064, which, with the dividends already paid in 1916, makes a total of \$1,252,107,191. This is a return of better than 133% on the combined issued capital of the companies, a remarkable record and one hardly duplicated by any other industry.

The great bulk of these figures for dividend paying stock companies represents metal mines operated solely within the United States. If you added to the exact proportion of that total the actual earnings of close corporations in the same fields and those of coal and other mineral producing companies, you would have an aggregate almost unbelievable. Yet even that is but a fraction of the colossal totals of production and disbursements for labor, equipment and supplies cited at the beginning of this paper.

[No more important work faces the American Mining Congress, and the mineral interests generally, than that of impressing upon the people of the United States the tremendous value of the mining industry to the welfare of the country.]

This will strengthen the hands of the tireless, efficient secretary of the Congress, J. F. Callbreath, in his great work to secure legislation better suited to the needs of the industry; it will bring more encouragement and support from Congress to the U. S. Geological Survey; it will foster the growth of the U. S. Bureau of Mines and it will attract to sound, legitimate mining enterprises the new capital constantly needed for development.

In this the mineral interests will have the vigorous backing of the mining press, and I can particularly pledge that of the one paper, cited above, which has consistently and persistently supported the American Mining Congress from its inception. With a long pull, a strong pull and a pull all together, there is much that can be accomplished in the immediate future to raise the mineral industries to the plane on which they belong.

Let us try our best to do this.

The paper by Otto Ruhl on "A Tariff for Revenue as Related to a Compensating Duty on Lead and Zinc Ores" elicited considerable favorable comment and the discussion that followed the reading brought forth many interesting sidelights on the subject.

J. W. Kelley of Chicago from results of experiences reviewed conditions in Mexico as they exist today.

As we all know, there exists at the present time in the Republic of Mexico a state of anarchy, but where the country is peaceful, under present transportation facilities, or, transportation facilities as they existed before the warring factions uprooted from their very bed the different railroads, even at that time you could not get ore out except to go and ship it away around to Monterey, or else away down to Vera Cruz, or to Tampico, or else come back to El Paso, where you could get into our own country, paying at the same time a highly exorbitant tax of 2½%.

Our systems of transportation are the greatest in the world, but in Mexico, unheard of conditions exist and some of the mines are as far as 150 miles away from the side of a railroad, others 65, 75, 50 and others within 4 or 5 or 20 miles away, and the ore has to be taken down the tortuous trails of the mountain sides of Old Mexico upon the backs of burros.

During the reign of the Madero government, that is, while the revolution was in existence, it practically stopped everything. However, after he was once elected and placed in power, the mines all opened up and their owners began pumping out the water with which their mines were filled during the time of the revolution. However, due again to the lack of railroad facilities, coal was practically impossible to obtain, due to the great distances from railroad transportation.

I have lived in the country, I know the people and I returned from there but a few weeks ago; returned from the midst of that cataclysm of anarchy, death and fire, starvation and pestilence, and I talked with and listened to many intelligent Mexicans, that is, I listened to and talked with such Mexicans as it would be safe to go among, and at the present time I find that the country is very much split on the question of Carranza. Many regard him as a high-minded benefactor of the poor, while others regard him as a treacherous robber. It is just this division of thought which is creating many factions at the present time.

Now, I have often thought that it is a great pity that something for the sake of humanity, for the sake of these millions of fellow beings, cannot be done, it is a pity something cannot be done for that God forsaken country.

Wednesday, Nov. 15, 1916, 2 p. m.

A. A. Codd of Reno, Nev., presiding.

"The Marketing of Zinc Ores" was discussed in a paper by W. B. Shackelford of Webb City, Mo. He devoted his attention to the sampling and the marketing of zinc ores in the Joplin district, comprising northeastern Oklahoma, southeastern Kansas, southwestern Missouri and northwest-

ern Arkansas. On the plan of settlement he had the following to say:

Taking a 60% ore, we receive \$1 for each per cent over 60% in settlement, and are penalized \$1 for each per cent under 60%. We are allowed 1% for iron. That is, if your ore carried 1½% for iron, you would be penalized 50 cts. The moisture is simply deducted from the total gross weight of the shipment. The mean of the two samples is taken to determine the basis of settlement. It is very seldom that we have differences of any consequence. Sometimes there are shortages claimed in weight, and if indications point to the scales being out of balance, the seller usually makes that good. If the shortage appears to have occurred in transit, the loss is upon the buyer. All settlements are cash upon determination of the assay. That form of settlement is used entirely in this district, and I presume originally started from the fact that in the earlier history of that district many of the smaller operators produced zinc ores. They were men that had very little means and they required the cash, so they could meet their payrolls and pay their supply bills. That system is still in existence today, and when we appear with our assay and check with the buyer, we immediately receive a check for the full value of the ore.

I know of no contracts in force in our districts, although I think at one time there were some contracts in existence in Oklahoma that were made by smelters who purchased largely western ores. I understand that all such contracts have expired.

The penalties sometimes apply to excessive lime in the ore. Some smelters refuse to buy any ore that carries over 1%, and some will limit you to 2%, but you are usually penalized for lime for anything above 2%.

Henricus J. Stander's paper on "Flotation" was well received, it being the first general paper of its kind to be read before the American Mining Congress. The importance of the subject and coming from an authority like Mr. Stander, warrants its publication practically in full:

Judging from an experience in which I came in contact with not only most of the practical flotation men in this country and Canada, but also with most of the scientific investigators of flotation, the practical man in charge of the flotation machines plays a far more important part in the actual development of the process than we give him credit for. To give you an illustration: In a 1000-ton per day flotation plant, in which a special flotation expert was employed, who had the very best co-operation of his assistant and of the chief assayer, I found, after spending 7 days in their laboratories and plant, that the man who could give me the best information, without any doubt in his mind as to what his answers implied, was the flotation man on the morning shift.

He knew exactly what to expect under any given condition. His knowledge came, of course, only from experience. It is the help of such men that the scientific investigator needs more than anything else. I myself have put a year on flotation in a laboratory, and have carried on numerous physical and chemical experiments in relation to this subject. Yet I must admit, after having come in touch with numerous of these practical men, and having taken note of what they had to say, and giving them full credit for their practical views gained perhaps by hard experience, that many points seem far clearer to me now than when I was trying to solve it all in the laboratory.

I am not trying to discourage any type of investigation in the flotation field, for we need as much as we can get and especially at this time, but I am trying to show that the scientific investigator can gain a whole lot, in all cases, when he keeps in close touch with the practical flotation man and his views. Simply because a man cannot talk to you in terms of particles, occluded gas, electrical theory, surface tension, oil film, etc., is no reason in the world why you should not give him full credit for what he knows, for in most cases he knows his subject from a practical viewpoint better than you. It is only through a co-operation of all parties concerned that we can ever expect to reach a final and perfectly satisfactory solution of the problem.

Those of you familiar with the flotation process will agree with me, I believe, that this subject has been credited with an undue amount of phenomenal and unexplainable obstacles. That those principles upon which the very existence of the process depends are not to be explained by any one law is perfectly clear to most of us. Yet the number of flotation pessimists form too large a group; for upon a careful step-by-step analysis of the actual facts in the case, it does not seem as if we are so very far beyond our depths when trying to formulate the courses, not course, of flotation.

In this brief talk, it is impossible to touch on all the points, but I should like to direct your attention to some of the very essential ones.

One of the first things that draws our attention is the fact that sulphides are peculiarly suited for flotation treatments. What is it about the sulphide that makes it so different from the silica? Applying a process of elimination, we find that gravity cannot enter into this discussion. What else do we know about the sulphide and silica bodies, respectively? We know that a silica particle absorbs water much more readily than does the sulphide. This is due partly to the property of porosity as manifested by these two respectively. The sulphide seems to constitute a much more compact and solid body. The very fact that the silica gets wet or absorbs the water so rapidly explains why it should break the water film and become literally "soaked" with water. The sulphide, on the other hand, behaves differently, and even when in suspension in the water, it appears to have more of a film of water around itself than having, like the silica, the liquid throughout its entire system. This may seem fairly theoretical, but we cannot, of course, conceive of so small a particle of either silica or sulphide, but that it is made up of an extremely large number of molecules of either SiO_2 or, say, PbS , respectively. The particle of silica that passes through 200 mesh is far from presenting as compact a body or system as in the particle of sulphide crushed to the same mesh. This to me is one of the very important factors in the flotation process. Going back to the old surface tension flotation process, we find that the separation depended on the fact that the silica, as soon as it strikes the water film, sinks into the liquid, whereas the sulphide particle does not. Now why

should the silica particle sink? First of all, it is necessary for the silica to pierce the surface of the water. Although much attention has been paid here to the so-called "Angle of Contact," I believe the fact that the silica absorbs water so readily plays the main role here.

The porosity of the silica particle, its exterior outline (embodying its so-called angle of contact), its lack of presenting a solid, compact body, will all help it in breaking the surface film of the water, and furthermore allow the liquid to enter its very pores. And this, as you saw, is not the case with the sulphides.

I am not going to bother you here with the duty of oil or acid in this process, for we have been shown that a truly flotation separation can be effected without the use of either or both of these. The oil and acid both will have their respective effects on the surface tension of the liquid and on the materials in the liquid, but in this case foreign substances are employed to get as near as possible perfect conditions. So the discussion of these and their functions is at present outside of my subject, as I am trying to analyze the actual essentials in the so-called flotation phenomenon. To see what these essentials are, it appears as if it is only necessary for us to study the case where this strange process actually takes place in virtue of the properties of the substances in the ore and the water employed. Such is the case in the purely surface tension process. To show you that oil, acid or chemicals are what we can call accessories, and very important accessories indeed, when we are trying to perfect the process, I need only remind you of the present Wood flotation machines and others of the same nature. I had the opportunity to watch the machines of Henry E. Wood in operation in his testing laboratory at Denver. With regard to this machine, I can say that I believe that Mr. Wood has succeeded, perhaps better than anyone else, in making a machine in which the sulphides get an almost perfect chance to stay on the surface and sink into the water; but the biggest thing for the inventor to overcome in this particular process is to make his machine such that the sulphides get as small a chance as possible to become wet.

In the agitation process (mechanical or pneumatic), the sulphides are already in the liquid when they enter the flotation machine, and in this case the inventor tries to make a machine with perhaps the use of outside help, by employing oil, acid or some foreign substance, in which the sulphide will again get a chance to come on the outside of a water surface, although this water surface may take the shape of an enclosing wall around an air-bubble in the liquid, either beaten in by mechanical agitation or passed in by means of what we call pneumatic agitation. The use of oil in this case may help to strengthen these numerous spherical water surfaces around the gas bubbles, or may enable the sulphides better to withstand the tendency of the water to wet them. The silica particles are drenched with the liquid, and so the oil may have a rather slight effect on them; yet I believe the effect of the oil on these numerous water surfaces (or what I called in an article "water-air interfaces") is far more important in the process than its effect on the silica and sulphide as individual particles.

Whatever methods we may be using or whatever improvements in the process we may employ, they all seem to tend to accomplish one thing, viz., to give the sulphide particle the best chance possible to rest on a water-surface, whatever slope this surface may take. We create such surfaces by agitation, mechanical or pneumatic, by the production of gas in the liquid through the action of an acid in some material in the ore, such as carbonates, or by freeing dissolved gas through a decrease in pressure (vacuum action). In some cases we use only the exposed water-surface, in which case it is necessary to pay supreme attention to the way in which the ore particles enter on to the water surface. But in all cases, the sulphide must be given a good chance to assert its property of floating on a water-air or water-gas surface.

That the principles of many of the advanced theories play a part and help in the procuring of this desired condition, I firmly believe. I do not, however, believe that any one principle, such as "occluded gas," explains the existence of the process. Different means may be used to attain the same end, and consequently different factors will enter into these different means employed; yet to understand why flotation takes place it is necessary for us to lay bare only those very essential things necessary to produce a flotation action. This we find in the very simple surface-tension process. Coming down as far as this, we are then confronted with the question: "Why does the sulphide float on the water surface?" And I repeat that to me the following properties of the sulphide explain its behavior:

1. Its slight degree of porosity, or its obstinacy to let water enter its system.
2. The compactness of the molecules comprising the sulphide particles as compared with that of the SiO_2 molecules. And this would, of course, favor the above mentioned obstinacy.
3. The exterior form, shape or outline of the finely crushed sulphide particle being such as not to be near so liable to pierce a water-gas film as is the silica particle.

I must again repeat that the very fact that the silica seems so eager to get wet, in other words, absorbs water so very readily in its pores, contrary to the behavior of the sulphides, that this property is of utmost importance in the flotation process.

Some of you may be eager to ask: "But why is it that some sulphides are more floatative than other sulphides, since, according to this they would then all come under one class?" Well, it is only necessary for us to recollect that the molecules of one sulphide, say, galena, will not be exactly as compact in comprising the particle of galena, as are, say, the molecules of MoS_2 in the particle of molybdenite. The sulphides will fall in the same group as far as their porosity, compactness of molecules and exterior surfaces are concerned, but the slight variations in these properties as manifested by the different sulphides would warrant different degrees of amenability to the flotation process for the different sulphides.

The behavior of the different sulphides as far as these properties are concerned would also make it necessary that a definite sulphide ore should be crushed to a definite degree in order to obtain the best results in flotation.

I believe you have heard enough on the theoretical end of the subject, and it may interest some of you to hear about a few of the most interesting things I saw in visiting the flotation plants in North America. Perhaps some of you do not as yet know that a 1000-ton flotation plant is in operation in Alaska. Should you care to read an account on Alaska flotation, I refer

you to the Alaska flotation article that appeared in the Nov. 11 issue of the Mining and Engineering World.

Perhaps the most interesting case I saw was up in the Cobalt district, Ontario, Canada. Most of the companies are treating their old tailing dumps. The concentrate may run as high as from 250 to 300 ozs. in silver. The concentrate will also carry approximately 2.0% copper, 0.5 to 1.0% nickel, 2.0 to 2.5% cobalt, 9.0 to 10% arsenic, 17 to 18% iron.

Most of these companies never knew that their ore contained any traces of copper, but when flotation was started to make a 300-oz. silver concentrate from a 10-oz. tailings, many were surprised to find copper appear in the concentrate. The concentrate is, of course, sold only for the silver values, as, according to the composition of the concentrate, the other metals are of no value in such a combination. Perhaps it may be made clearer by directing your attention to the Mond Nickel Co.'s problem. I warn you all not to ask me any detailed questions with regard to the nature of the ore and the troubles encountered in the flotation experiments, as it is not the policy of this and most of the other companies up there to allow detailed results to be given out. Yet I may state what their problem is. The object is to bring about a separation of nickel from the other metals, particularly the copper. Should any flotation investigator, whether a university research man or an employee of the state or government, ask me to express my views on the best and most interesting topic to work upon, I would immediately suggest the study and attempt to solve this problem: The separation, by flotation, of nickel from an ore carrying the sulphides of nickel, copper and iron. The problem would, of course, resolve itself into a preferential process. Preliminary roasting, the use of a chemical and the effect of oils, acid and alkali would all be points that would come under this work. The solution of this particular problem, and similar preferential-flotation ones, would be far more valuable than most of the theoretical problems that some of the investigators are now trying to solve.

The paper by D. A. Lyon and O. C. Ralston of the U. S. Bureau of Mines on "The Present Status of the Ore Flotation Process" was read by H. I. Seaman. According to the authors:

Flotation as practiced today is a method of causing one mineral or another to stay on the surface of water or other liquid or to be entrained in the froth lying on the surface of water or other liquid. Only certain minerals will so float and the remainder of the finely ground ore sinks. Flotation finds its present application in the recovery of sulphide minerals or of native metals from a finely ground pulp. Such a finely ground pulp has for many years been known as slimes and has often been a source of much trouble and loss due to its finely divided condition.

Previous to the development of flotation no process for successfully extracting aimed values from low-grade ores existed. Flotation is needed as a process for treating such material. Now that it has been developed, its principal applications are to the following materials.

(a) Accumulations of old tailings containing minerals which were not recovered at the time the ore was treated by ordinary gravity concentration methods.

(b) Tailings from ores now being treated by ordinary gravity concentration processes, for the recovery of the value not recovered by the gravity concentrating machines.

(c) Ores containing valuable minerals in such small crystals as to necessitate very fine grinding in order to permit of the valuable particles of the ore being separated from the gangue. It is, of course, understood that this applies to only sulphides or metallic minerals.

Several different kinds of flotation have been proposed and used, such as film flotation, bulk oil flotation, and frothing flotation. This last type of flotation is the one largely responsible for the great metallurgical advances which have recently been made in the treatment of non-ferrous ores and is now practically the only commercially important method of flotation. A frothing agent, usually an oil, or a substance closely relative to an oil, is used in order to make the water of the pulp froth easily. In addition, the substance added must be such that the valuable minerals will adhere to air bubbles introduced into the pulp. These air bubbles in rising to the surface must carry only the valuable minerals and the froth formed on the surface can be allowed to overflow or to be raked off in some manner, separating the valuable minerals from the gangue. Hence, the first operation in flotation after the ore has been finely ground in readiness for the application of the process is the mixing in of the "oil" and other addition agents. Whether rightly or wrongly, flotation men have come to call this operation emulsifying of the oil. Whether it is emulsion or not, the oil is distributed throughout the ore very thoroughly by mechanical or pneumatic methods of stirring. A soluble frothing agent can, of course, be very easily mixed in with the pulp, but when an insoluble frothing agent is used, the pulp usually needs considerable mechanical heating. The fact that very often only one pound of oil, such as wood creosote, or coal creosote, is used for every ton of ore, which is suspended, say, in four tons of water, makes considerable stirring necessary in order to divide up this oil equally throughout the pulp. Just exactly what function the oil performs is still obscure.

Oils have been classified as frothers and collectors, because some oils make abundant froth but collect very little mineral into the froth, while others seem to have the property of collecting plenty of mineral, but do not tend to froth well. The presence of both properties in an oil, or the use of an oil having each of these properties, seems to be necessary. Occasionally an acid or an alkali or various metallic salts are added. There is a serious question as to the feasibility of flotation in perfectly pure water. Many instances are known where the addition of an electrolyte of one type or another has improved the flotation work, but the reason is not clear. It is possible that acid helps clean off the surface of the particles of sulphides in case they are partially oxidized, and when a better recovery is effected by the addition of an alkali, something takes place, but at the present time nobody knows what it is.

The operations of mixing in the oil and introducing small air bubbles to form a froth, and finally separating the froth, are performed in machines of two broad classes, namely, mechanical and pneumatic.

In the mechanical machines, the mixing of the oil and the introduction of air bubbles takes place usually simultaneously. This is generally effected by a rotating member of one type or another, so arranged that in its rotation air bubbles are beaten into the pulp. As examples of the most successful machines performing this operation are those of the Minerals Separation Co., the Janney machine, and the Krout & Kohlbach machines. After beating the air into the pulp in such machines the pulp is allowed to pass into a spitzkasten where the froth is allowed to rise to the surface and be removed.

There are likewise three general types of pneumatic flotation machines, namely, the Callow, the Inspiration and the Cole-Bergman machines. In all of these the oil must be previously mixed with the ore by any method, while air is introduced through any kind of a porous medium, such as a canvas blanket, on the bottom of the machine.

The present status of the mechanical side of flotation is the designing of new machines along two general lines, namely, those which will consume less power, or less oil, than the earlier types of machines. In other words, one of the greatest advances now being made in flotation is in the designing of machinery.

After the froth is carried off, or flows off from a flotation machine, it must be broken down and dewatered, leaving a concentrate to be sent to the smelter, or otherwise metallurgically treated. At first, considerable difficulty was met in the breaking down of froths, but it is believed that there are now appliances developed which will break down almost any froth. The use of oils which will give an easily handled froth is one thing which is to be considered. A finely divided jet of water issuing from various patented nozzles, such as garden spray nozzles, has been found to be a very efficient breaker of froth. Passing the froth through a bucket elevator has been known to be a good method of breaking it up. Almost universally the pulp resulting from breaking down and concentrating the froth is dewatered in such apparatus as the Dorr thickener, to a consistency which can be filtered. Vacuum filters have become very popular in the filtering of flotation concentrate, especially the filters of the continuous type, such as the Oliver and the Portland. However, they do not give concentrates with as low a percentage of moisture as do the pressure filters, where high pressure can be used in blowing out the water from the filter cake. In some cases it will probably pay to even dry out the moisture in filter cakes in order to save freight when shipping the concentrate to the smelter. As the material is very finely divided, tight railroad cars are necessary for its shipment.

The effect of flotation on smelter practice has been considerable in copper metallurgy and promises to cause extensive changes in zinc and lead smelting practice. The finely divided flotation concentrates are not adapted to smelting in a blast furnace because of the formation of too much flue dust. In copper metallurgy the trend had been toward reverberatory furnaces before flotation was developed on a large scale, and the effect of the sudden development of flotation was the almost complete change to the reverberatory furnace. The reverberatory furnace smelts flotation concentrates with very little previous preparation. The most serious problems in the treatment of any flotation concentrates are the roasting problems. In lead metallurgy it is possible to pass this material over a Dwight-Lloyd, or other centering machine, and obtain a product adapted to blast furnace smelting. It is possible that this could be done in copper metallurgy if the sulphur content of the material were not too high. In the case of zinc sulphide concentrate, the case is not quite so easily handled. The fine subdivision of the zinc sulphide should lead to new methods of roasting and smelting zinc in order to prevent the dusting losses during roasting. In the field of gold and silver it has been found that flotation is a more economical process than cyaniding for many ores and the effect will be the sending of flotation concentrate to the lead and copper smelters for the extraction of the silver and gold contained in them. It would seem that the present state of the art is such that further important developments in smelting practice are liable to take place in the effort to meet the difficulties encountered in treating flotation concentrate.

As intimated above, the flotation process at the present applies mostly to sulphide ore, notably of zinc, lead and copper, although the process seems to be well adapted to the concentration of silver sulphide ores and considerable success has been had in concentrating gold ores with or without the presence of pyrite.

Notable installations where zinc sulphide is being floated are the Butte and Superior at Butte, the Mascot in Tennessee and the Interstate-Cullahan in Idaho. Galena is being successfully floated in the southeast Missouri district and in the Coeur d'Alene district of Idaho. Copper sulphide ores are being most successfully treated at Anaconda, Inspiration, Chino, etc. Silver and gold ores are being treated with success throughout Colorado and Nevada.

In the copper country they are finding that the finely divided native copper is also amenable to flotation. During the past year considerable experimental work has been done in flotation of carbonate ores of lead and of copper with the promise of considerable success. This flotation has been accomplished by first treating the ore with the solution of a soluble sulphide such as sodium or hydrogen sulphides. The flotation of the artificial sulphides so formed seems to be a comparatively simple process. While the present state of the art has not seen the successful commercial accomplishment of this method, it is probable that the immediate future will see flotation of carbonate ores of both lead and copper. All attempts at the flotation of carbonate ores of zinc have thus far failed.

We are informed that important developments are on foot making possible the concentration of iron oxides such as magnetite and scheelite and fluorite, and such related minerals which break up with marked cleavage planes.

Very little is known as to the "why" of flotation. We only know "how." During the past year some very important theoretical papers have appeared, but the discussion of the underlying principles involved in flotation has only begun. We do not know enough of the properties of the various oils used and we do not know what becomes of them during flotation. We do know why certain minerals will stick to air bubbles in water contaminated with such oils and it is probable that there are too many things involved for a very immediate complete scientific explanation of the process.

In spite of lack of knowledge as to the underlying principles,

its scope is being rapidly widened and it seems safe to predict the commercial success of the extension of the process to flotation of lead carbonates, and of copper carbonates during the coming year. The solution of the problem of the mixed sulphide and oxidized copper ores, so common in Arizona, also seems to be nearly in sight. The extension of the process to the flotation of non-sulphide minerals of a valuable nature seems to be a more remote possibility, but there are reasons for thinking that a better understanding of the theory of flotation will finally result in the development of methods which will allow the flotation of any kind of mineral. Differential flotation of two flotative minerals in the same ore is at present only mildly successful and we feel justified in predicting important developments along these lines as well. The art is still in the stage of development. It is experiencing a vigorous youth and its full growth has by no means been obtained.

Charles F. Willis, speaking on "The Value of State Organizations," claimed that the reason why mining is not getting its share of recognition is the fact that there is a lack of organization and co-operation, and advised the learning of the lesson from the farmers, whose conditions are envied.

Thursday, Nov. 16, 1916, 10 a. m.

In calling the meeting to order H. I. Scaman, who presided, announced the belief that there should be some forceful revision in the method of giving out subjects to the big men of the country to discuss, and then having the big men not to show up.

This conference is attended by men from all over the United States, who come here from great distances, and who come here for the very purpose of hearing these talks, often leaving their businesses many times at great sacrifice, merely to listen to the papers by the big men of our industries who are announced weeks and weeks before, weeks and weeks in advance, to give us some paper of real interest, because it is only those men who have given the matter long months and years of study that can discuss it properly and answer our questions. For instance, I myself am very much interested in Frederic Laist's development at Anaconda, and I personally have given up matters of considerable importance this morning to come here and listen to his paper, but he is not here. Neither has he deigned to tell this conference anything as to his whereabouts or as to his intentions. Now, I am going to propose at some subsequent meeting that a revision of this method be made, so that we will have these men right at our meetings, Johnny-on-the-spot, or else we will have something in the way of a paper here from them.

The report of the Committee on Revision of the Mineral Land Laws was read.

According to a paper by Fred F. Van Wagenan of Denver on "The Prospector and the Mining Law," by excluding extralateral rights, the rights to follow a vein outside the side lines of a claim, from the Federal mining law, and change its simple provisions for the initiation and maintenance of titles, the prospector will disappear. With his disappearance, discovering (except by accident) will cease. Then as our known ore bodies become exhausted, production will decline, as it has elsewhere, and the magnificent industry that our free laws have created will slowly, but surely, dwindle to the status already reached in British Australasia, and to that which is approaching in Canada.

Oil and Gas Section.

Tuesday, Nov. 14, 1916, 2 p. m.

Judge Short presiding.

In a paper on "The Authority of the State to Tax Mining Property on Indian Lands," Judge J. G. Gamble of Des Moines, Iowa, reviewed with some detail the various decisions in which it was established that instruments of the general Government are immune from taxation by the several states. Mining and oil leases on Indian lands are made by the Government under the Curtis Act, royalties, etc., all going to the Indians or rather to the fund held by the Government for its wards. Thus it was also held in another famous case that an attempt on the part of the State of Minnesota to tax securities owned by its citizens, but issued by a municipality situate in Indian country which in time gained its power to issue the securities from the Federal Government, is void. From this point Judge Gamble shows that the Government in its administration of Indian lands has vastly increased the amounts set apart for general service, maintenance and supervisory purposes. In this respect the officials do not differ from those of American municipalities. And finally Judge Gamble proposes what he believes is a decided improvement on methods of taxation. He be-

lieves there should be created in each taxing district a board consisting of tax payers to whom the administrative officials should submit an estimate of their requirement of funds for the ensuing year, together with a financial statement showing among other things, the resources of the municipality other than from taxation, and if such board was invested with authority to review such an estimate and reduce the same, and not increase it, as their judgment might dictate, and thereupon was empowered to lay the taxes necessary to meet the estimated requirements as approved by it, it would seem to him that there would be an added assurance to the tax payer that he would be subjected to no such extravagant expenditures as is possible in certain communities now.

In a paper on "The Relation of the Federal Government to Western Oil Production," Governor James N. Gillett reviewed the oil situation as it affected the public lands in the west. As early as 1909 the conclusion was reached that something ought to be done by the national government to conserve the oil resources of the country, and to keep such a control over those resources that there might be prevented monopoly and waste and an over production. He discussed the various withdrawals covering oil lands and as to what disposition was to be made of them by the government.

The paper created considerable interest and brought forth extended discussion by delegates and members, including J. C. McDowell, Judge Short, Louis Titus, Dr. Norman Bridge, and Max W. Ball.

At the conclusion of the paper the following resolution was read and adopted.

Be It Resolved, That this Congress is deeply interested in the just operation of the mining laws. As a result of certain orders of withdrawal by the President and legislation by Congress, many persons, who at great expense, and, as adjudged by the courts, in good faith have developed the oil lands of the country, are threatened with ejection and forfeiture of their developed lands and their investments, in all such cases we urgently urge prompt and appropriate relief legislation so that those who have in good faith developed such lands shall be protected and shall receive prompt and appropriate relief.

Wednesday, Nov. 15, 1916, 2 p. m.

Dr. Rittman in his paper, "Through the Use of Petroleum," showed that the annual consumption of dyes in America is, roughly, from 100,000 to 125,000 tons.

Of this total amount 90% is made up of two colors. Sixty per cent of all the colors used in this country are black, 30% blue, and the numerous other colors are in the remaining 10%.

We hear all kinds of opinions and estimates regarding the importance of this dye industry, some believing that the very foundations of the making depend upon it, others again believe now that in terms of dollars and cents it is no more important than Woolworth's candy item a year. True, it doesn't amount to more than Woolworth's candy item, but it is wrong to consider it in that light.

The importance of the dye industry is more in its relation to other industries, such as the leather industry, the textile industry, and more particularly the explosive industry. The world has learned from a military point of view that Germany's wonderful dye industry was in reality an explosive industry.

It is very natural that these two industries should run hand in hand, because they use identically the same materials to start with, and the processes of manufacture are practically the same up to the very end.

Therefore, we have the close relation between these two industries, first, because they use the same materials, second, because they are manufactured by the same processes. The same equipment that makes the dye materials makes the explosives, and it is a matter of a week or two to convert a plant from one into the other.

In concluding his paper Dr. Rittman held that there is no fundamental division scientifically between coal, lignite, peat, shale, oil, gas. It is a question of volatile matter or a question of hydrogen relative content, because hard coal is the one extreme, methane is the other extreme. Twenty-five per cent of the methane is hydrogen; practically none of the coke is hydrogen. None of the hard coal is volatile, or all of the methane is volatile. It is a case of getting a blend between, that is, on the extreme substances. Is it possible to make one into the other? Not at all. Nature has simply done the same, but scientifically the mere possibility has conceived the possibility in very many cases. So it resolves itself into a natural working out by a study of the laws of physics and chemistry, a study of the laws of nature, and working in sympathy and harmony with those laws.

"Geology In Its Relation to the Oil Industry" was the subject of a paper prepared by J. C. McDowell of Pittsburgh. A summary of the paper follows:

Oil and gas are found in practically every formation porous

enough to contain it through the entire geologic series. But profitable commercial deposits are found only when the formation containing them is enclosed within an impervious strata of rock or shale, usually the latter. It is for this reason that the anticlinal theory first promulgated by Dr. I. C. White about 1880 has been gathering strength in late years. Dr. White discovered that the production was generally found associated with anticlines or earth folds, gas being in the upper part of the anticline; oil, the next heavier, below the gas, and beneath the oil, the salt water.

Perhaps it might better be said that in recent studies the application of the anticlinal theory has been more fully developed, and accumulations are found in places where the theory apparently does not hold, but upon further study a trap or some condition similar to that produced by anticline is found to be present.

Very few, if any companies, however, applied geology greatly to wild-cattling work.

In fact as each producing section of the country appears to offer its own peculiar problems of relationship of deposit structure, it is practically necessary to study each field by itself; but the more this is done the more apparent becomes the fundamental uniformity along certain geological lines.

Probably the most successful application of geology to gas and oil production is that of the last few years in the Mid-continent field in Kansas and Oklahoma. It is safe to say that during 1915-16 several million acres of land have been leased on this trend, and strange to say not only has Kansas acreage been brought back into demand after years of absolute condemnation as worthless for oil and gas purposes, but practically all of the larger producers, but record prices for undeveloped leases are now being paid in that territory. This condition has been brought about by discoveries made along a strictly scientific basis and by men who had faith in the correctness of the anticlinal theory.

By this work were opened three prolific oil and gas pools now among those attracting the attention of the entire oil fraternity—the Augusta pool, the North Augusta pool and the Eldorado pool, all of Butler county, Kan., which represent a good individual example of geology applied to the oil industry. After several years of unsuccessful attempt to open the Augusta gas pool along the customary practical lines, and this field abandoned several times as small, spotted and of no great consequence, methods of geological disclosures were attempted which were very successful from their earliest application in 1913 until today. The earliest attempts were made by taking the level, or altitude at the mouth of each of the wells drilled, whether productive of gas or oil, and plotting an arch representing the top of the gas-bearing sandstone stratum from the well logs or drilling records, taking the cross sections at several points and indicating the true axis of the anticlinal dome, and thereby under a short period of time the field was extended several miles in length by actually producing wells.

Later a carefully prepared planed table survey of the structure was made, using the Fort Riley limestone outcropping at the surface as a base or datum on which to plot structural contours, thus disclosing a dome or trap extending in an irregular shape for seven miles in length and two and a half in greatest width.

It was very apparent that with careful geologic study upon the sound lines, that practically all of the main productive fields of Kansas and Oklahoma could have been forecasted and opened strictly upon geological evidence.

In general it must not be understood that such forecasting is a simple matter, for it is not. At best there are many chances of failure, even after a possible trap is disclosed upon the surface of the ground. Not only is there a danger of the trap flattening before porous strata are reached, but there may be no porous strata underneath. Again there may be, but filled with salt water; again there may be some denser impervious area intervening on the slope preventing the oil and gas from collecting in the dome or trap, and last there may be no gas or oil in any of the formations tapped.

Only patient, careful thought and study can avail.

R. L. Welch had for the title of his paper "Practical Phases of the Standard Oil Dissolution, and the Necessity of Combinations Among Independent Producers to Meet Unfair Competition."

A paper on "Oil Storage" prepared by Garrett B. James of Chicago claimed that the two main points to be considered in the storage of petroleum are evaporation and fire hazard.

The loss of the lighter or more volatile constituents of the oil lowers its value to a more or less marked extent. Evaporation from loose top steel tanks has been as much as 2,000 to 2,500 bbls. in 5 months. Evaporation from steel tanks with gas-tight steel roofs has been comparatively low for the same period. The saving by the latter method would probably cover the additional cost in construction of the tight roof in less than 2 years.

The most effective means known of reducing the fire hazard of oil in steel storage would be the equipment of all-steel tanks with gas-tight steel roofs, properly vented so as to eliminate any possibility of back-firing tanks to be electrically grounded.

As a thoroughly-grounded gas-tight tank of metal is safe from damage by lightning and will also reduce evaporation losses to a marked extent, this is considered the best form for oil storage.

In his paper on "Remedial Legislation for the Benefit of Oil Companies," Roy N. Bishop, president of the Oil Industry Association of California, summarizes the situation as follows:

Under the Act of Congress passed Feb. 11, 1897, entries upon and patents for oil lands can be made under the provisions of the laws relating to placer mineral claims. It was found that the law was a misfit even in the opinion of the Secretary of the Interior and could not be properly applied to the prospecting and developing of petroleum lands; but acting

under the assumption that the government would do no wilful injustice where actual prospecting was in progress many valuable pieces of land were entered upon by men who expended, in many instances, their entire fortunes. New oil fields were discovered, splendid properties were developed and a great industry given to California and the Nation through the courage, optimism and pluck of these men. The development of one oil field encouraged men to further penetrate the mountains and look for others. In the summer of 1909 they were in the midst of this work when in September 3,041,000 acres in California and Wyoming were withdrawn from entry. A divided Supreme Court declared the withdrawal legal.

Ever since the withdrawal the conditions in the oil fields of California have been chaotic. No new work is being done, great losses are being suffered and bankruptcy faces many who but a few years before went upon government land in the best of faith.

What is going to be done for these men? What relief should Congress give them in the oil-leasing bill now pending in the Senate? Secretary Lane in his report for 1915 says Congress should prevent "an unnecessary injustice to those who have invested many millions of dollars under a mistake as to the law." The House has recognized these equities. The Senate Public Lands Committee favors a like provision. Now comes opposition to the relief provisions of the bill from Gifford Pinchot and a few other ultra conservationists, based upon the cry of "wilful trespassers and looters of the public domain." Two federal judges have dealt with this assertion. Judge Bean in the case of the United States versus the Midway Northern Oil Co. says: "The defenders were not wilful trespassers but relied upon the law and were honest in their belief that they were within their rights." Judge Bledsoe's decision in the case against G. W. McCutcheon is just as emphatic in his statement.

Thursday, Nov. 16, 1916, 10 a. m.

"Adequate Acreage and Oil Conservation" was the subject of a paper by Max W. Ball of the U. S. Bureau of Mines. Mr. Ball decried the enormous wastage now going on and cited figures from various authorities that at the present rate our oil supply—7,704,000,000 bbls.—would last but 29 yrs., based on government figures of resources now available. He emphasized the necessity of conservation:

It is evident that here is a resource the use of which is rapidly increasing, the dependence upon which is well-nigh universal, and the readily available supply of which is limited. There could be no situation calling more clearly for prevention of waste, economical production, and careful use—principles of wise development and proper utilization which we comprehend by the word "conservation." If the American people have need to practice conservation with regard to any natural resource, it is with regard to their supplies of oil and natural gas.

Are we practicing this conservation? Within the last few weeks I have seen millions of cubic feet of natural gas wasting into the air—gas so rich in gasoline that it dripped from the trees like an April shower. I have seen wells capable of yielding 40,000,000 cu. ft. of gas each being deliberately drowned out by pumping water into the gas sands. Reckless drilling, defective casing, careless plugging are flooding great areas with water and losing forever enormous quantities of oil. It has been testified before the Corporation Commission of Oklahoma that ordinary methods leave from 25 to 85% of the oil in the ground, and this estimate is concurred in by careful engineers and practical oil men. Think of it! Twenty-five to 85% of this valuable resource left underground, chiefly through ignorant, careless, wasteful methods.

Nor are these underground losses the only ones. When the oil is brought to the surface before transportation and market are ready for it, it must go into storage. Indeed, in many fields oil has been produced before storage was available and millions of gallons have gone down the streams or seeped away from earthen reservoirs. Even when the best steel tankage has been provided evaporation losses still go on. Cushing crude stored in steel tanks for a few months lost approximately a fifth of its gasoline content. The State Mineralogist's office of California has estimated that even with the heavy oils of that state the loss by evaporation represents perhaps 25% of the total value of the production at the well. An official of one of the largest companies in the Midcontinent field recently told me that last year fire destroyed 6% of his company's production.

Just consider these examples: 25 to 85% left underground; 20 to 25% of the value of oil produced lost through evaporation in storage; 6% of stored oil lost by fire! These losses are staggering and are not exceptional! What a small percentage of this wonderful natural resource is saved to run your machine or to deliver goods at your door, or to plow the fields from which your food must come!

In concluding, Mr. Ball said:

If you would prevent waste of oil and natural gas, if you would do away with careless drilling methods, excessive production charges and storage losses, if you would insure the production of the maximum amount of oil at the minimum cost, if you would help to maintain a reasonable price for petroleum and its products in the years to come; then do your part in creating a public sentiment in favor of adequate acreage. You may not find it a popular propaganda just now. You will doubtless be accused of advocating monopoly and probably branded as a corporation partisan. But if you take one step toward imbedding the acreage idea in the popular mind, or incorporating it into state legislation, or embodying it in oil-field practice, you will have assisted in conserving the oil and gas deposits of the United States, and will have rendered a valuable public service.

Dr. David T. Day had prepared a paper on "The Chemical Possibilities of Petroleum," but owing to the shortness of time was read by title only as was that of Franklin D.

Roosevelt on "The Naval Oil Reserves as a Necessity to National Preparedness."

"The World's Oil Supply" was discussed in a paper by Ralph Arnold, New York, which concluded the sessions of the Oil Section.

Smoker.

Tuesday Evening, Nov. 14, 1916, 6:30 p. m.

In the Grand Ball room of the La Salle Hotel a most enjoyable smoker was tendered the members and guests at which a Dutch lunch was served, interspersed with vaudeville numbers. Orchestral music enlivened the occasion.

Manufacturers of Mining Machinery and Supplies Have Notable Exhibit.

The conveniences which have become necessities in the industrial world above ground are rapidly being extended to equally important uses underground in mines. The electric lamp, the electric railroad and other machinery operated by electric power, the telephone, the acetylene lamp, etc., have become indispensable to efficient mining. It would be a difficult matter to imagine our large copper, gold, silver, coal or iron mines being worked on anything like their present scale with only the facilities available a century ago. Their operation would be physically and financially impossible on the tremendous scale of the present time. Every means available must be employed to increase output and decrease cost of production.

Seldom, if ever, does it come within the reach of the average operator, mine manager or superintendent to have the opportunity to see or know of every new device put upon the market that will increase the efficiencies of his operations. In the exhibits made by manufacturers of machinery and supplies at the nineteenth annual session of the American Mining Congress in Chicago, an unusual opportunity was afforded the mining man to get in touch with many new appliances as well as the standard products that have stood the test of time and will continue to do so for time to come.

Among the exhibitors were the following:

H. R. Ameline Prospecting Co., Core Drill Contractors.—Gave a drill demonstration in motion pictures, the first demonstration of its kind given.

American Mine Door Co., Canton, Ohio.—Automatic mine door, automatic mine switch, extension lever track switch, automatic electric switch, trolley wire splice, insulated trolley splice, solid feed wire splice, flexible cable splice, section insulators, trolley frogs, automatic signals.

Carbic Mfg. Co., Duluth, Minn.—Carbic portable welding outfit and flare lights.

Central Foundry Co., New York.—Universal cast iron pipe and fittings.

Edward Christman, Drilling Specialist, Massillon, Ohio.—Development of mineral land and water supply. Exhibited a miniature oil well drill in operation. Sample of cores were displayed.

R. & J. Dick, Ltd., Passaic, N. J.—"Dickbelt," the original Balata belt; Barry patent transmission equipment; tubular steel-split pulleys; semi-steel drop hangers, adjustable post hangers.

Draeger Oxygen Apparatus Co., Pittsburgh, Pa.—American-made oxygen breathing apparatus, for mines, and the small self-rescue apparatus for light engineering work; type B pulmotor; safety signs; electrically lighted bulletin boards, and a full line of safety-first supplies.

Electric Storage Battery Co., Chicago.—Submarine cell as used by the U. S. Navy; iron clad-exide cells, as used on storage battery locomotives, iron clad-exide cell cut away to show internal construction.

Fairmont Mining Machinery Co., Fairmont, Va.—Railroad car retarder, portable electric mine pump, steel mine ties, conveyors, car hauls, tipples, etc.

J. D. Fate Co., Plymouth, Ohio.—The Plymouth mine locomotive (gasoline type). A list of the company's installations in the mining industry was shown covering practically every branch of the industry in this and foreign countries.

Felt & Tarrant Mfg. Co., Chicago.—The controlled key comptometer, adding and calculating machines.

General Electric Co., Schenectady, N. Y.—Permissible miners' electric cap lamps, with several new and novel safety

features; new form H-2 incandescent headlight for mining locomotives, illustrating special features, such as the adjustable focussing device, parabolic glass reflector and spring suspension; line material devices, such as suspensions, clamps and roof attachments for mine haulage systems; mining machine and locomotive reel cables.

Goodman Mfg. Co., Chicago.—Storage battery and trolley type electric mining locomotives and electric coal-cutting machines (photos).

Haggard & Marcusson Co., Chicago.—Tiger steel bunks for housing men in bunk houses under sanitary and comfortable conditions.

Jeffrey Mfg. Co., Columbus, Ohio.—Photographs and literature on electric locomotives, crushers, conveyors, rotary drills, fans, truck loaders, etc.

Justrite Mfg. Co., Chicago.—Carbide lamps and lanterns for metal and coal mines, fire-prevention devices, non-explosive oil cans, automatic oil waste cans, chemical fire extinguishers, sanitary hospital pails, sanitary garbage cans.

Koering Process Cyanide Co., Detroit, Mich.—Literature covering the Koering method of extracting precious metals from their ores.

Link-Belt Co., Chicago.—Demonstrated by photos the handling and preparation of coal at the mine by Link-Belt machinery. Pictures were also shown of coal storage systems for both anthracite and bituminous coal; modern picking tables and loading booms; power-operated car dumps; the Ayres separator; portable wagon loaders, electric hoists and Link-Belt silent chain drives.

Macomber & Whyte Rope Co., Chicago.—Wire rope, wire rope fittings, Crosby clips, Monach car hitchings, lamp guards.

Miller, Earle & Miller, Inc., Distributors, Chicago.—Four wheel drive trucks and Troy truck trailers.

Monroe Calculating Machine Co., Chicago.—The Monroe calculating machine.

Morgan-Gardner Electric Co., Chicago.—Metal mines locomotives (photos).

Pengacola Tar & Turpentine Co., Gulf Point, Fla.—Yellow long leaf pine, raw material and flotation oil.

John A. Roebling Sons Co., Trenton, N. J.—Wire rope and wire for every purpose.

Siebe, Gorman & Co., Ltd., London, Eng., represented by H. N. Elmer, Agent for North America and Mexico.—"Proto," self-contained oxygen breathing apparatus for mine rescue work; "Salvus," half-hour self-contained oxygen breathing apparatus for rescue work of short duration, especially ammonia fumes, chemical laboratories, etc.; flannel smoke helmet and respirator used by British army in combating gas attacks; helmet and mask with telephone for use of firemen; "ambalanza," oxide generator for first aid work; electric safety lamp; self contained diving suit used by Universal Film Co. in the production of "20,000 Leagues Under the Sea."

Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., Chicago.—Exhibited the well-known Mine-a-Phone for underground work as well as other telephones used in connection with telephone systems for mines. Also mine signalling apparatus.

Sullivan Machinery Co., Chicago.—Diamond drills, diamond drill contracting coal drilling machines, chain coal cutting machines; air compressors and coal punching machines.

Tool Steel Gear & Pinion Co., Cincinnati, Ohio.—Tool steel hardened and toughened gears and pinions for mining locomotives and machines; also showing tool-steel pinion which has been in service five times as long as the average life of the untreated pinion in the same locomotive.

Vulcan Fuel Economy Co. (J. L. Simonds & Co.), Chicago.—Vulcan soot cleaner for water-tube and tubular boilers; Hays gas analyses instruments; Hays draft gages; Vulcan Lastite, an air-tight coating for boiler settings; Eclipse smoke indicator.

Miscellaneous Exhibits.

The Arizona Exhibit.—Representing the resources of the state, distributing a large variety of literature regarding the state, maps and samples from prominent mining districts, pictures and charts showing progress of the state, etc. Distributed badges of Mexican sombreros made of horsehair; also copper bricks, postcards, etc. Represented by Charles F. Willis, director Arizona State Bureau of Mines, and A. M. Heckman, secretary.

U. S. Bureau of Mines.—The U. S. Bureau of Mines is to be congratulated on its exceptionally fine educational exhibit of photographs and apparatus. The apparatus exhibited were only those which had stood a thorough test and were now in use by the bureau field men. Among the photographs shown were some 200 underground "safety" pictures recently taken by the bureau in co-operation with the Ellsworth Collieries Co. These vividly illustrate, in series of from two to five pictures, 50 of the most common accidents met with in soft coal mining. Each series typified a wrong practice, the accident resulting therefrom, and a right practice. Great interest was shown in these safety pictures.

There was also shown a set of pictures and diagrams illustrating rock dusting in coal mines and the application of rock

dust barriers. A mine accident statistical chart was also shown covering metal and coal mines.

The following apparatus was shown:

1. Fleuss-Proto oxygen mine-rescue apparatus.
2. Draeger (by-pass) oxygen mine-rescue apparatus.
3. Set of approved electric mine lamps.
4. Approved safety lamps.
5. Coal-sampling outfit.
6. Mine air sampling outfit.
7. Miner's first-aid cabinet.
8. Surgeon's emergency chest.
9. Burrell methane detector.
10. Canary bird for detecting carbon monoxide (white damp).
11. Fleuss one-half hour breathing apparatus.
12. Oxygen resuscitator.
13. Floor plan and elevation of new all-steel mine-rescue car.
14. Map showing all field activities.

The various Bureau exhibits attracted considerable attention and the various features were interestingly presented by Edward Steidle, mining engineer, in charge.

Mining Publications.—Coal Age, Engineering & Mining Journal, Denver Daily Mining & Financial Record, Mining & Engineering World.

Peculiar Engine Design.

When compressed air was brought in to be used in conjunction with steam in driving the hoisting engine at the Franklin Junior mine, in the Michigan copper country, considerable interest was aroused in connection with the unusual idea. The next step in such unusual practice is to be taken at the Ford Motor Co.'s plant. It consists of a twin tandem horizontal engine. One side is a gas engine with two cylinders in tandem and the other a tandem compound steam engine. The engines are connected to a shaft, on which is mounted a generator of 4000 kw. The gas engines have water-cooled cylinders 42 by 72 ins., and are of the 4-cycle double-acting type. The gas exhaust is utilized in a steam superheater on the steam main between the high-pressure and low-pressure cylinders of the steam engine. Some of the exhaust gas is passed through the jacket of the high-pressure cylinder to reduce heat loss. Finally the exhaust gases are utilized in the feed-water heaters for the boilers. This water has already passed through the cylinder jacket of the gas engine, and has thus been heated to about 180° F. before it enters the heater. The exhaust gas raises the temperature to about 250° F. for the feed. The gas-steam unit is designed to combine the economy of a gas engine under constant load with the reliability of a steam engine under varying load. A gas engine operates to best advantage under full and constant load. The general practice is to run the engine rather under-loaded. This produces wire-drawing of the gas through the valves and ports, which tends to cause a precipitation of matter. Such trouble does not occur with the engine running under full load. To avoid this with the combination unit the gas engine does not come into service until there is at least more than half load on the gas engine unit, so this engine will be normally under full load. The steam engine does all the governing and can meet fluctuations in the load. The only governing on the gas engine is to prevent excessive speed. In case of trouble with the gas side of the unit, the steam side can handle the full load by giving a late cut-off. No information as to the practicability of this design can be given, as the first units were installed late in 1915 and the plant as yet is not in operation.

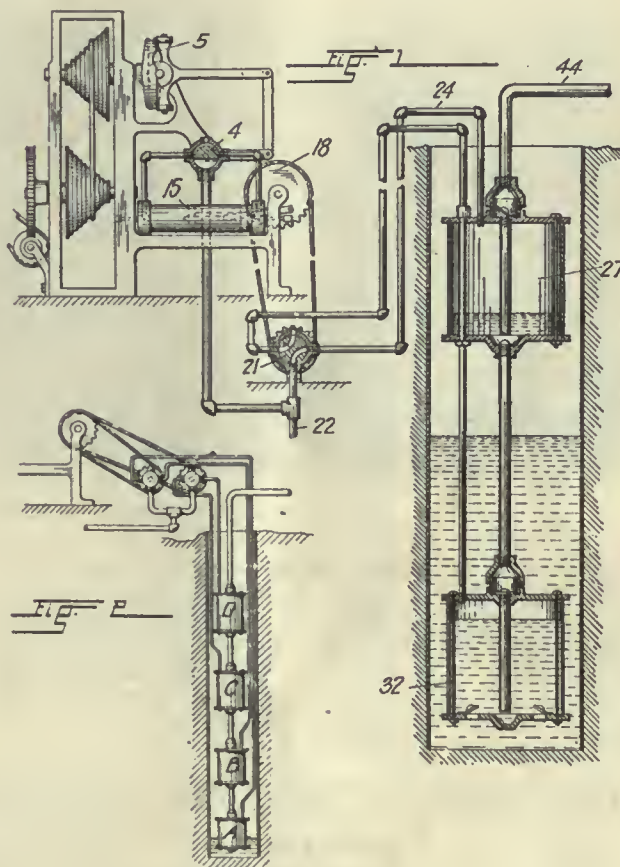
Elevators receive very hard service and it will repay the mill man to make frequent and thorough inspection of these important machines.

In starting up a new plant, no part of the machinery requires more vigilant watching than the elevators.

Pumping by Compressed Air.

There are certain advantages in raising water by compressed air, where the conditions of service permit. These are enhanced if the system is so designed as to have no moving parts in contact with the water, other than the necessary check valves, so that sand, gravel and other solids may be raised along with the water without injury to the operative parts. Such a pumping system has been designed by Philip H. Shue of Denver, as shown in the diagram, Fig. 1.

The compressed air is admitted at (22) and passes up to the rocking valve (4) operated by the cam (5). As this valve tips back and forth on its axis, it admits air alternately behind the piston heads in the cylinder (15) so that the latter moves back and forth and



PUMPING BY COMPRESSED AIR.

oscillates the sprocket (18). This in turn oscillates valve (21), admitting air from (22), under pressure, through pipe (24) to chamber (27). This forces water up and out of pipe (44). At the same time valve (21) exhausts air through pipe (23) from the lower cylinder (32), allowing it to fill with water through the valves at the bottom.

Now when valve (21) is turned clockwise through a quarter circle, air is exhausted from chamber (27) and forced into (32), so that water rises from the latter and fills the former. Then the cycle is repeated.

As will be seen in Fig. 2, two pairs of chambers can be connected, water being carried up continuously from (A) to (B), (B) to (C) and (C) to (D).

Cupric chloride is sometimes preferred to all other reagents as an elimination of base metals by volatilization.

A 40-Ton Colorado Smelter.

Vulcan Mines & Smelter Co., Century building, Denver, has built and put in operation a 40-ton smelting plant at Vulcan, Gunnison county, Colorado. It is running on sulphide ore taken from Vulcan and Good Hope mines, on which this company has a lease and bond. The equipment consists of a cold-blast, pyritic furnace, designed by C. H. Mace, superintendent. The matte produced runs 51% iron, 23% sulphur, 15% copper, 4% zinc, 4 ozs. silver and 1 oz. gold per ton. By resmelting the matte a much higher grade product can be turned out, but thus far the

Mercury, flask, 75 lbs.....	37.00	200.00-300.00
Pebbles, French, ton f. o. b. New York	9.75	13.25
Pebbles, Danish, ton f. o. b. New York	13.00	15.00-16.00
Soda ash, 100 lbs.....	1.27	3.91
Sulphuric acid, 100 lbs.....	1.30	1.95
Zinc dust, lb.....	0.065	0.33-0.35

At Porcupine, which is about 100 miles northwest of Cobalt, still higher prices have prevailed and advances of from 8% to 427% of the cost of mill supplies is recorded.

Porcupine continues to be the principal gold-producing camp, and the output for 1915 was valued at \$7,580,766, as against \$5,203,229 for 1914. Cobalt is the main source of silver, having produced 234,000,000 ozs. since its discovery in 1904. The output for 1915



PYRITIC SMELTER OF VULCAN MINES & SMELTER CO., AT VULCAN, COLO.

matte in the form described has been marketed. Six cars of matte of this grade have been shipped.

All ore required for the smelting mixture is found in the mine, which is opened by a 700-ft. shaft. Lime is accessible in the vicinity. Coke for smelting and coal for steam power are shipped in. Robt. G. Ainsworth, Denver, is president of the company.

The Cobalt and Porcupine Districts, Ontario.

An unusual amount of interesting information is contained in the annual report of Arthur A. Cole, engineer for the Ontario Government railway, on the mining industry in northern Ontario. Much information and data on mining and metallurgy in the Cobalt and Porcupine districts is given. Ontario is now the largest gold and silver-producing province in Canada, yielding 44% of the gold and 87% of the silver. The increased cost of supplies during 1915 was partly compensated by the increased price of metals, but the greatest compensation came in the way of improvement in the work whereby costs per ton were materially reduced. The following comparative statement of the cost of milling supplies used at Cobalt will give an idea of the increase that has taken place:

Material.	Before the war.	March, 1916.
Aluminum dust, lb.....	\$0.34-\$0.38	\$0.75-\$0.90
Caustic soda, 100 lbs.....	1.30	7.50
Chrome-steel balls, 100 lbs.....	4.16	7.58
Cyanide—contract, lb.....	0.15	0.16
Cyanide—no contract, lb.....	0.15	0.20

was 23,653,713 ozs., a decrease from the previous year when the output was 25,162,841 ozs. The production of silver from Cobalt has constantly decreased since 1911, when the high point of 31,507,791 ozs. was reached. There were nine companies at Cobalt, each of which produced more than one million ounces of silver during 1915. Dividends and bonuses paid by Cobalt companies in 1915 amounted to \$4,523,415; the grand total since the discovery of the camp is \$57,614,202.

A number of Cobalt companies are now employing the flotation process. The largest plant is that of the Buffalo Co., which experimented first with a 50-ton plant of the Callow pneumatic type. A permanent plant of 600 tons capacity is now being erected for the treatment of 500 tons per day of accumulated tailings from water concentration and of 100 tons of mine rock. The fine-grinding equipment will consist of four 5 ft. 6 in. by 20 ft. tube-mills, and the flotation plant of four 2-compartment, triple-length Callow cells to be used as roughers and four standard 2-compartment cells as cleaners. The old cyanide plant will be used for dewatering flotation concentrate and for the cyanidation of flotation middling.

Any mine in which leasers can make a profit and pay royalty can be operated at profit by the company if the management understands its business.

An old rule that was a safe guide in developing mines was to follow the ore. This rule is as good now as it ever was.

What the Mining Companies are Doing

Cons. Interstate-Callahan, Idaho.

Operations of the company for the third quarter of 1916 are shown in the following report just issued:

Net value of shipments	\$655,034.04
Miscellaneous receipts	6,030.34
Total net value	\$661,064.38
Operating costs	247,369.39
Profit	\$413,694.99
Cost of improvements	7,968.47
Surplus for period	\$405,726.52

The principal features of the mining and milling operations during the period were as follows:

Tonnage mined	38,695
Tonnage milled	32,938
Average contents—	
Zinc, %	25.70
Silver, ozs. per ton	1.80
Lead, %	5.60

Shipped	Tons.*	Zinc, lbs.	Lead, lbs.
Zinc ore crude	3,297	3,329,970	.....
Zinc concentrates	14,184	13,538,866	.....
Lead ore crude	388	146,664	331,352
Lead concentrates	1,121	435,743	1,123,210
	18,990	17,451,243	1,454,562

Total mill recovery, %	\$5.70
Mill recovery on basis of metals paid for, %	\$2.90
Total zinc in zinc crude and zinc concentrates shipped, lbs.	16,868,836
Total lead in lead crude and lead concentrates shipped, lbs.	1,454,562
Cost of mining, per ton extracted	\$5.050
Cost of milling, per ton extracted	1.252
Cost of mining and milling, per ton extracted	6.302

Caledonia Mining Co., Idaho.

The Caledonia Mining Co. earned a net profit of \$296,390 during the quarter ended Sept. 30, according to the official report of Charles McKinnis, secretary-manager of the corporation. Total mining, milling and shipping costs were \$37,617 and the surplus at the end of the period was \$375,366. The increase in metal prices since the report was issued will add materially to the settlements for ore in transit, and the company will be able to continue dividend payments at the rate of 3 cts. a share, or \$78,150, for the remainder of the current year.

Development work is being carried on continuously in the Keating tunnel level in an effort to recover the faulted ore body, but so far without success. The work is being continued, however, and the territory in which it is believed the lost shoot will be found is to be thoroughly explored.

Detailed report of operations during the quarter follows:

Total dry tons shipped	4,865.72
Lbs. of lead	2,652,600
Ozs. of silver	350,421.83
Lbs. of copper	220,680.46
	56,124.20
Gross value	\$460,972.95
Freight and treatment	126,964.68
Net value of bullion	\$334,008.27
Mining cost	31,133.70
Milling cost	5,385.65
Shipping cost	1,098.64
Total operating cost	\$37,617.99
Profit available for dividends	\$296,390.28
Cash in banks, Sept. 30	\$275,533.10
Inventory, ore on hand	25,823.00
Due from smelters and ore in transit	89,142.19
	\$390,660.29
Less current bills	15,194.21
Surplus	\$375,366.08

Butte & Superior Co., Montana.

The Butte & Superior Co.'s report for the quarter ended Sept. 30 shows net operating profits of \$947,901, equivalent to \$3.27 per share, compared with \$7.56 a share in previous

quarter. In corresponding quarter in 1915 profits were \$2,560,327.

Comparison with 3 previous quarters follows:

	Sept. 30.	June 30.	March 31.	Dec. 31.
Net value zinc concent....	\$1,731,670	\$2,879,568	\$4,337,412	\$3,614,570
Net value lead concent....	190,099	246,341	264,303	240,053
Miscellaneous income	14,757	22,772	21,427	18,265
Total	\$1,936,527	\$3,148,682	\$4,623,143	\$3,872,888
Operating costs	988,625	1,086,653	1,068,203	112,849
Net operating profits .	\$947,901	\$2,062,029	\$3,554,940	\$2,760,039

Operating statistics for the past 4 quarters compare as follows:

	Sept. 30.	June 30.	March 31.	Dec. 31.
Ore milled—tons	136,130	161,270	164,600	150,150
% zinc	15.55	15.970	15.692	16.66
Silver—ozs. (per ton) ..	6.60	6.7041	6.844	7.04
Zinc in concent.—lbs.	39,519,432	47,901,445	47,938,530	47,663,144
% zinc in concentrates ..	52.92	52.997	53.122	53.63
Silver—ozs. (per ton) ..	21.5	21.87	22.018	21.419
Mill recovery %	93.3	92.989	92.855	95.07
Mining cost per ton ...	\$4.94	\$4.4971	\$4.0341	\$3.537
Milling cost per ton ...	2.169	1.761	1.5763	1.59
Total cost per ton ...	\$7.10	6.2581	5.6104	5.128

The decrease in tonnage of ore treated during the quarter was due to an accident in the shaft in August, thereby causing the suspension of operations for 11 days. The increased cost in mining and milling is due to the smaller tonnage treated, the constantly increasing cost of supplies and the larger maintenance costs brought about through repairs to the Black Rock shaft. The grade of ore mined and concentrates produced was slightly less than for the previous quarter, but the recovery was somewhat better.

Development work on the 1700 and 1800 ft. levels continues to show ore bodies of normal size and grade as compared with those above. This with development above these levels gave a total addition to reserves of 185,903 tons, or about 50,000 tons above the amount of ore mined during the quarter.

The chief features of interest are the continued extensions of ore bodies to the east of the former workings.

The average price used in estimating returns on spelter for the quarter is 8.3441 cts. per pound.

After disbursement on Sept. 30 of \$6.25 dividend the company had net quick assets of approximately \$2,700,000.

Selma Mines Co., Utah.

A financial statement has been issued by the Selma Mines Co. covering operations to Sept. 8, 1916, as follows:

Assets—	
Mine claims	\$ 47,800.00
Mine buildings	2,354.00
Mine machinery, tools and equipment	7,033.23
Stable equipment	934.00
Mine development	25,956.91
Promotion and organization expenses	21,770.64
Notes receivable	1,200.00
Accounts receivable	442.09
Advanced expense money	32.50
Treasury stock	13,291.55
Utah Savings & Trust Co.—Cash in bank	125.18
Total assets	\$120,993.10
Capital and Liabilities—	
Capital stock	\$ 50,000.00
Donated working capital	17,608.35
Partial payments on stock	772.50
Employees' wages payable, cash	958.92
Employees' wages payable, stock	2,470.40
Sundry accounts payable	974.59
Suspense account	127.58
Sundry cash overpayments	38
Cash credit	67.92
Premiums on capital stock	7,810.97
Assessments on stock	22,618.56
Suspended surplus derived from stock forfeitures	17,582.91
Total capital and liabilities	\$120,993.10

Intermountain Co., Mont.

The financial statement of the Intermountain Copper Mining Co. for the 11 months ended Oct. 1, shows receipts of \$69,741.52 for ore shipped, \$12,232.15 due from smelter

and \$12,843.74 on hand. Other details of the statement shows:

Treasury stock	\$ 3,480.00
Salary of manager, advances, boarding house profit, road and poor tax	4,725.58
Mine labor and supplies	15,360.99
Mine supplies	4,314.62
Mill labor	4,799.60
Mill supplies	3,129.29
Railroad operation, labor and supplies	3,451.97
Office salary and supplies	669.67
Freight on ore	4,334.31
Treatment charges	6,767.85

Miscellaneous Company Notes.

Utah Copper will expend \$1,000,000 in enlarging its tailings dam and adding 1400 acres to its tailings ground. A portion of the town of Garfield, Utah, will be removed.

It is learned that banking and mining interests have acquired by purchase 250,000 shares Ray Hercules Mining Co. stock. Part of this purchase was on account of treasury of the company, which is provided with \$500,000 additional cash.

The Butte & Superior mill output for the first half of October showed a large increase over same period of September, indicating monthly mine production of 55,000 tons ore against 50,150 tons in September and 15,009 tons concentrates against 13,650 tons in September, 16,000,000 lbs. zinc against 14,496,000 previous month.

Calumet & Arizona's production for 1916 will eclipse all records with an output of close to 72,000,000 lbs. of copper, compared with 65,269,000 lbs. in 1915, and 52,668,000 lbs. in 1914. The Briggs shaft mine at three new lower levels has opened up rich ore, while Cole and Junction shaft mines are both in new sulphide ore running better than 4%.

Earnings of the Ray Con. Copper Co. for 1916 will approximate \$12,000,000 net, equal to about \$8 a share. An ultimate capacity for producing about 100,000,000 and 120,000,000 lbs. of copper per annum has been outlined for the Ray property, and it is largely with this object in view that the management has built up a strong cash reserve for mine development and construction.

For the quarter ended Sept. 30 the American Zinc, Lead & Smelting Co. earned net profits of \$1,713,000. In the same period the Granby Co., now an integral part of the American Co., earned \$725,000, or a total of \$2,438,000. These figures compare with profit for the first 6 months ended June 30 of \$3,642,391, making a total net for the first 9 months of \$6,080,391. At the present time the company is earning at the rate of better than \$800,000 a month.

On Dec. 1 directors of the Utah Copper Co. will meet for dividend action. The last dividend was \$1.50 and \$1.50 extra. Such is the strength of the company's cash position, and so large have been the earnings resulting from 25-ct. copper, that a further increase is assured. The company has been expanding its output very rapidly, and, apart from its 51% interest in Nevada Con., the Utah Copper property alone has gotten its output up to a basis of 240,000,000 lbs. per annum.

The plan, which was duly adopted at the Seattle meeting of the Mother Lode of Alaska, provided for the issuance of \$1,000,000 of 10-year convertible 6% first mortgage gold bonds, an increase of the capitalization from \$5,000,000 to \$7,500,000, and the reduction of the number of shares from 5,000,000 of a par value of \$1 to 750,000 shares of a par value of \$10. Present stockholders will receive one share of the new stock in exchange for 10 shares of the old. The bonds will be dated October, 1916, and may be converted any time before maturity into stock at par, and are redeemable at any interest day after 3 years at 110 and accrued interest. From the proceeds from the sale of the bonds \$100,000 will be spent in opening up the mine for steady production, \$300,000 for a 100-ton concentrator, \$50,000 for a hydroelectric plant and \$50,000 for a wagon road and motor truck equipment. The balance will be reserved for working capital. Of the new stock, 100,000 shares are to be reserved

for bond conversion and 150,000 shares are to be held as a reserve in the treasury.

The Nevada Douglas Con. Copper Co. has issued its report for the quarter ending June 30. It shows that the total receipts were \$197,524. Of this amount \$105,936 was received from the shipment of ore and \$88,936 came from assessments, and all of which was expended. For the half year to June 30 the company earned \$11,044 net after all charges. The balance sheet as of June 30 shows a profit and loss surplus of \$328,685. Other statistics show that the ore averaged 12.34 per cent copper and that the company received an average price of 24.81 cts. per pound.

By the end of next year the Chino Copper Co. will be in position to produce copper at the rate of more than 100,000,000 lbs. of copper per annum, provided plans for increasing capacity have been completed on schedule. Two new units will be added to the Chino mill, and with their completion and operation, output should swell to at least 10,000,000 lbs. In the meantime the pace set by Chino during the month of September—7,300,000 lbs.—should be at least maintained and probably increased slightly, so that the company may be regarded for the immediate future as a 90,000,000 lbs. copper producer.

The improvement in the Boston & Corbin Mining Co. affairs, brought about by changes in the mill, and the addition of flotation, is illustrated by the comparison of tonnage treated and copper produced in the first half of October, as compared with August and September. The mill treated 2808 tons of ore in August, 2695 tons in September and 1429 tons the first 15 days in October. The copper product in August was 49,815 lbs., in September 53,622 lbs., and 32,000 lbs. for the first half of October. The silver product for these three periods was 2723 ozs., 3570 ozs., and 2117 ozs. In other words, on about the same tonnage the metallic products have increased over 28%.

The principal by-product of Nipissing Mines Co. which has closed an important contract for the handling of by-products, is cobalt, used extensively in manufacture of chrome nickel steel. At present there is a record-breaking demand for chrome nickel steel for automobile parts, shells and steel rails. Of two new veins recently discovered by Nipissing, one is estimated to contain 1,000,000 ozs. of silver, the second to run 1500 ozs. to the ton. This vein extends for 3000 ft. in the company's property. With silver selling at approximately 72 cts. an ounce the company is operating plant at capacity. It continues to pay quarterly dividends of 5% on the \$6,000,000 stock, and last quarter paid an extra 5%.

The American Smelting & Refining Co. will double the capacity of its tin smelter and refinery at Perth Amboy. As originally laid out, the plant had a capacity for 1000 tons of electrolytic tin a month, but units erected had an estimated capacity of only 500 tons a month. In operation, output has been found a little more than 300 tons a month, so the plant will be enlarged to size originally planned in order to increase output of tin. The additional units are expected to be ready in about 6 months. Expansion is largely on the refinery end and there is great difficulty in securing delivery of necessary electrical apparatus. The company will also expend \$5,000,000 to enlarge the Murray and Garfield plants. All the men that can possibly be employed to make alterations are engaged and the capacities of plants will be raised soon.

There was produced by the Chile Copper Co. during the first half of this year a total of 19,724,385 lbs. of copper. These figures are the first of their kind to be published concerning the company. It has been decided by the management is issue monthly reports of production hereafter. In carrying out the proposed plan for enlargement of the plant new financing will probably have to be arranged. No decision has actually been reached as to the form of new securities to issue, although \$10,000,000 has been mentioned as the amount to be raised. Up to the end of last August there had been spent on construction and equipment \$13,000,000, since which time no financial statement has been made public. The company has outstanding \$95,000,000 capital stock, and \$15,000,000 convertible 10-year 7% bonds. The floating debt last August was about \$5,000,000.



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*Illustrated.

The Nineteenth Session of the American Mining Congress.

The Mining and Engineering World prints in this issue the stenographic report of the proceedings of the Nineteenth Annual Convention of the American Mining Congress, held in Chicago last week. The resolutions, passed after a most thorough thrashing out of the conflicting views of many minds, are an epitome of the mining demands of the country, the common ground on which all are agreed, and a consensus which the legislators of states and of the nation must heed if there is to be any real administrative helpfulness for this, the second great industry of the country. It was fortunate that the mining men present were able, in the confusion incident to an interminable program, to do so much.

But as always there is a fly in the ointment, and the Mining and Engineering World feels it is performing only its duty in pointing out to the mining men of the nation the rocks upon which the Congress is likely to end its long period of usefulness.

Criticism unless it is constructive is futile, and this article is written solely for the purpose of building up, or rather of repairing, than of tearing down.

First and foremost permit us to say that the American Mining Congress is assuming more and more the functions which are so ably performed by the national technical societies, the Institute of Mining Engineers and kindred organizations. As a matter of fact the preponderance of membership in the Congress is of mine owners and operators who have been coming to the Congress not for technical instruction, but rather to exchange views on practical mine betterments, on the possibilities of getting together for effective business co-operation, and more than all for the purpose of working hand in hand to avert destructive and to invite constructive legislation.

While topics along these lines were on the program they were only casually discussed and were in every instance rushed through to make way for papers and discussions of a purely technical nature. The entire time of the Congress might well have been devoted to five or six business-building topics instead of to forty or fifty papers on widely varying subjects, not one of which was gone into with any thoroughness. It was a case of "confusion worse confounded" to busy men whose minds run along the channels of pure practical industrial up-building.

But this duplication of effort is not confined to the programs. It has crept into the very life of the Congress. Here, for instance, is an illustration which merits serious consideration by the men who have the real interests of the Congress at heart. The United States Government is expending vast sums of money annually in properly exploiting the work of its bureaus. For the departments of Geology and of Mines there is published weekly through excellently-managed pub-

licity departments practically every piece of information that is of value to the oil, the coal and the metal mining men of the country. While much of this is published, at least in summary form, in the leading mining and engineering journals of the country, it is possible for any man interested to secure, free of all charge, the weekly contributions of the bureaus.

With these facilities in mind the American Mining Congress is spending a large part of its income in issuing an expensive journal, which can only mean loss and waste, and whose sole purpose is to republish what the bureaus and engineering journals are doing so well.

As far as its own propaganda is concerned there is not a class paper in the country, published along its lines, which is not giving without cost and with the utmost liberality as to space, whatever the American Mining Congress issues in the way of up-building and constructive publicity.

It was the most natural thing in the world for the Congress to swish around in search of new purposes after it had so ably aided in establishing the U. S. Bureau of Mines. And yet its new purposes lie clearly before it. For there is a real need for the organization in getting mining men together so that they may find a common ground on which by co-operative action they can make mining safer, make it more profitable, and avert disastrous legislation.

It is simply a case of "stick to your last, shoemaker."

Copper Prices in the Lake Superior Copper Region.

The average price for Lake Superior copper during the year 1916 will not net the mines of this district 25 cts. In fact the average will likely be closer to 24 than to 25 cts., unless a few large sales of spot copper is made at 36 or 38 cts. during November or December. Any mine that can show an average price for its metal for 1916 better than 26 cts. will be over the average for the district.

It must be remembered that a full year ago a large number of the mines of the Lake Superior district contracted for their entire output away long into 1916—until May and June—in many cases, at approximately 21 cts. It was good business at the time. Later they contracted for the remainder of the year at 27 and 28 cts. for the bulk of the product. Of course the domestic sales averaged somewhere in between 21 and 28 and 29 cts. And now those that have been able to turn out more copper than their contracts called for are getting 33, 34 and even higher bids for their ready-to-ship copper.

Considering earnings of Lake Superior copper shares it likewise must be remembered that contracts already have been made at 27, 28 and 29 cts. for the bulk of the copper from the mines of this district for January, February and even as far away as May delivery in 1917. The present top prices for the metal

are for small lots, and do not represent any considerable tonnage, although they do indicate the advantages that some of the smaller, independent producers, may be able to secure in the sale of their metal.

Relative to the possibility of the ending of the war in Europe and its effect on the price of copper, it is explained that there is little likelihood of any European nation cancelling any present contracts for copper, for the reason that each would want to be fully prepared for any eventuality, and would desire to maintain its stock of war munitions up to the limit, to say nothing of trade demands and the re-entrance of Germany to the copper metal market; Germany took 40% of the Lake Superior product for regular trade requirements before the war broke out. Even if contracts should be broken by the war in Europe provisions are made so that little loss could accrue to the mining companies.

It often happens that one of the most expensive items on the bill for equipping a new mine, or that of replacing the old machinery with something better is that of hauling the ponderous pieces of steel and iron from the railroad to the property. The sites for mines are not selected by any means; they must be wherever the ledges are. Frequently this is an isolated spot, and nearly always in a mountainous country, a long distance from a railroad or main traveled highway. A certain amount of expense, hard labor and annoyance must be suffered to get the machinery in place, but a little intelligence along with the hard work will often reduce the expense bill very materially.

In view of the remarkable progress that has been made in mining in the United States in the last few years, it has become apparent that the industry, though ever attractive to the business man, has assumed proportions that entitle it to more than a speculative interest. Though great strides have been made in mining and in the manufacture of mining machinery, it is but a forerunner of the marked advances that bid fair to be accomplished in the next few years. To those conversant with the situation the outlook is contemplated with the keenest satisfaction.

City officials of Wardner, Idaho, have granted a lease permitting mining beneath the streets, alleys and other property belonging to that city. The lease is to run for a period of 25 years and calls for the payment of 5% of the gross proceeds of all ores extracted from the premises included in the lease. A shaft is to be sunk to a depth of 1000 ft. below the Main street level and an effort made from that depth to reach the main leads crossing between the Bunker Hill and Stewart veins to the south of the Osburn fault.

The interests of good mining are not always served by the finding of rich ore. True progress in the art is more apt to be recorded in the low-grade mines, especially those containing copper, lead and zinc, where small economies may make the difference between profit and loss, and so it comes that the best practice and the most modern investigations may be found in our base metal mines.

PERSONAL.

William L. Creden has resigned as manager of the Utah Apex properties in Utah.

C. M. Weld, consulting engineer, New York, has left on a 2 weeks' trip to Cuba.

G. W. Evans, mining engineer, Seattle, Wash., has returned from a trip to Alaska.

F. M. Wichman, recently operating property near Nevada City, Calif., is in Montclair, N. J.

V. H. McNutt, geologist and mining engineer, Tulsa Okla., has returned from New York.

C. O. Lindberg, consulting mining engineer, New York, is in Chicago on professional duties.

F. Lynwood Garrison, consulting engineer, Philadelphia, Pa., is now back from a trip to Brazil.

Eli Cinde has been appointed superintendent of the New Golden West Mines Co., Deadwood, S. D.

Ben Wilson, manager of the Montana-Illinois Mining Co., Butte, Mont., is on a home visit in Iowa.

H. G. Ferguson of the U. S. Geological Survey, is examining areas in the Mogollon district, New Mexico.

E. V. Daveler, metallurgical superintendent of the Alaska Gold Mines Co., Thane, Alaska, is in San Francisco.

L. C. Hodson, professor of mining and metallurgy, Iowa State University, Ames, Iowa, is visiting in Chicago.

Victor C. Alderson, ex-president of the Colorado School of Mines, has arrived in San Francisco from New York.

Harry J. Sheafe, mining engineer, Los Angeles, Cal., has recently been in Dulzura, Calif., near the Mexican border.

John F. Martin is now superintendent of the La Luz & Los Angeles Co., in the Prinzapolka district, Nicaragua.

E. A. Suverkrop, Jr., mining engineer with the Chile Exploration Co., has returned to Chuquicamata, Chile, from a visit to New York.

William C. Madge, mechanical and metallurgical engineer, London, E. C., England, is now in the United States from Siberia and will leave for London soon.

J. L. Bruce, general manager of the Butte & Superior Mining Co., Butte, Mont., has returned from a trip of inspection of the American Zinc Co. properties in Missouri.

M. H. Sullivan, assistant superintendent of the Consolidated smelter, Trail, B. C., has resigned to accept the position of smelter superintendent for the Bunker Hill & Sullivan Co., Kellogg, Idaho.

J. A. Quick, Frank Breeze and Paul Greyer of the Columbia Mines Co., Atlin, B. C., have left for the winter, via Skagway, for London, Ont.; Vancouver, B. C., and Cincinnati, Ohio, respectively.

Henry D. Wilbauer, William S. Pritchard and S. Gregory, all of New York, were in Butte, Mont., last week to look into mining conditions. All three men are mining capitalists from Gotham and all are interested in that camp.

OBITUARY.

Edward Thomas Hendec, secretary of Jos. T. Ryerson & Co., died Nov. 12, 1916, at Minneapolis, Minn., at the age of 36. Mr. Hendec graduated from the New York University in 1900 with the degree of B. S., afterwards receiving the degrees of M. E. and M. S. He received the degree of Sc. D. at Columbia University in 1901. From 1901

to 1902 he was assistant professor of mechanical engineering at New York University. In 1902 he became associated with Joseph T. Ryerson & Son of Chicago as advertising manager. He built up and became manager of the machinery department. He was made assistant to the president in January, 1911. In 1913 he assumed charge of the railway supply department of the firm. In 1913 he was elected secretary and continued so to his death.

Emil Storer, secretary-treasurer of the South Hecla Mining Co., Cottonwood, Utah, died on Nov. 4, 1916, in Salt Lake City. His death, which was caused from infection of the eyes, was both unusual and sudden. Mr. Storer came to Utah from Indianapolis, Ind., in 1898 and was 72 years of age at the time of his death.

SCHOOLS AND SOCIETIES.

Michigan College of Mines.—The Students' Organization of the Michigan College of Mines has recently been affiliated with the American Institute of Mining Engineers. In behalf of this an address is to be made to the organization on the benefits, usefulness and purposes of the American Institute of Mining Engineers.

American Institute of Mining Engineers.—The sixth annual meeting of the Columbia section of the Institute will be held in the Spokane Hotel, Spokane, Wash., on Nov. 25. The program will be as follows: Address of Retiring Chairman, Stanley A. Easton; report of Secretary-Treasurer L. K. Armstrong; installation of newly elected officers and election of the same. A discussion of U. S. Mining Laws, Flotation, Land Classification, State and National Co-Operation, etc.

NEW PUBLICATIONS.

A Reconnaissance of the Cottonwood-American Fork Mining Region, Utah. By B. S. Butler and G. F. Loughlin. Washington, D. C., U. S. Geological Survey. Bulletin 620-I; pp. 62.

The bulletin is an advance report on the district and will later be included in a report on the ore deposits of the entire state. It is based on a reconnaissance which is insufficient to include the more detailed points and is a general description of the main features with respect to stratigraphy, structure, ore deposition and general geology.

Antimony Deposits of Alaska. By Alfred H. Brooks. Washington, D. C., U. S. Geological Survey. Bulletin 649; pp. 67; illustrated.

Though there are 67 localities in Alaska which produce some antimony or at least in which it is present, Fairbanks, according to the prominence given the various localities in this publication, seems to be the one of most importance. The field examinations were limited to this and the Iditarod districts, though the other districts are also described, the data having been obtained from the notes and writings of other authors.

Gold, Silver, Copper, Lead and Zinc in California and Oregon in 1915. By Charles G. Yale. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 1:10; pp. 51.

Both of the states are reviewed separately, the outline of each report being identical. The general metal production of the state is first reviewed by the different metals and followed by a review for the year of the mining and metallurgical industry of the state in so far as it is affiliated with the metals mentioned. Tables showing various productions are given and separate reviews of mine and metallurgical plants are then made by counties.

Progress Made in the Manufacturing Industries

Morse Bros. Make a Large Purchase.

The entire assets of the United States Reduction & Refining Co., recently sold by the U. S. Court to the Golden Cycle Mining Co., have been purchased from them by the Morse Bros. Machinery & Supply Co. of Denver, who will dismantle the mills. The Standard plant at Colorado City was a 1000-ton daily capacity chlorination, concentration and cyanide plant, crushing being done in rolls and tube mills; 1500 hp. in individual induction motors drove the machinery. The chlorine gas used in the process was made at the plant. The Union plant at Florence was a 700-ton chlorination, concentration plant, crushing being done by rolls. Electricity generated at the plant with steam furnished the current for the motors used there. The U. S. Smelting Co. at Canon City was a smelter making "zinc lead white" from zinc sulphide ores. The plant had a daily capacity of 700 tons. The Bimetallic plant is a modern cyanide plant of 500-tons capacity for treating tailings from the old Bimetallic mill destroyed by fire several years ago. The dismantling of these plants marks the passing of chlorination treatment of Cripple Creek ores, and is the answer to the controversy waged 10 years ago as to the relative merits of the two treatments. The U. S. Reduction & Refining Co. had a capital stock of \$6,000,000 common, \$4,000,000 preferred and a bond issue of \$2,650,000. This is the largest purchase of milling plants ever made in the west, and adds quantities of nearly every kind of machinery to the Morse Bros. stock. In these plants there is 15,000 tons of machinery, 5000 tons of structural steel and buildings, 2000 tons of pipe, 300 tons of lead, 45 tons copper wire, 12,000,000 ft. of lumber, 10,000 squares corrugated iron. Over 1500 acres of land with water rights was also included.

TRADE PUBLICATIONS.

Packing for Air Pumps and Compressors. The United States Metallic Packing Co., Philadelphia. Circular; illustrated.

In a sectional view the nature of these packing rings is shown. A brief description gives information on the installation and proper care of packing rings.

Pumping and Dredging Machinery. Byron Jackson Iron Works, San Francisco. Bulletins; illustrated.

Information of value in the design and practical installation and operation of systems is given in each bulletin, each of which takes up the description of different kinds of pumps. Descriptions of the different pumps, their construction and information as to the work for which they are best adapted is given, with tables of details regarding the capacity and dimensions of each.

Acetylene Gas Tips and Burners. American Lava Co., Chattanooga, Tenn. Catalog No. 19; pp 23; illustrated.

The general text of the catalog is written in French, Spanish and English with a glossary of terms used in the listing of the different types of burners as this portion of the catalog is entirely in English. The list gives an illustration of each burner, a description in few words and the price of the burners. Since acetylene is becoming so popular for illumination underground and in remote sections this catalog will be found of considerable interest.

Water Purification with Sulphate of Iron. American Steel & Wire Co., Chicago. Manual; pp 152; illustrated.

This manual "System of Water Purification" is purely a text on this method of purifying water being written in as brief a form as the subject will allow. A general discussion of the necessity of water purification in certain instances is brought out. Formulas and other tabulated data of practical use is given in describing the system and its

installation in plants. Various tables of value to users of purification systems are given and drawings and illustrations of plants are reproduced.

Gandy Belting. The Gandy Belting Co., Baltimore, Md. Booklets and Price List.

Different features of this belting are brought out through experiences of the company and letters of recommendation from users of the belting. Rules for figuring the size and class of belting needed in various instances are given as also is a price list. The belt is made from stitched cotton duck which is treated with oil and paint.

High Vacuum Pumps. Eimer & Amend, New York. Bulletin No. 5; pp. 12; illustrated.

Three different types of pumps are included. A general talk on the May-Nelson high vacuum pumps in which is embodied the later features and conveniences of the pump. An evacuation-time curve is reproduced and there is a separate treatise on the principles of the pump, its operation and installation. Specifications and prices are given for each of the three types.

Overhead Carrying Devices. New Jersey Foundry & Machine Co., New York. Catalog 88; pp. 48; illustrated.

Many of the devices described are of the well known mono-rail type which is used around smelters and mine plants. Hoists for the handling of equipment in the shops and grab buckets for moving materials around the plant are among some of the devices considered which operate on this mono-rail system. Traveling cranes and similar devices are listed, as is also other sundry equipment used in connection with this type of carrying.

Scales, Trucks, Mine Cars, Wheelbarrows, Concrete Mixers, Etc. The Standard Scale & Supply Co., Pittsburgh, Pa. Catalogs A210 and D95A; pp. 192 and 130; illustrated.

Prices, brief descriptions, and illustrations of each piece of equipment are given. The equipment included consists of trucks of all kinds for use about the plant, at the smelter and mine; wheelbarrows and carts of particular use about the mill and smelter, steel scrapers for excavation work; mine cars, coal chutes, screens, concrete mixers and equipment, etc. Catalog A210 is confined to the listing of scales for various kinds of use, and including the smaller platform scales of portable type as well as the larger stationary platform scales.

INDUSTRIAL AND TRADE NOTES.

F. W. O'Neil, who recently resigned from the Nordberg Mfg. Co. to accept a position with the Ingersoll-Rand Co., New York, has been appointed assistant general manager of sales.

E. W. Petter, chairman of Petters, Limited, Yeovil and London, England, is in this country making arrangements to organize an American company to build the Petter semi-Diesel crude oil engine, which is widely and favorably known in mining districts in all parts of the world, except the United States, although several engines have been successfully operated in Alaska for over 2 years.

F. B. Gleason, formerly in charge of the Western Electric Co.'s business in the Far East, with headquarters at Tokio, Japan, has been appointed manager of the Southern district with headquarters at Atlanta, Ga. He will succeed E. J. Wallis, who, on Jan. 1, will take up his new work as manager of the Pacific Coast district, with headquarters at San Francisco. Mr. Wallis will succeed F. H. Leggett, who, after 3 years on the coast, returns to the company's executive offices, New York.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Carcross, Y. T.

With the addition of two more shipments to the smelters at Trail and Anyox, British Columbia, the Venus mine has shipped 500 tons since the resuming of operations this season. A launch has been used to convey the ore to this city, and when the lake freezes it will be hauled by horses.

Twenty-four men are now being employed on the Montana group, and ice has been cleared from the shaft down to the 180 level.

Fairbanks.

The Bureau of Mines has made a final decision on establishing an experimental station here which will be the first and only one in Alaska. John A. Davis, who is now in Alaska, will have charge. He will leave shortly and return in the spring to commence the actual establishment of the station.

Cordova.

In the upper Copper River valley good deposits of mineral other than copper have recently been uncovered, it is rumored. The new find is a ledge 60 ft. wide which contains silver-lead ore, and located in a lime-greenstone contact with the lime formation for the footwall and greenstone the hanging wall. The locators intend to start a tunnel in the spring and bring out a trial shipment for the smelter as soon as possible.

Anvick.

McGrath and associates are working the Marshall placer ground on the lower Yukon. The ground is somewhat expensive to work but is yielding \$3 per foot. In a recent cleanup \$44,000 was said to be taken, and the operators expect as much again before closing for the season. About 400 men are in the district.

Taku Harbor.

A mill, similar in design to that at the Alaska-Gastineau, is to be installed at the Engineer mine. James Alexander, general manager, has left for Denver, Colo., where he will purchase a 100-ton ball-mill for his plant.

Anchorage.

The work on the new railroad is progressing and W. C. Edes of the Alaska Engineering Commission states that 59 miles of track have been laid from Anchorage. With the 71 miles of the old Alaska Northern Railway that is now in operation to Kern Creek, there have been completed 130 miles of the 470 that will connect Seward and Fairbanks. The track so far laid from Anchorage consists of 6 miles south toward Seward; 38 miles of main line north to Fairbanks, and 15 miles on the Matanuska branch into the coal fields. The right of way has been cleared from Potter Creek on Turnagain Arm to Kings River in the Matanuska coal field, a distance of 77 miles and on the main line from Matanuska to the Little Susitna river. Rail will be laid this fall as far as Kings River on the Matanuska branch, 62 miles from Anchorage, and to Wassilla on the main line, 15 miles from Matanuska. On the main line in Susitna Valley, between Montana Creek and Indian river, a distance of 55 miles, the right of way is 70% cleared and a number of grading contracts have been let. Grading of the right of way will proceed in this section from Talkeetna to Willow Creek, and north to Broad Pass. At Willow Creek it will connect with the work under the Matanuska district, and at Broad Pass with the work from the Nenana division. Rail will be laid in the near future as far as Potter Creek, which is 15 miles southeast of Anchorage on Turnagain Arm, and from which point the rock work on Turnagain Arm will be attacked during the winter.

ARIZONA.

Miami.

In the extension of the Inspiration concentrator, which will soon be completed, items of interest in crushing will be brought out, it is said, in the process being installed. The flow will probably be identical with that in the main plant. It is understood that in the grinding equipment, Hardinge ball mills will be run in competition with Marcy ball mills. Heretofore the Marcy mill has shown the ability to reduce rock from 3-in. size such that only 2% would remain on a 40-mesh screen in a single stage. The Hardinge mill in this plant will probably perform its work by two mills in series, one mill reducing to half the desired size, and passing it to the next mill for finishing.

Oatman.

During the past 10 days there have been notable developments in two Oatman properties, and a third is now coming into attention. The Nellie Co., operating in the Black Range section of the district, sent its crosscut on the 350 level through more than 35 ft. of vein matter, of which 25 ft. was ore averaging better than \$12 gold. Measured at right angles the ore shoot is about 17 ft. in width. Drifting has now started on the ore shoot, in both directions. The United Northern, to the north of the United Eastern, something over a mile, has on the 400 level crosscut a vein of 53 ft. in width. About 16 ft. is good mill-grade ore. The vein is somewhat faulted and broken at this point, and drifting is now being started in both directions. This is one of the largest veins opened in the district at this depth. The entire vein is strongly mineralized. The shaft will be carried down 600 ft. for lateral work at greater depth.

The third property is the Iowa, which at a depth of 400 ft. has entered its vein from the foot-wall side, and is showing some 8 ft. of milling ore. Drifting to the west is in progress and shows that the vein is widening and values increasing. Mining men regard the showing as pointing to important results within a short time.

The Carter has been refinanced, according to official announcement, 350,000 shares having been sold for 19% cts. per share, this money going into the treasury. The sale agreement calls for continuous operation for 6 months. The interests making the purchase control two other near-by properties and are planning the erection of a 200-ton mill to handle the ores from the Carter and other properties. The Carter has quite a large tonnage of fine milling ore blocked out on three levels, down to 350 ft. Work at greater depth will now be prosecuted.

The Fessenden officials state that negotiations with the Pittsburg syndicate for control of the company are still in progress. Statement that work will be resumed shortly, with ample finances back of the company is significant. It is rumored that the deal has actually been agreed upon, but that official verification will not be made until actual stock transfers have been made.

The Lucky Boy, after some delay, resumed operation last week. The operators believe that they are within 60 days of pay ore. During their period of inactivity, development in surrounding territory has been of much assistance in giving clues to the geological conditions to be found in the Lucky Boy.

The Ivanhoe has its new compressor and pumping plant installed, and as soon as the mine can be pumped out will resume development work on the 500 level. When the water drove the miners out a full face of ore had just been encountered. For some time a drift had been driving along

a spur vein, and the inflow of water appears to have started when the main vein was encountered.

The Adams, with its shaft down 400 ft. is now cutting a station, and next week will be engaged in driving a crosscut to its vein. This property has a good surface showing, and is well financed.

Prescott.

The Commercial mine in Copper Basin, owned by the Phelps-Dodge interests, is shipping from 80 to 100 tons of copper ore daily to smelter, and could increase the tonnage considerably were it not for the fact that smelting facilities are not keeping pace with the output of Arizona's mines, either in this or other mining counties of the state. Adjoining the Commercial mine is the property of the Loma Prieta Co., where a body of ore having a general average grade of 2½% copper is being developed. A small tonnage of sorted ore on the dump samples about 15% copper. The property is to be equipped with a modern plant of machinery and developed at depth. The present depth of the shaft is 155 ft., and it is in a solid body of chalcopryite ore from the 80-ft. point down.

The property of the Copper Hill Co., a corporation dominated by E. S. Clark and John J. Jackson, of Prescott, is another Copper Basin property for which a future is predicted. Next to the Commercial mine, the Copper Hill has been developed to a greater extent than any mine in the basin. Commercial ore is exposed on three levels and has been stoped to some extent above each. Several shipments have been made at a good profit, and the mine is in general in excellent shape for future production. Other properties in Copper Basin having a copper ore showing above average are the Schuber, Blickenstaff, McBride-McNulty, John H. Robinson and Lucky Five.

Mineral conditions continue to improve as development work progresses on the 8th level of the Harqua Hala Bonanza mine, a Yuma county property in which H. William Stevens and other Prescott mining men are heavily interested. Hitherto worked as a gold proposition solely, it now appears probable the mine will in due course come to the fore as a copper proposition. Sulphide ore carrying 5.8% copper was opened several months ago on the 8th level in connection with a large body of oxidized ore carrying high values in gold.

Jerome.

Early December will record the calling of the shares of the Boston and Jerome Copper Co. on the New York Curb. The Boston and Jerome is one of the early-day mining propositions of the Verde district. It consists of 12 claims, a number of which are patented, and is located in the recognized productive area of the Jerome copper belt. It lies 2 miles south of Jerome and adjoins the Verde Central Copper Co. on the west. Considerable development work was done in past years. A lack of funds, however, at that time forced suspension of operations. From then until recently the property remained dormant. Reorganization of the company and a refinancing of its treasury has been perfected through the efforts of S. F. Balentine, of Jerome, who has interested in the proposition several well known mining men of Arizona and a number of wealthy Eastern parties.

Before the close of the current month the shares of the United Verde Con. Co. will be listed and called on the New York Curb. Representatives of the company are now in New York for that purpose, and it is said the stock will open at \$1 per share.

Diamond drilling operations are being prosecuted on the company's United Verde Junior group about 1½ miles south of Jerome, and are to be supplemented in the near future by operations on the company's Mahurin group in the Copper Canyon country. The former is traversed by a strong vein outcrop and is considered promising, while the latter offers ore yielding possibilities similar to those of the copper-porphry deposits of the Ray country.

At the annual meeting of the Venture Hill Co. held a few days ago in Prescott, W. R. Uber, Ed Kiehl, C. T. Jolly, Phil Pecharich and Ed Shumate were elected directors for the ensuing year. The officers will be: Ed Shumate, of Prescott, president-treasurer; C. T. Jolly, of Clarkdale, vice-president; W. R. Uber, of Los Angeles, secretary, and

Ed Kiehl, of Prescott, assistant secretary. The annual report of the company, soon to be issued, will show 437,000 shares of treasury stock, and a treasury fund of \$14,000. The company's property carries a good copper showing, and is being developed under the supervision of John S. Riley, formerly of the United Verde Extension.

Operations are being prosecuted in conjunction with the Verde Apex Co. on a 50-50 expense sharing basis. A force of 25 men is employed in erecting the camp buildings and grading a site for the joint 3-compartment shaft. As soon as the cook house and sleeping quarters are completed the working force is to be doubled. The Venture Hill tunnel has been driven to the line of the Verde Apex ground and a crosscut is now being driven therefrom to the site of the shaft. The plant of machinery, ordered jointly by the Venture Hill and Verde Apex, is en route, and the cement foundations on which it will set are nearing completion.

CALIFORNIA.

Julien.

Friday Copper Mines Co., controlled by W. E. Sterne and L. A. Ellis, San Diego, is opening important deposits of nickel-iron sulphide ore in what was originally started as a copper mine. The ore was oxidized and leached near the surface, but at 100 to 200 ft. depth it is found to be a sulphide. The ore bodies occur in irregular deposits in igneous rock. Samples considered typical of the ore exposed in the workings contained the following, according to assays made: Pyrrhotite, 43.99%; silica, 3.08%; sulphur, 35.11%; arsenic, 0.15%; nickel, 4.12%; copper, 0.93%. Some assays, in addition to the above metals, showed the presence of cobalt and zinc. Two drifts have been run in ore from a 200-ft. shaft, one drift being 50 ft. below the other. This work showed a 14-ft. width of ore. The company is making an effort to develop the property as extensively as possible and block out the ore before attempting to find a market for it. Julien district is 60 miles east of San Diego.

Encinitas.

Encinitas Copper Co. is operating 8 miles east of Encinitas, W. H. McKinnon being superintendent. The mine is being developed through a 420-ft. shaft and a 200-ft. winze from one of the levels. The vein is in diabase and porphyry. The ore runs about 4.7% copper, 4 to 6 ozs. silver and \$4 gold. New milling equipment is being installed in an old building, which will have capacity to crush and concentrate 60 tons per day. Machinery includes a crusher, ball mill and K. & K. flotation machines, the latter being those designed by Southwestern Engineering Co., Los Angeles.

Amador City.

The surface equipment formerly used at the Amador Queen mine, near Jackson, has been moved to the South Keystone, of the South Keystone Con., a recently-formed \$1,000,000 corporation. Unwatering of the 1000-ft. North Star shaft will be immediately rushed, and a drift extended from the 600 level to open the South Keystone ore body.

Extensive repairs to the shafts and surface plants of the Bunker Hill and Keystone properties are being rushed to completion, and the respective managers expect to resume normal production at an early date. The working force is being gradually increased and everything placed in shape for an active year. Practically all the men recently on strike have signified a readiness to return to work.

Jackson.

Unwatering of the Old Eureka mine at Sutter Creek has advanced to the 850-ft. point and less difficulty is being experienced in clearing the shaft below the 800 level than was anticipated; 25 men are engaged in erection of the steel headframe and electric hoist, with a like number active in the shaft.

Examination of the St. Juneau has been completed and the engineers are calculating costs of required equipment and supplies. It is understood British Columbia people have arranged to reopen the property and develop it. It is located in the slate belt 4 miles south of Jackson, and to the west

of the Mother Lode, and has produced several pockets containing \$10,000 to \$50,000, and is said to have yielded \$75,000. Late prospecting of the slate revealed numerous seams of gold-bearing quartz. Developments consist of a 1000-ft. tunnel and numerous laterals.

Taylorville.

Preparations for building of the railroad from the Engels copper mine to the station of Paxton on the Western Pacific have been made, and construction of the line will soon start. The road will be approximately 22 miles long. The management of the Engels Copper Co. states that within a year the company will be producing 1000 tons of ore daily, placing it at the head of California copper properties in point of tonnage. Numerous additions are being made to the flotation plant, and its capacity has been increased to about 700 tons daily.

Angels.

Unwatering of the Porter copper mine, idle since 1865, is proceeding. Timbers are found in a splendid state of preservation and the workings are generally in good shape, despite the many years under water. When last worked considerable rich ore was extracted.

The Angels Camp Deep Mining Co. has installed a hoist and compressor, and is negotiating for the purchase of the Brown-Smyth-Ryland mine. If the deal materializes the 10-stamp mill on the ground will be overhauled and placed in operation. An electric transmission line is also to be built to the Pioneer shaft of the main group. Good ore is showing in new workings and the outlook is considered highly satisfactory.

Sonora.

The Springfield Development Co. has arranged for extensive prospecting of its gravel channels with a Keystone drill. Explorations by the drift method have been curtailed, but driving of the main tunnel continues. As the channels are definitely located by the drill drifts will be thrown out to open the gravel and production pressed.

Quartz mining is decidedly active in this field. All the old producers are operating full-handed, and several good prospects have been recently opened. Abundant water is now available, and the few mines that closed temporarily for want of water are again in operation.

Crescent Hill.

A quartz mill, capable of reducing 50 to 65 tons of ore per 24 hours, has been installed at the Tefft mine and will be operated by a large gasoline engine. A good tonnage of profitable ore is on the dumps and exposed underground, and it is planned to operate during the winter with a force of 15 men. With the advent of spring the working crew will be at least doubled and operations pressed along greatly broadened lines. J. F. Groover is superintendent. Crescent Hill is 5 miles south of Quincy.

Alleghany.

The Twenty-One Mining Co., with head offices at Phoenix, Ariz., has applied to the California Water Commission for authority to divert water from tributaries of Kanaka creek for mining and milling purposes. A 2200-ft. flume and 140 ft. of ditches will be used. Late work in the Twenty-One mine has been encouraging and with the arrival of spring developments will be pressed and milling facilities augmented.

Downieville.

Los Angeles people are actively developing the Morning Star and London Tunnel properties at Blue Nose and Nelson creek. New equipment is being installed and the camp improved. Clearing out of old workings is proceeding, including a 1000-ft. drift in London Tunnel territory. Work will be pressed all winter with a crew of 20 men.

A new pump is being installed at the El Oro gravel property, near Lake City. Work has been seriously hampered in the past month by an unusually heavy water flow. The pay-streak is thought to be near at hand.

The 3475-ft. tailings flume at the Kirkpatrick has been completed and connected with 200 ft. of ditches. This will facilitate removal of tailings to a desirable point, and more economical operations. During the summer much prospecting

and development work was carried forward and a large yardage of good gravel is available for mining. The water supply has also been improved.

Vidal.

Bendigo Mines Development Co. has a well developed copper and gold mine, 7 miles from Vidal station, and 15 miles northwest of Parker, Ariz. The ore occurs in deposits, lenses and irregular shoots in limestone. The copper consists of oxides and chalcocite, and the gold is mostly in free state. Ore shipments made within the last 2 years sampled 12% copper and \$15 gold. Smelter returns from 450 tons were \$45 per ton. Most of the ore thus far produced was taken from an inclined shaft 160 ft. on the ore body. A tunnel is being driven on the ore from a point in a ravine. The entire group of 8 claims is to be explored with churn drills. Lester Scott, E. M., is in charge of the work. The company's camp is close to Colorado river, and its main office is in Los Angeles.

COLORADO.

Cripple Creek.

Ernest A. Colburn purchased the properties of the Ajax Gold Mining Co. with all plants of machinery and improvements thereon, excepting the Colburn mill, at public auction. The price was \$480,400, including costs.

The Modoc Con. Mines Co., Denver, has taken over the old Modoc Mine. A 1500-ft. shaft is to be sunk. The work of sinking is to be pushed from five different levels in order that the shaft may be completed within a few weeks.

The Laura Lee has been equipped with a new electric plant. It includes hoist compressor and drills. One shift is now employed, but the second shift will soon be put on. The company is now driving a crosscut from the 200 level of the main Laura Lee shaft to cut the main east and west vein. When encountered it is planned to drift west to the junction of this vein with the cross veins, that in the past have produced good ore at shallow depth. Ore returning 2 ozs. gold has been exposed by a winze sunk below the 200 level. It is the opinion that Laura Lee will be on the shipping list by the end of November.

Hahnwald Brothers, J. Cortellini and associates have purchased the lease on the Queen Bess.

Plans for the development of the Queen Bess by the new owners are not known.

Idaho Springs.

The Empress group has been taken over by the Gilpin Tungsten Production Co. A 500-ft. tunnel opens this property at a depth of 300 ft. At 75 ft. from the breast \$150 ore was encountered in what is thought to be the Empress vein.

The Argo Leasing Co., operating 22 claims in the Dailey district, is working a force of 20 men. The machinery for the new concentrating mill being erected by the McFarland Co. is now being hauled up, the building having been finished.

The McCreedy property on which a tunnel has been driven some 200 feet, has 25 feet yet to go to reach their objective. The vein on surface shows good value in silver. It is the intention to erect a boarding house and mine buildings next spring, the lumber now being on the ground.

A small force, which is soon to be augmented, is now working under Supt. Sturdevant on the claims of the Pittsburg Con. This property has not been worked for some years but will now be reopened on a fairly large scale.

Leadville.

The Mikado is constructing new buildings and installing machinery. A 300-hp. Wellman, Siever, Morgan hoist is being installed. The pumping equipment has not been delivered and nothing of importance is being done underground. The Leadville Unit has begun pumping and only the bottom level is under water. The lift is 50 ft. from the shaft bottom to the connecting drift in the Harvard through which the water is being carried to the pumps in the Har-

ward shaft. The water has been lowered to the bottom drift in the Jamie Lee. It is said that the shaft will be free of water in the next 10 days. Following the completion of draining, sinking will be started in the Jamie Lee shaft.

Underground work at the McCormick is of a preliminary nature. New drifts are being driven to intercept the ore bodies. Some of the old drifts are being retimbered and enlarged. A new railroad switch is being put in and a trestle is being built to expedite shipping. No effort has yet been made to extract a heavy tonnage. Drainage of the Greenback will continue below the 1100-ft. level. The past several weeks have been confined to the installation of relief pumping machinery at the 1100. The sinking pump has been connected with the new station plant and resumed its task.

Silverton.

At the Kittimac snow-breaks are being built to protect the tramway towers during the winter. At the mill changes and improvements have been made. A new classifier, designed by J. M. Hyde, is in operation and gives good results. The Card tables have been relaid with Wilfley tops and hung upon new supports.

The development tunnel on the Elk Mining & Milling Co.'s property has reached a depth of 1200 ft. and in being driven encountered five veins, three of the veins being from 3 to 7 ft. wide with good milling ore. The tunnel is now passing through the last 20 ft. of the bedding plane of the vein, which is 25 ft. wide on surface. This vein is the objective for which the tunnel was driven. In driving the last 17 ft. andesite formation was encountered in which seams of ore were found carrying copper, gold and silver. Assay returns show 9% copper, \$2 gold and 4% silver. The flow of water is 850 gals. per minute. As soon as the flow has decreased sufficiently, work with a day and night shift will be started.

GEORGIA.

Dahlonaga.

Louis Work, Cincinnati, owner of the Keystone Placer property, has been spending the past 2 weeks with John A. Kimber examining the property with a view of putting in a hydraulic equipment to work the property on an extensive scale.

The Crown Mountain Mining & Power Co. are running 30 stamps on ore from the Wallace and sand veins. The latter vein is opened and 20 ft. thick. The company is arranging to put in a gravity tram so as to be able to handle 200 tons per day. They will also probably add a cyanide plant to treat the tailings in the near future.

IDAHO.

Wallace.

The Rex Con. Mining Co. has purchased six claims adjoining the Rex group in the Nine-Mile district, paying \$47,600 cash and 187,000 shares of Rex Con. stock for the holdings, according to official announcement. The new property is said to be remarkably promising, considering the limited amount of development, and plans are being prepared for entering the ground at depth from the old Rex workings. The sorting plant and tramway at the Rex mine were placed in commission recently, and the mill also has been given a trial run, preparatory to beginning permanent operations. About 200 tons daily will be treated at first, but as soon as the new equipment is in thorough adjustment the capacity will be increased to 300 tons. General Manager Raymond Guyer states that a year's supply of ore of good commercial grade has been developed above the No. 2 level, and the reserves are being increased daily. It is believed that it will not be necessary to mine below the No. 2 for a number of months, leaving all the tonnage on the Rex vein below that level and on the Okanogan vein between the Nos. 2 and 4 levels for later extraction. The mine now is opened to the

No. 5 level, which is 500 ft. below the No. 2, and the bodies between these two levels are to be fully developed, while the shaft is to be sunk 500 ft. below the No. 5.

The Alameda Mining Co., which owns and is developing the Alameda mine, in the Nine-Mile district, control of which recently was acquired by Spokane men, has been awarded \$56,070 as the value of the ores alleged to have been extracted from its mining ground by the Success Mining Co., by Referee Lawrence E. Worstell, who heard the testimony in the case under appointment by Judge Woods of the district court. This award bears interest at the rate of 7% from June 1, 1913, and Nov. 1, 1916, amounted to approximately \$13,410, making the total award with interest, \$69,450. Referee Worstell finds that on or about April 1, 1912, the Success Co. commenced to extract ore from Alameda grounds and continued up to Aug. 1, 1914. The trespass, however, according to the report and findings, was committed under an excusable mistake, and the removal of such ore was through inadvertence in the honest belief that it was the property of the Success Co. The total amount of the trespass committee on the 400 stope, according to the findings, equals 25,695 cu. ft. and on the 450 level 13,442 cu. ft., while the foot-wall area on the 700 level amounted to 10,323 cu. ft. A ton of ore on the 400 and 450-ft. stopes was found to be equal to 7.49 cu. ft., which assayed 20.45 ozs. silver, 20% lead, and 23.95% zinc. On the 700 level it took 8.86 cu. ft. of ore to the ton and its assay value was 7 ozs. silver, 7.5% lead, and 25.7% zinc. The referee adopted the average prices of metals as testified to by Rush J. White as a basis for the values of the ores extracted, which were: 58.787 cts. for silver; 4.236 cts. for lead, and 5.188 cts. for zinc. It was stipulated during the trial that the mill saving was 56% silver, 72.5% lead and 65% zinc values. The Success contract in force between the first day of April, 1912, and the first day of August, 1914, was used by the referee as a basis for computing the freight and treatment charges, and that the reasonable cost of mining and milling the ore was \$2.21 per ton and that the Success Co. was entitled to those costs. In computing the amount of ores extracted from the different stopes, the referee found that 1848 tons of ore had been removed from the 400 stope, 1532 tons from the 450 stope and 736 tons from the 700 stope. The report after being handed to Judge Woods, was immediately assigned to Judge John M. Flynn, who will review the findings of Referee Worstell and file his decision thereon.

LAKE SUPERIOR.

COPPER.

Houghton.

Calumet & Hecla is steadily increasing its daily output and is now forwarding to Lake Linden about 10,867 tons, which has been increased this month up to the 16th, from 10,600. Conditions all over the district are very favorable for good tonnages this winter, as the lessons of last winter have taught both the mines and railroads to prepare for the storms that do so much damage to tonnage. Men are more easily to be had except at the most remote mines, and all of the mines except that class are steadily enlarging their forces.

Almееk has discontinued for a time its development of the Kearsarge conglomerate in order to use the men in getting out rock; but will again start up this work. The mill ran six stamps all the time, and with the overflow from the Franklin mill of the La Salle rock, operated the seventh stamp a little over half time. It is thought that the eighth will soon receive the jigs that it lacks, and it will in a very short time thereafter be put into commission as the Franklin will need all of its stamps.

Tamarack is getting out about the same output monthly, 23,000 tons. Nothing is known here as to the plans of the directors for the future. Almost all of the stockholders, as far as it can be learned, favor a management that will work in harmony with that of the Calumet & Hecla, as the two properties have so much in common. Mining men here feel that it is very unfortunate for the mine's best interests that

the Calumet & Hecla could not have secured the property, and that General Manager McNaughton thought it best to resign from its management. Supt. Been is qualified by long experience and a thorough knowledge of the mine to make the most out of its resources, which, taking into consideration the large areas of the Calumet conglomerate as yet untouched, the sands or tailings along the shore of Torch Lake, and the Osceola amygdaloid, which runs across the property even if in part at a considerable depth, are of great value.

Copper Range has so perfected the refining of its copper, which contains quite a large amount of arsenic, so that the latter is sufficiently extracted as to command the highest prices for munitions; this is being done at a rather low cost and effects a very great gain in income. The generally favorable conditions that are prevailing at the three mines of this company, especially at the Champion, will continue for quite a long time.

South Kearsarge has yet before it 2 years of life at both shafts according to the conservative statements of those officially connected with the mine, but the mining men here believe that it will take much longer to take out all of the good rock. The long life of this small mine is due to the large amount of good ground that has been found in the footwall that gave the appearance of being mostly trap. There is much more of this good ground than was at first expected.

Cherokee in the 16 ft. that has been so far opened on the crosscut that is being driven to ascertain the width of the lode and its mineral contents at the depth of 118 ft., is disclosing the same heavy grades that have been found all the way down in the shaft, and for 60 ft. in drifts. Experienced miners that have been to the bottom say it is equal if not superior to any of the amygdaloids yet exposed here.

Victoria really begins this week for the first time to mine on a sufficiently large scale to give a profit that will lead to dividends, as it puts its second 5-ton skip into commission to the bottom of the mine, the 26th level; all its previous work having been done with one of a 2½-ton capacity. It will now get out about 550 tons daily which will be increased very soon. The bottom level is, on the eastern drift, revealing the same heavy rock; the 25th east, which at first was in a mineralization that soon pinched out, is sending up the characteristic high grades, and from the 23d there was taken a carload of mass last month and another is about ready; this is, of course, in addition to the usual amount of stamp grades. It has been pretty conclusively shown that the best values have been from the 17th down, and that the mineralization is disclosing long and richer stretches with depth. Sinking was started again on the 16th from a point about 30 ft. below the 26th level. Last month there was a product of 136 tons of mineral, and for November it will be nearer 150. Now that the large construction costs, which have been paid out of the current profits with a balance going into the treasury have been taken care of, the earnings will be quite large.

Keweenaw is still being held back by the lack of men. It is hoped in 10 days to run for a shift and a half. The rock is of a low grade, as was expected, but the yield is high enough to give a good profit. Only enough work is done under ground to send to the mill an average grade of the whole mine as far as opened.

Michigan with its main crosscut has passed beyond the Evergreen lode to a distance of 446 ft. from the Butler lode, on its way to the North lodes of the South Lake; at the Ogimah every foot displays some copper, which averages commercial grades, and which with the longitudinal fissure lying about 7 ft. above the production, should be quite profitable. At the Butler lode the eastern drift is just about up to the 5th level, and there was taken out in the week ending the 11th, about 1000 lbs. of mass copper, while in the western the diamond drill is being used to explore for the mineralization cut off about a month ago by a fault. There is a pretty good average coming from this mine, as when the copper pinches out it is found in another.

Mass is slowly increasing its tonnage and hopes after a while to attain to its mill capacity of nearly 1300 tons daily. It is taking advantage of the high price of the metal

and its splendid earnings to put its plant in first class condition. It is replacing the two boilers, one of 200 hp. and the other of 250, which will be set up at the mill later, and which were at its central power plant furnishing steam for the compressor that runs the drills at both shafts and the hoisting-engine at shaft "B," with two Wilcox & Babcock boilers each of 335 hp. It is installing at the central power plant another Ingersoll-Rand compressor so that it can operate 80 drills at both shafts, and it has erected a new boilerhouse and a dry, or changing-house for the miners, both of concrete blocks, and is putting up two concrete stacks, the work on the stacks being done by the Concrete Construction Co. These improvements have been paid for as far as the money is due, from the current earnings, which will besides pay a dividend and give a balance to the surplus.

New Baltic is down 48 ft. with the shaft pit and has about finished timbering to that depth, though it has been much delayed by an inflow of water. It should cut into the ledge at any time.

New Arcadian has begun to crosscut to the New Arcadian lode on the 1500 level, a distance of about 150 ft. Its progress will be somewhat slow for a while as the dirt or rock taken out has to be hoisted two levels by a bucket, as the new rockhouse is not yet ready on account of delay in getting the crusher and the new rockhouse engine. The crusher will come from the Portage Lake Foundry & Machinery Co. The 1050 level, which has covered about 450 ft. of the 700 necessary to go to reach the New Baltic boundary, has been for some time in very rich ground, which will equal any grades yet found here.

Lake is sending to the Baltic mill about 300 tons daily, or 7000 monthly, which is giving about the same yield of 26 lbs. of refined copper a ton.

Flint Steel has unwatered shaft No. 3 about 200 ft. Nothing accurate is known about the old workings, as the maps have been lost, and there are not enough of the old reports in existence to furnish the needed data.

White Pine Extension was visited by John R. Stanton of New York, Fred and Angus Smith of Detroit, who are all directors. Carlos Van Law of Boston, who is a director of the Indiana, and who is connected with the U. S. Mining Co., is of the party. The White Pine was also included in the trip.

Algoma has been waiting for a sufficient fall of snow to get in the new boiler, as it is so much easier to take in anything of such great weight by sled, but judging from the snow we have been having it will not have to wait long. The boiler will be set up as soon as it is brought in and then sinking of the shaft will be resumed.

IRON.

Bessemer.

The Colby mine, operated by the Oliver Iron Mining Co., has ordered drills and equipment for the sinking of a new shaft. It will give greater facilities for the prosecution of mining in that portion of the property now too far away from present shafts, and will somewhat lessen the cost of mining.

Ishpeming.

Shipments have been nearly stopped by the Lake Superior mine. The cold weather has brought shipping activities nearly to a standstill. There are 400 cars of frozen ore in the Escanaba yards and this is delaying ore handling there to a great extent.

MISSOURI-KANSAS.

Joplin, Mo.

The Dick Turpin mine, located on the Riseling land, southwest of Joplin, will be started up in the near future if the owners can make arrangements with the electric company for current.

The market jumped from a top price of \$90 of last week to \$98 this week. As high as \$97 was received for

second-grade blende; \$95 is believed to be the average basis. Operators are very optimistic and many are holding their output of the past week for \$100. The shortage in electric current and weak gas this week greatly augmented the high prices, as it cut down production all over the district. Lead remains firm, selling at \$87 top price.

A new mining camp has started up southeast of Baxter Springs, Kans., or between the Galena, Kans., and Picher, Okla., camps, which is very promising; 40 to 50 drill holes having been put down, and six different tracts of ground are ready for shafts. Two shafts having been sunk, at the Blue Mound mine, and the Broom Corn mine, which show rich faces of ore. A number of companies have been formed who are prospecting, and it is believed by mining men that this camp will equal any of the Oklahoma camps in production.

R. W. Larson of Kansas City and O. W. Sparks, owners of the Yellow Pup mine at Klondike, have a rich new run of ore and renewed activity at the property is promised before long. The new development is near the old Anderson shaft, which is some distance north of the Yellow Pup mill. Operations are conducted at a depth of only about 70 ft., and it is at this depth that the recent good ground has been opened up by the Yellow Pup Co.

Operations have been started at the old Cock Robin mine on the United Zinc Co.'s land at Chitwood. The Pelican Zinc Co., capitalized at \$75,000, has just been organized, and has taken a lease on 60 acres on the north end of the United Zinc Co.'s "eighty" at this place. Ben H. Humiston of Kaneville, Ill., and Wm. Browne, of Chicago, are principally interested in the company. There is already a good concentrating plant on the property, the mill formerly owned by T. B. Osborne, and it will be put in first class condition and extensive mining operations begun.

The new mill of the Bumble Bee Mining Co. in the southwestern part of Joplin has been completed and started operations. While the ground is fairly well opened up, there is still considerable work to do, particularly around new shafts that have been put down. It is not likely the plant will be going at full capacity for some weeks. There are four shafts in ore, all connected with the mill by tram.

Webb City, Mo.

Carmean & Squires Mining Co., one of the largest operating organizations in this district, has arranged to take over the Old Virginia mine south of Carterville, recently operated by J. F. Dexter. The Old Virginia is a sheet ground proposition and was a good producer about 8 years ago, previous to the flooding of the South Carterville field. The lease was obtained by Dexter last winter and after an examination of the ground, a new concentrating plant was started, and was completed and placed in operation about the first of March. Up until a few weeks ago steady operation was carried on, with results reputed very satisfactory.

The two properties of the St. Regis Mining Co. No. 1 at Duenweg, and No. 2 west of Chitwood, are averaging nearly 150 tons of ore weekly for their combined output. A shaft that was being sunk at No. 2 mine for air went into a rich face of zinc ore that measured 25 ft. This ore was encountered at the 170 level. A 20-acre tract has been acquired by the company at the No. 2 mine. Drill holes showed rich mines on different portions of the land. A 250-ton mill was erected several weeks ago and is now in operation. A hopper and tramway is being completed at the field shaft, and the dirt will be pulled up the tram to the big mill hopper. The mill hopper is large enough to hold dirt for two shifts milling. E. R. McClelland and associates of Kansas City own this property.

A rich drill strike has just been reported by Chas. W. Edwards and associates on a 45-acre lease of the Burch land, southeast of Duenweg. At a depth of only 60 ft. the drill went into a rich lead ground formation and continued into it for about 18 ft. At slightly more than 100 ft. a good silicate formation has been encountered, and from an old drill hole nearby, it is virtually certain jack will be found below 150 ft.

The Ground & Barnett Mining Co. at its new property, the Burch, southeast of Duenweg, has made a rich strike

of silicate. A new concentrating plant was completed some time ago and has started operation. They are hoisting tubs of dirt that contain 400 to 500 lbs. of silicate, which is considered to be a very high percentage in this district. The mill is approximately of 250 tons capacity and is one of the largest in the district, constructed solely for the cleaning of silicate.

Galena, Kans.

E. Pruitt and Fred Edwards of Galena, Kans., have opened up a good mine on a sublease of the Hurry-Up Mining Co.'s tract southeast of Galena. Considerable zinc and lead ore is being produced each week. The ore lies in disseminated ground and is believed to be the continuation of a rich face that was opened up at this level in the Hurry-Up shaft.

The Gypsy Mining Co. on a 20-acre tract of the St. Paul land at Spring City, southeast of Galena, made its first turnin last week since Sept. 4th, when operation ceased because of a bad cave-in of the drift in which the company was working at the time. A drill hole just to the west of the shaft shows a 20-ft. face of good rich silicate dirt at from 150 to 170 ft. This company has one of the most complete hand-jigging propositions ever used in the entire district. The derrick when erected was built so that a mill could be added without altering it. Work will begin soon to housing in the jigs for winter operation.

MONTANA.

Butte.

All the copper mines of the Anaconda Copper Mining Co. were closed down a few days last week because of the difficulty in moving ore. The recent cold snap froze the ore in the cars and as a result these cars cannot yet be unloaded. The ore is free in the bins at the mines, but it is impossible to move it to Anaconda under present conditions. The company's zinc properties, the East Colusa, Emma, Lexington and Poulin, will work as usual.

The Great Butte Copper Co., successor of the Butte & Bacon Copper Co., has completed its surface plant. There is a large shaft-house with two 125-hp. boilers, a first-motion hoisting engine, an air compressor, and a 70-ft. head frame. There is a machine shop and a blacksmith shop, as well as boarding house, bunk houses and the usual buildings appurtenant to a mine. The machinery is in operation, and the shaft unwatered and repaired to a depth of 420 ft. It is believed that below the 500 level the shaft is in good condition, and that the water can be tanked out and development work resumed immediately. The shaft, which is now 1025 ft. deep, will be sunk at least 500 ft., and some development work will be done on the 1000 level. There were strong indications of ore bodies when work was discontinued in 1907, as a result of the failure of the company's fiscal agent in Pittsburgh.

The Davis-Daly Co. has received information that the new Nordberg engine, which will greatly increase the hoisting capacity of the mine, has been loaded and was shipped, and the entire equipment is expected to reach here within about 10 days, and will be installed within 3 weeks after it arrives. Cable for the hoist is here, comprising two great reels good for a depth of 3000 ft.

According to the October report the Tuolumne mine produced 52 cars of ore in October which netted \$20,000. This will be increased to 92 cars in November. Several well-mineralized stringers have been cut in the Main Range mine and the installation of the new surface plant at the Colusa-Leonard Extension is progressing rapidly. The report follows: "During October, 52 cars of ore were shipped from the Tuolumne mine, netting about \$20,000. This ore is coming largely from the old gobs on the upper levels. It is estimated that there are at least 100,000 tons of ore in the old stopes which can now be worked at a profit. The winze being sunk from the 2600 level is down 50 ft. The ore in this winze has widened from 18 ins. to 7 ft. November production will be increased to 90 cars. The crosscut south from the Sinbad shaft on the 700 level is being advanced at

the rate of 9 ft. a day. This crosscut is in about 550 ft. and an additional 1000 ft. of crosscutting will be necessary to reach the south side line. Several stringers have been cut, showing strong copper mineralization and it is anticipated that one of the east and west leads will be encountered within the next 200 ft. A new station is being cut on the 700 level and an electric pump is to be installed within the next few days. The installation of the new surface plant is progressing rapidly. This work should be completed, the mine unwatered, and the sinking of the shaft started by Jan. 1."

Elkhorn.

John Lynn and associates, who have taken a lease on the Elkhorn Queen, which has lain idle for a number of years, are overhauling the steam hoist and boiler preparatory to working the property from the lower levels, where good bodies of shipping ore are known to exist.

Rothfus & Dickman of the Montana have completed the installation of electric machinery for running the mill and air compressor in both the Montana and Dolcoath tunnels, and everything is in readiness to start up as soon as the power can be turned on.

The East Butte is working about 20 men and shipping a car a day to East Helena. The cave-in which occurred a few days ago has been cleared and caught up and everything is running smoothly again. They are expecting a large transformer soon and when it is installed and the electricity is turned on, the steam hoist will be replaced by an electric hoist and compressor. They are also getting in material for the concentrator and cyanide plant, the erection of which will be begun as soon as certain details of construction can be worked out.

At the Elkhorn Bulwer, the crosscut from the 200 level toward the shoot of high-grade copper ore on which a winze was sunk last spring, is being driven as fast as possible, and according to the survey should be encountered within the next 8 or 10 ft.

Superior.

The Richmond Mining, Milling & Reduction Co. has purchased a half interest in the St. Lawrence group, adjoining, according to Martin Woldson, president of the Scandinavian-American bank of Spokane, who also is president of the Richmond Co. The St. Lawrence holdings were owned by the Finch-Campbell estates of Spokane and Dan and Angus Sutherland of Wallace, and the Richmond Co. has taken over the Finch-Campbell interests. Production at the Richmond is to be increased immediately to a car of ore daily, according to President Woldson. A contract for transporting the output to the railway at Saltese has been let to S. K. Fitzhugh, who reached the camp Sunday with eight 4-horse teams. About 1000 tons of shipping ore has been broken down in the stopes ready for extraction, and this will be removed at once. A tunnel has been driven through St. Lawrence ground jointly by the Richmond and St. Lawrence companies into the Richmond lines, and a contract, giving the Richmond interests perpetual right to the use of this working, has been filed at Superior, Mont.

NEVADA.

Goldfield.

The new raise from the main drift at a depth of 880 ft. in the Jumbo Junior is advancing in ore of good grade, indicating the ore shoot extends into the Kewanas mine. The winze on the vein near the Jumbo Extension line shows rich ore and the management is arranging to prospect it at further depth from one of the levels of the Jumbo Extension. This will open the contact where most of the bonanza deposits of the district have been encountered.

Because of the low grade of the developed sulphide ore, and the unsatisfactory results attending the treatment of oxidized material with flotation, the Florence mine has been closed and the flotation unit shut down. It is stated the directors are considering resumption of deep mining, as large deposits of sulphide ore, suitable for treatment by flotation, are indicated below the 500 level. It is also reported the

company is contemplating leasing a portion of the mine, and may arrange for treatment of its oxidized ores at the cyanide mill of the Goldfield Con., as soon as the latter company resumes with its 1000-ton flotation plant. It is expected this unit will be in commission before the end of December.

Thompson.

It is unofficially stated that the smelter of the Mason Valley Mines Co. will be blown in at an early date. The company has secured assurances of large quantities of custom ore, in addition to its own product, and will also treat a heavy tonnage from California properties. Experiments with the 10-ton leaching plant have been so satisfactory that arrangements have been made to enlarge its capacity and treat both carbonates and sweet-roasted sulphides. Custom ore will include copper, gold, silver and lead ores from numerous properties around Yerrington and in the rapidly-developing Reservation Hill field.

Toulon.

The Humboldt Nevada Tungsten Mines Co. has placed its concentrator in operation and is treating 75 tons of high-grade ore daily. A large tonnage is available, and the management has arranged for the development of large areas adjoining the proven ore zone.

Seven Troughs.

Ore assaying \$200 is being mined on the north end of the 1700 level of the Seven Troughs Coalition. A new winze is going down from this level, and another lateral will be extended from the 1800-ft. point. Since the installation of the new pumping plant no trouble has been experienced with water, and a steady output has been maintained. Developments are active at several points.

Virginia City.

All the mineral holdings in the West Comstock district, generally known as the Jumbo field, have been taken under bond and option by the C. E. Jury Syndicate of Toronto, Can. The consideration is stated to be \$500,000 and arrangements are being made for extensive explorations with diamond drills, under supervision of Charles Baycroft. Holes will be sunk to a depth of 1500 ft. and the entire field thoroughly prospected. Among the most important properties are the Bargo, T. & E., Fluck & Mahoney, and Gates. Considerable high-grade gold ore has been extracted, particularly from the Bargo.

Goodsprings.

The Akron and Bill Nye properties, on the west side of Columbia mountain, have been merged into a consolidation known as the Goodsprings Bill Nye Mining Co. The Bill Nye has been shipping zinc and lead ores at a good profit for several months, and considerable zinc and silver ore has been sent out from the Akron which is a comparatively new proposition.

Engineers of the Salt Lake Railway are inspecting the district with a view of broadening the railroad from Goodsprings to Jean, and the possible extension of the line to the mines on the west side of the Columbia mountain range. A number of good properties have been developed lately in this field that are hampered by unsatisfactory transportation arrangements.

The working force at the Oro Amigo has been increased and a heavier output will be maintained in future. The new vein is yielding ore ranging from 10 to 45% copper, with some gold and platinum. The product is stated to closely resemble the ore found in the Boss mine. President S. E. Yount, of Los Angeles, is personally directing improvements.

Roach.

Mojave Annex Tungsten Co. is opening a vein of tungsten ore in granite rock, and has on its group the croppings of other veins. The property is in Clark Mountain district, 12 miles from Roach. Development by adit levels and surface work on the main vein show 2 to 4 ft. of mineralized gangue, running 4 to 5% wolframite. Joseph B. Evans, manager and mining engineer, Los Angeles, states that a small concentrating mill is to be erected. This will require a crusher, a set of rolls and Stebbins dry concentrators.

Mojave Tungsten Co., for which Foster S. Naething is manager, has 30 claims in Clark Mountain district, and is operating through three shafts. One of these is 180 ft. deep,

the others 100 ft. each. Gasoline engines are used for hoisting. The shaft first named is to be sunk 100 ft. deeper. The group has two systems of veins. One consists of narrow veins on which there are croppings of ore; the other consists of wider veins on which all minerals have leached out-down to a depth of 30 ft. These vein systems run at right angles to each other. The tungsten ores consist of wolframite and scheelite, and carry an average of 15% of these metals. The company is operating a small concentrating mill, making jig and table products, grading about 50%. The necessary supply of water is obtained in the mine.

Las Vegas.

There has been millions in gold and silver produced in Eldorado Canyon. Some of the properties are being developed very profitably, others have equally as good showings and are awaiting the time when capital will interest itself in the further exploitation and development of these mines. Practical mining knowledge was responsible for the placing of the Colorado Nevada, Techatticup and Rand in the producing column and for bringing the Enterprise, Carnation, Lombard, Woods Lease, Empire, Skylard, Lucky Jim and others to their present state of development. It is believed that good percentage of these will be placed on the producing list before long.

The mine making conditions are here, the geological formation is right, the country has all the earmarks of a big mining district. The district has been proven for 8 miles in length and several in width, being dotted with producing mines.

The Canyon's present production, considering the small amount of development done, is without a parallel. The day is not far distant when its mineral resources will be fully explored and determined.

NEW MEXICO.

Mogollon.

The road through Mogollon is being macadamized and placed in shape to accommodate heavy traffic in winter.

D. E. Bearup, owner and operator of the Eureka mine, in which a rich strike was recently made, is arranging to pack an accumulation of mill ore to local custom works. The richer ore is being sacked for shipment to smelter.

Timbering of new shaft below the 500 level in Last Chance mine is progressing rapidly, the work being conducted from two different points. The shaft is 960 ft. deep. Development will be pushed from both 800 and 900 levels as soon as timbering will permit. The Mogollon Mines Co. is operating the property.

Socorro Mining & Milling Co. has installed an automatic scale at mill terminal of aerial wire rope tramway from Pacific mine for weighing all ore received from latter property. A belt conveyor is being placed to handle this ore between receiving bins and crusher.

The Oaks Co. is breaking ground in its main drainage and transportation tunnel on Mineral creek, which will eventually tap the leading vein systems of the camp at various depths up to 1800 ft. Road to the tunnel site has been overhauled to facilitate traffic to that point. At the Eberle mine, drifts are being advanced both north and south from 50-ft. level in exploratory shaft, which is equipped with a Fairbanks-Morse 15-hp. gasoline hoist and compressor plant. Present development on the Clifton mine consists of driving south drift from adit level and raising on No. 1 ore body.

The aerial wire rope tramway from Pacific mine to Socorro Mining & Milling Co.'s plant 1 mile distant, has been completed and operates perfectly. The adoption and placing in commission of this system of transporting the Pacific product marks the end of an era of operation during which 11,162 tons of ore carrying a gross value of \$171,585 were mined in a crude way and shipped to local custom mills by the burro train. While the general average of ore mined in the Mogollon district for same period has been around \$12 per ton, that from the Pacific had an average of \$15.37, and with the more adequate mining facilities now employed,

in connection with modern tramway delivery to mill, the property may be expected to soon eclipse its past record and take rank with the best producers in the camp. Operations are being conducted by Socorro Mining & Milling Co. under agreement with the Oaks Co.

Red River.

A tunnel is now being driven by the Buffalo New Mexico Mines Co., which will serve surrounding properties which are now idle because of the haulage question. The Dorothy tunnel is being run to cut the Silver King vein of the company. It will not only be a means of unwatering this particular section of the district but will be the means of putting thousands of tons of ore in shape to be mined that would otherwise be undeveloped on account of the expense of fuel, haulage and pumping. The Placer creek region which the tunnel will penetrate is a large mineral zone with massive quartz fissures. The Silver King shaft is 200 ft. deep. Drifting and crosscutting has proven the ore shoots to be of good length and breadth, and shown an increase in values from the surface to the present level. The ores are silver-gold.

NORTH CAROLINA.

Charlotte.

Charlotte and Concord parties are opening up the old Pioneer Mills gold mine, which is situated 16 miles from Charlotte. This mine has not been worked since 1862. A stamp mill for demonstration work has been erected.

G. W. Jackson, of Lenoir, N. C., who owns the Fleming gold mine, is making plans to work it. He has rebuilt his reservoir dam and expects to rush operations.

Charter has been granted the Avery Feldspar Co., of Bewland, N. C., with a capital stock of \$10,000.

The Consolidated Sales Mining, Milling & Mfg. Co. is a new concern with \$100,000 paid capital and \$1,000,000 authorized. Objects of the company are to prospect for gold, marble, and other minerals. Officers of the company are J. Frank Wilkes, M. Greenendyke, and R. Burdge.

Southern Pines.

F. A. Lane has been here looking over the old Cumnock coal property with a view to developing. Lane is now awaiting some drill records from State Geologist Joseph Hyde Pratt.

Kinston.

A report states that Lon Hines is considering the development of marl deposits on 300 acres of land in Jones county.

Stony Point.

A company has been incorporated here to establish a plant and mine asbestos. Capital stock of the corporation is \$10,000. G. B. Holeyberton is president; J. S. Kever vice president-treasurer and J. W. Sims secretary.

Referring to the possible location in North Carolina of a government armor plate plant State Geologist J. H. Pratt states that North Carolina probably has the largest deposits of chromite of any state in the east. To a depth of 100 ft. there are at the present time iron ores available, according to Pratt, as follows: magnetite 650,000 tons; titanite magnetite 1,510,000 tons; hematite 250,000 tons; limonite 750,000 tons.

OREGON.

Sumpter.

C. L. Camp, superintendent for the Susan D. Mines Co., says that development has exposed free milling ore that averages \$22 in gold to the ton. It lies in a shoot 1 to 8 ft. wide exposed for 325 ft. at an average depth of 175 ft. This development was performed by the company, during the current year. The equipment includes a 10-stamp mill. Production from the mine is in excess of \$1,200,000.

The Sumpter smelter which was closed in 1907 was purchased a few months ago by J. A. Gyllenberg. Considering

better conditions which prevail now Gyllenberg is giving due consideration to the question of reopening the plant.

SOUTH DAKOTA.

Silver City.

The Saunders mine has been taken over by the Home Lode Mining Co. The company has sunk to the 100 level, where considerable water was encountered. Drifting on this level revealed a vein which did not show on surface and is found to be very good. Work of developing the new find is being continued. As soon as new pumping machinery can be installed the shaft will be lowered, probably to the 300 level and drifts started to the vein.

The Omega has been taken over by the recently formed Pactola Dev. & Mining Co. Development will start immediately. The deposit is described as a large body of low-grade free milling ore assaying from \$2 up.

UTAH.

Beaver.

Owing to the development recently of good bodies the directors of the Antelope Star have decided to immediately erect a mill. This work it is said will be begun in December.

Electrical equipment has been installed at the Paloma and a fan is now used to drive out powder smoke from blasting. On the 600 level according to C. J. Graft 6 ft. of ore is showing which runs 19% lead; 37 ozs. silver; 0.02 ozs. gold and 20.63% copper in places. The richest values are appearing in the monzonite. When the lime was encountered the fissure narrowed down. Along the contact some ore is appearing. Indications at present are that some high grade and large bodies will be found in the monzonite. In another drift on the 600 hanging wall side, 18 ins. of carbonate that will carry \$45 is being found. This is in the lime fissure. The drift sent out on the 600 to cut the contact has gone through the lime that was expected and has encountered another body of monzonite. Instead of a fault in the monzonite as expected it has developed that a fault has caused the displacement that led to belief that there had been a faulting of the formation. The shaft is down 55 ft. below the 600. It is the intention to continue sinking to the 700 before starting lateral work. The Indian Queen will soon drive a drift 100 ft. out from the old tunnel. This is expected to intercept and determine an extension of the fissure where the ore bodies make. Lessees have been given control of another block of ground which they will start developing. Recently Indian Queen shipped 3 cars.

In a recent strike at the Leonora 20 ins. ore was found which runs 91 ozs. silver, 5% copper and 5% lead. Supt. Nebecker says that this was on a fissure directly under the old workings, and at a depth of 450 ft. A fault was encountered, but late developments point to the fact that the intersection of the cross fissure will result in the restoration of the ore, evidence of which is to be found in the softening of the lines and the improved mineralization.

Milford.

The first car of company account ore has been shipped from the Creole; the property is being electrically equipped and things are in a revolutionary condition in general. A new compressor and electric hoist are to be installed. Two good showings of copper ore have been opened up. On the 100 level is 14 ins. of copper. This is a high grade ore, while on the 150 level there are 16 ins. of high grade.

The stope of carbonate at Silver King Con. is proving satisfactory. The work is being done between the 1550 and 1625 levels. On the 1625 level new ore disclosures have been made lately and the ore is going down strong. First-class ores from this mine range from \$45 to \$65. A group of directors who recently visited the property report: The new Thaynes tunnel is in 960 ft. and making progress. This will develop and drain at depth a large and important terri-

tory of the company. The new 10,200-ft. tramway is completed and is operating smoothly. It has a capacity of 200 tons. The 50-ton mill is being completed and new ore disclosures in the deeper workings are reported important.

As soon as teams can be secured further shipments can be made. The bins are full and 4 to 5 cars will be shipped each week. Within 10 days it is expected that the company can be marketing from 7 to 10 cars a week. The car just shipped will average 6% copper with values in gold and silver. D. H. Ferguson is superintendent. A force of 10 men are at work. This force will be doubled as soon as arrangements can be completed.

Lund.

At No. 3 lease of the Mines Development Co. a compressor and drills are being installed and the boarding and bunk houses about completed. Pres. R. W. Brown reports three places at which 23% to 39% ore can be mined. The mine has been developed with an incline shaft down 85 ft. and a drift running east and west from the bottom of the shaft. The west drift is out 40 ft. The face is in a broken formation of manganese, iron and lead sulphides, which will probably turn into solid ore. Streaks of ore from 2 to 3 ft. thick show on both sides of the drift for its full length. There is a raise from the east drift in which 1 ft. of 30% lead is exposed. The 23% ore is at surface, near a glory hole. There is a large tonnage of this ore which can be taken out through this glory hole.

Eureka.

Walter Fitch, Jr., has taken a contract to drift from the 1200 level of the Victoria to the property of the Plutus Co. The drift will cut through Victoria, Eagle, Blue Bell and Plutus. The expense will be taken care of by all companies interested. In the neighborhood of 300 ft. of drifting will be necessary before the drift reaches the Plutus territory. Another drift is being driven into the Plutus from one of the lower levels of Chief Con. This work, as well as practically all of the development work in the Chief Con., is being handled under contract by Fitch.

Yankee Con. has made a strike of high-grade silver in the Hamburg workings. The face samples 175 to 570 ozs. silver, 15 to 20% lead and \$1 to \$20 in gold. Some of the assays showed \$300 to \$400 to the ton. Yankee is also carrying on extensive development in a ledge of quartz next to where the Beck tunnel took out several pockets of ore that brought \$30,000 to \$40,000 each. Leasers are shipping several carloads a month of first-class ore.

WASHINGTON.

Spokane.

The Silver Bell Mining Co., capitalized for 1,500,000 shares at \$1 each, of which 500,000 shares are to be held in the treasury, has been organized to take over and continue development of the old Spokane Belle mine, 4 miles from Clayton, one of the oldest mineral locations in the state. E. E. Belden, attorney, is president; R. F. Blackwell, formerly general manager of the Idaho, Washington & Northern Railway Co., is vice-president, and Mrs. Estelle McCabe is secretary-treasurer. The president and vice-president, with James M. Fitzpatrick, treasurer of the Union Iron Works Co.; H. N. Metzger, treasurer of the H. J. Shinn Co., and James A. Broad, construction contractor, compose the directorate. All are residents of Spokane. There are three parallel veins showing on the Silver Bell property, and they have been proven for 500 ft. by a series of surface cuts. A 43-ft. shaft has been sunk on the north vein and a 93-ft. shaft on the south vein. It is planned to sink the latter to the 300-ft. level, and then crosscut. Average assays show values of \$26 in silver, and picked samples ran \$59 to \$149, according to President Belden. A shipment of 2 cars to the Northport smelter a number of years ago netted \$26 a ton.

Chewelah.

After a suspension of 4 years the United Copper Mining Co., which owns and operates the United Copper mine, has resumed dividends. The directorate on Nov. 11 authorized

a disbursement of 1 ct. a share, or \$10,000, payable Dec. 15. This will make the total payments \$50,000, four distributions of \$10,000 each having been made prior to suspension. "The mine is in fine condition, and, while our values are not high, with the immense tonnage that has been proven, the increased milling capacity and the close saving being effected I believe we will be able to maintain dividends indefinitely," said Conrad Wolfe, president and general manager. "The report for the quarter ended Sept. 30 shows that the company still has outstanding indebtedness, but earnings are increasing steadily and will be considerably augmented after Jan. 1, when we will have both the mine and mill operating more efficiently. If copper and silver prices remain near prevailing levels we will be able to make large dividend payments in 1917." The quarterly report states that, after 18 months of experimentation a treatment has been devised that is resulting in saving 90% of the copper values and 92% of the silver. While metal prices have held at good levels during the period, wages and the cost of supplies have increased, adding materially to operating expenses. A tract of land below the concentrating plant was purchased for \$7,500 to obviate a threatened law suit, and considerable was expended in improving and adding to the mine and mill equipment.

WISCONSIN-ILLINOIS.

Platteville.

Reports covering operations of the field this week ending Nov. 18 show deliveries to track of 124 cars of zinc ore, 4782 tons, an appreciable falling off from the usual figures. Three cars of lead ore cleared 107 tons, all from the Benton district. Unheard of prices for pyrites failed to stimulate shipments and only 698 tons cleared. The gross turn-in of crude concentrate for the week was 4267 tons; net shipments to smelter 2883 tons. Jersey Zinc Co. delivered 15 cars of high grade separator product to smelter at DePue, 678 tons. Prices went soaring for the week, the base on 60% standard ore and premium grades holding at \$93.00. An advance of \$5 was noted on medium and second grade ore. Lead ore advanced to \$87.50 per ton and pyrites, usually selling at \$4.50 to \$5, advanced to \$10 per ton.

Locals were not much in evidence. The Bell Mining Co. with a complete rig started mining and milling on the Graham-Stephens property with success.

Benton.

A new mining and concentrating plant housing a 9-cell jig was started on the Grotkin farm for the Frontier Mining Co. The new plant has been provided to take care of zinc found just under the flint bed at a depth of 80 ft. and an equal distance above the oil rock, where the Bull Moose range makes exceptionally heavy. Should this top run not prove as profitable as anticipated the shaft will be dropped down 80 ft. picking up the oil rock run.

The new Hird mine, with full rig, attempted operations on the shaft sunk in treacherous ground. Heavy timbering delayed ore recovery sufficiently to keep the plant from moving steadily. Work was suspended and the range is being opened up 1200 ft. southwest through a new shaft down 100 ft., where drills showed heavy zinc formations, and a strong cap rock. The dirt will be gravitated to the mill and will insure a steady diet. General Manager J. H. Billingsley declares they are still lifting 2000 gals per minute. The pumps are draining the entire range now proven for ½ mile to the southwest. Mine and mill will be going on 2-shift schedule not later than Dec. 15.

On the Calvert property the Frontier Mining Co. has discovered a new range going past the west end of the old Calvert mine, 50 ft. from the hanging wall. This range has been drilled out to the Robson fence and runs northeast. A drill was moved on the Robson lease to check up extensions. A drift was cut from the old Frontier basin west into the old Calvert basin, which was followed in northwest and now miners are on the breast with good results.

Drills have picked up zinc for the Frontier Co. on the

extreme south end of the Hird farm. It is contended that this find is a part of the range coming out of the first Hird basin, 3000 ft. north. Several small runs of ore are located with drill on the Robson, Calvert, Bainbridge and Whaley farms but to date none show volume warranting development. Two small deposits have been proven on the Schultz land one along the south end, the other 500 ft. north of this. Neither is large enough to justify building a mill. The company intends mining them from the Treganza and Frontier properties as they belong to the same range on which is now found the Burr and Frontier mines.

The Burr mine is yielding 4 cars of 45% zinc weekly. It is driving west and sloping toward the Schultz lease. A drill has been put to work on the property. On the Buck Hill lease some fair runs of ore have been proven on the Hughlett farm but not strong enough to insure a lode. The work continues and traces of ore are being found in the grey rock.

Shipments of zinc ore last week totaled 55 cars, 4,414,000 lbs.; nearly all producers being represented. Shipments of high grade separator ore were the lightest yet reported this season for a week. Longhenry Mining Co. and H. B. Pulsifer, Chicago, have interested capital in a local project held under lease. Indian Mound, Kittoe and other zinc producers contributed 3 cars of lead last week all going to the Federal Lead Co. The Grasselli Chemical Co. was the single heaviest buyer, taking 28 cars, 1061 tons, under contract. The Eagle Picher Lead Co. secured little ore. From the National Separators came 7 cars, high-grade ore, 263 tons. The American Zinc Co. secured most of the high-grade offered by independents.

Linden.

Saxe-Pollard Co. have opened up a zinc deposit at the Gilman mine. The breast is 135 ft. wide, undetermined as to length and carries several flat sheet deposits. Shipments of concentrate are running 8 cars weekly from this and other company mines.

Miffin.

The reserve estimated at 1800 tons on Nov. 1 is being eliminated. Fifteen cars were shipped last week, 570 tons. One car came from locals nearer Mineral Point, 28 tons. A slide at the O. P. David mine, at Montfort buried the east breast from which a fine showing in shipments was being made. It will take several weeks to clean up.

Galena.

Shipments from the extreme southern end of the field last week were light, Hazel Green reporting 8 cars of zinc, Shullsburg, 2; Potosi, 1; and Galena 7. No disposition was shown to ship high-grade.

WYOMING.

Cody.

A dividend for Xmas is being planned on by the Midwest Sulphur Co. The refinery product is running 99.5% sulphur. It brings in carload lots \$49 a ton for the brimstone and \$47 a ton for flour sulphur. Fifteen beet sugar factories in this section consume an average of about 15 cars a season. The Midwest Sulphur is turning out 20,000 lbs. daily. The production is still sold about 8 months ahead.

Greybull.

The American Oil Co. has erected its standard rig on section 18, which is in line with the oil bearing zone. The Lamb Drilling Co. has installed a rig on the ground of the Greybull Oil & Dev. Co. The rig that was on the ground was too light and was removed and a contract made with the Lamb Drilling Co. to sink a new well. The drill has reached 1000 ft. depth.

Lander.

R. C. Heslep is drilling under contract for the Five Hundred Corporative Oil Co. and Nate Levi. The Hudson Co., west of where Heslep is drilling, have 8 wells which are good pumpers. During December Hudson expects to start new wells on its lease.

CANADA.

BRITISH COLUMBIA.

Silverton.

The Galena Farm Mining Co., which owns and is operating the Galena Farm lead-silver-zinc property near the Standard Silver-Lead Co.'s holdings, is producing at a rate that promises to enable the corporation to retire its outstanding indebtedness soon, according to official reports. The company is controlled by the heirs of the late Patrick Clark of Spokane, who secured the Galena Farm group under bond from A. W. McCune of Salt Lake, Utah, a few months before his death. The Clarks and their associates hold 75% of the stock, and the remaining 25% is held by the McCune interests. A report issued by the company states that the gross income for September and October was approximately \$70,000, and that the net earnings for the period were about \$50,000, the most of which was devoted to the bond payments. Three shifts of miners are employed at the property, and the 100-ton concentrator, commissioned about 8 months ago, is producing about 35 tons daily, the output running high in lead and zinc. The vein from which ore now is being extracted has been developed for more than 300 ft., the shoot averaging 14 ft. wide, and it is said that there is a sufficient reserve to provide material for the mill for not less than 5 years.

ONTARIO.

The Bureau of Mines has collected returns from the metalliferous mines and works of Ontario, Canada, showing the production for the 9 months ending Sept. 30, 1916. Following are the figures for the period, and for purposes of comparison, figures for the corresponding period last year. It will be noted that there has been a large increase in the aggregate value, and also in the value of nearly all the individual products, due to causes mentioned in the notes appended:

SUMMARY OF MINERAL PRODUCTION FIRST 9 MONTHS OF 1916.

Product.	Quantity		Value	
	1915.	1916.	1915.	1916.
Cobalt (ore), tons.....	92	98	\$ 12,472	\$ 10,591
Cobalt (oxide), lbs.....	135,337	378,732	107,363	231,947
Cobalt (metallic), lbs.....	76,979	172,055	66,552	146,467
Cobalt and nickel oxides (unseparated), lbs.....	2,501	57,026	500	22,890
Copper ore, tons.....	.....	1,715	.....	21,685
Copper in matte, tons....	14,057	16,989	2,024,658	6,285,930
Gold, ozs.....	281,712	363,955	5,826,941	7,513,734
Iron ore, tons.....	302,586	271,034	601,044	673,170
Molybdenite (concentrates), lbs.....	.....	15,845	.....	15,845
Nickel, oxide, lbs.....	142,483	54,152	16,085	6,331
Nickel, metallic, lbs.....	11,905	17,435	4,762	7,618
Nickel in matte, tons....	24,054	31,046	5,369,536	15,523,000
Pig iron, tons.....	354,153	501,410	4,510,906	6,686,965
Silver, ozs.....	17,178,629	16,203,091	8,030,469	9,750,040

Cobalt.—The silver mines of the Cobalt district have definitely established their supremacy of the sources of the world's supply of this mineral. Notwithstanding the war, which has closed the European markets, the shipments of cobalt oxides were much greater, both in quantity and value than in the first 9 months of 1915. It will be observed that metallic cobalt is assuming an important place in the list. This is mainly due to its use in the manufacture of special alloys, principally stellite, for high-speed tools. Stellite is made of cobalt, chromium and tungsten, and is finding a good demand from munition makers and other workers of modern hard steels.

Copper.—The extraordinary rise in the price of copper, which averaged 27 cts. in New York during the 9 months, has brought about the opening of several deposits of copper ore chiefly west of Lake Superior, from which shipments have been made to British Columbia smelters. The principal of these mines is the Tip Top; another at Mine Centre has lately been sending forward a carload of ore daily. The price received by the shippers has averaged 18.5 cts. for the copper contents. This figure has also been applied to the

copper contained in the heavy shipments of matte from the Sudbury nickel-copper mines, and a considerable part of the increase in value of the copper reported is due to the higher valuation, although the quantity shipped was also greater by 20%.

Gold.—The output from the mines of northern Ontario is steadily increasing, being 28% in excess of that for the 9 months of 1915. Hollinger Con. continues to be the chief producer, accounting for 47% of the total. Dome followed with 21% and McIntyre-Porcupine with 10%. The other considerable contributors in this camp are Porcupine Crown, Schumacher, Vipond and Jupiter, which together furnished 5.5%. Outside of Porcupine proper, Tough-Oakes yielded \$519,149; Canadian Exploration, Croesus and a small output from Dome Lake amounted to over \$250,000. At Teck-Hughes (Kirkland Lake) the mine has been developed and a mill built which will be put in operation as soon as the power transmission line now being erected from Cobalt has been completed. Other prospects here, the Lake Shore, Wright-Hargrave, Kirkland Lake Gold Mines, La Belle-Kirkland and Sylvanite are also being developed. This is a promising camp. In Gauthier township the Huronian mine is being worked under a lease. Several discoveries of gold were made during the summer in Benoit township, but there has not been time to prove their value. At Tashota, the Tash-Orn Co. bought the Wells' claim and put in machinery to give it a thorough test. This company is also working the King-Dodds claim. A diamond drill has been operated on the Devaney, Reamsbottom and Clive claims.

Molybdenite.—There is a demand in Britain for tool making steel, and several deposits of the ore in eastern Ontario have been opened and are being worked. There are dressing plants at Renfrew and Ottawa, the latter operated by the Dominion Mines Department. Ferro-molybdenum is also being made at Orillia and Belleville. The supply of molybdenite throughout the British empire has been reserved as a war measure and a price of 105s per unit fixed for concentrates delivered at Liverpool. This approximates \$1 per lb. here.

Nickel.—The Canadian Copper Co. and the Mond Nickel Co. have been working their mines and smelters at maximum capacity, and the output of nickel, contained in the matte product of the furnaces, for the 9 months falls little short of that for the full year 1915. The production for 1916 will probably exceed the production of 1915 by 20%. The valuation of the nickel in the matte has been increased from about 11 cts. per lb. (the figures adopted by the mining companies) in 1915, to 25 cts. in 1916. Nickel refineries are to be erected in Ontario by the International Nickel Co. and the British American Nickel Corporation, the latter of which is developing the Murray mine. Small quantities of metallic nickel are being produced from Cobalt ores by the Deloro Smelting & Refining Co.

Iron.—The whole production of iron ore was from the Helen and Magpie mines of the Algoma Steel Corporation. At the latter the ore (siderite) is roasted previous to shipment. Four blast furnace companies at Port Colborne, Sault Ste. Marie, Deseronto and Hamilton respectively, produced pig iron in quantity 41%, and in value 48% greater than in the corresponding period of 1915.

Silver.—The mines at Cobalt continue to produce, though on a slowly diminishing scale. The number of fine ounces contained in the shipments of the 9 months was 795,538 below the record for the same period of last year, but owing to the much higher prices that have prevailed for silver the return to the mining companies was \$1,719,571 greater. Silver started the year at 56.76 cts. and rose to a maximum in May of 74.27 cts., when it receded to 63.06 in July, reaching 68.51 again in September. In 1915 the monthly average was 49.75 cts. Nipissing still leads in production, Mining Corporation coming next, followed by Kerr Lake, Coniagas, McKinley-Darragh-Savage, Seneca-Superior, Temiskaming, etc. The flotation process is likely to assist materially in increasing the production of silver at Cobalt. It has been introduced at the Buffalo mine, where it is treating successfully low-grade rock containing 5 or 6 ozs. per ton. From the gold ores treated during the period 66,347 ozs. of silver were obtained, and from the copper ores 607 ozs.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

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Frood, G. E. B.—*The Cape Asbestos Industry, South Africa*. [From the annual report of the Government Mining Engineer. The deposits and working of the same in Cape province are described in detail].—S. Afr. Mg. Jnl. Sept. 30 1916; p 94; pp 1½; 70c.

Larson, A. G.; Lakes, Arthur, Jr.—*Slocan Star Mine, British Columbia*. [Abstract of a report made by the authors on this mine, in which details regarding it are given].—Mg. & Eng. Rec. Oct. 1916; p 96; pp 4¼*; 35c.

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(I) METALS AND ORES

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—*Transvaal Chamber of Mines August Analysis of Gold Production*. [Tonnage, yield, working costs, profits, dividends, etc., are given separately in tabulated form for each company].—Transvaal Chamber of Mines Aug. Report; pp 6.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

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Forbes-Leslie, William.—*The Norfolk Oil Shales.* [A paper read before the Inst. of Petroleum Technologists, England. In England and Scotland oil is found mostly in these shales and similar formation].—*Petro. World* Nov. 1916; p 525; pp 5; 35c.

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Huac, A. J.—*Cost Accounting for the Clay Plant.* [A complete system in the form of a series. Accounting forms and description are given].—*B. & C. Rec.* Nov. 7 1916; p 806; pp 2*; 35c.

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III. TECHNOLOGY

MINES AND MINING

Prospecting

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—*Method and General Cost of Rock Excavation for the Inlet Swamp Drainage District, Illinois.*—*Engg. & Cont.* Nov. 15 1916; p 429; pp ¾; 25c.

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Dixon, C. Y.—*Plant and Method of Dry Excavation, Livingstone Channel, Detroit River, Michigan.* [From Professional Memoirs. Pumping, drilling, costs, equipment used, etc., are included in this review].—*Engg. & Cont.* Nov. 15 1916; p 425; pp 2*; 25c.

Sargeant, E. W.—*Centrifugal Pumps and Dredgers.* [Confined mostly to the use and construction of these pumps as practiced in England].—*Lippincott & Co.*; book; pp 188*; \$3.25.

—*Triplex Pumps in the Wisconsin Zinc Mines.*—*Mg. World* Nov. 11 1916; p 829; pp 1*; 10c.

Dredging

Sargeant, E. W.—*Centrifugal Pumps and Dredgers.* [Confined mostly to the use and construction of these pumps as practiced in England].—*Lippincott & Co.*; book; pp 188*; \$3.25.

Sibley, Robert.—*The Most Powerful Dredge Afloat.* [The dredge is in California and is electrically operated].—*Jnl. of Elect., Power & Gas* Nov. 11 1916; p 371; pp 3¼*; 35c.

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Transport

Clapp, W. Howard.—*Economics and Costs of Motor Truck Operation.* [A paper read before the Amer. Soc. of Mech. Eng. The costs of trucks and various details in the cost of their operation is given].—*Canadian Eng.* Nov. 9 1916; p 383; pp 3¾*; 35c.

Murphy, S. J.—*A Submarine Pipe Line Across the Atlantic.* [A scheme for the under-sea transportation of oil and similar liquids].—*Petro. World* Nov. 1916; p 530; pp 2½*; 35c.

Rickard, T. A.—*The Britannia Mine and Mill, British Columbia.* [Details on the mill equipment and operation, with further information on the mine workings and deposits].—*M. & S. P.* Nov. 11 1916; p 693; pp 8*; 20c.

Warden Stevens, F. J.—*Coaling at the Panama Canal.* [Describes coaling docks and methods of operation there].—*Coll'y. Guard.* Oct. 20 1916; p 745; pp 3*; 35c.

Haulage and Conveying

Buck, A. M.—*Some Graphical Solutions of Electric Railway Problems.* [Formulas, description and curves on various problems].—*Univ. of Ill. Bull.* July 24 1916; pp 36*.

Hood, O. P.—*Safety in Hoisting and*

Slope Haulage. [Published by permission of the U. S. Bureau of Mines. A talk and discussion on preventives and accidents which have occurred].—Mg. World Nov. 11 1916; p 823; pp 1¼; 10c.

Scott, W. A.—*The Tonopah Extension Mines in Nevada.*—Mg. World Nov. 11 1916; p 831; pp 1; 10c.

Rickard, T. A.—*The Britannia Mine and Mill, British Columbia.* [Details on the mill equipment and operation, with further information on the mine workings and deposits].—M. & S. P. Nov. 11 1916; p 693; pp 8*; 20c.

Walker, Sydney F.—*Coal-Face Conveyors Employed in the United Kingdom.* [The conveying belt, shaking trough, traveling trough and the troughless chain conveyor are all described].—Coal Age Nov. 11 1916; p 790; pp 4¼*; 20c.

Sanitation

Bain, Foster H.—*Labor Problems in African Mines.* [Treats on the question of working and living conditions, with respect to sanitation].—Mg. Mag. Oct. 1916; p 199; pp 10; 50c.

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— *Placer Mining in Yukon, Methods and Costs of.* [Extract of a report published by the Minister of Interior, Ottawa, Ont.].—Canadian Mg. Jnl. Nov. 1 1916; p 506; pp 3¼; 35c.

Mine Sampling

Parr, S. W.—*Chemical Study of Illinois Coals.* [Methods of sampling in the field and laboratory are given, with a review of the results of analyses].—Ill. Geol. Surv. Bull. 3; pp 86*.

Ventilation

Rosback, E. J.—*Tunnel Construction on the Mill Creek River.* [Methods of operating, drilling, compressed air equipment, lining with concrete and brick, etc., are among things described].—Mine & Quarry Oct. 1916; p 907; pp 11*; 20c.

Accidents

— *Mines Inspector's Reports for 1915.* [A report of accidents, operations and labor conditions at mines in Great Britain, being confined mostly to coal].—I. & C. T. Rev. Oct. 20 1916; p 483; pp 3; 35c.

Rescue and First-Aid

— *Progress of First-Aid Work in British Columbia.* [Considerable of the information is from a report to the B. C. Dept. of Mines by Dudley Mitchell].—E. & M. J. Nov. 4 1916; p 815; pp 1¼; 25c.

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Hood, O. P.—*Safety in Hoisting and Slope Haulage.* [Published by permission of the U. S. Bureau of Mines. A talk and discussion on preventives and accidents which have occurred].—Mg. World Nov. 11 1916; p 823; pp 1¼; 10c.

— *Jos. A. Holmes Safety Association, Who's Who in.*—Mg. World Nov. 4 1916; p 795; pp 2¾*; 10c.

Production

Hoffman, E. J.—*The Nitration of Toluene.* [On the formation of nitrates of toluene of different valences from toluene as a byproduct from water gas].—U. S. Bur. of Mines Tech. Paper 146; pp 31; 15c.

— *British Columbia Report of the Minister of Mines.* [On the production and mineral industry of the provinces].—Mg. & Engg. Rec. Oct. 1916; p 92; pp 1½; 35c.

— *Pretoria Inspectorate of Mines, 1915 Annual Report.*—S. Afr. Mg. Jnl. Oct. 7 1916; p 122; pp 1; 35c.

— *Rhodesia Chamber of Mines Report of the Executive Committee.* [Tables of details of the production of gold and asbestos properties in the district are given].—Rhodesia Chamber of Mines Report Aug. 1916; pp 6.

— *Transvaal Chamber of Mines August Analysis of Gold Production.* [Tonnage, yield, working costs, profits, dividends, etc., are given separately in tabulated form for each company].—Transvaal Chamber of Mines Aug. Report; pp 6.

Mining Costs

Ayer, Frank.—*Reducing Air-Drill Repair Costs.* [A general talk pointing out various ways by which this cost can be reduced].—E. & M. J. Nov. 11 1916; p 864; pp 2*; 25c.

Clapp, W. Howard.—*Economics and Costs of Motor Truck Operation.* [A paper read before the Amer. Soc. of Mech. Eng. The costs of trucks and various details in the cost of their operation is given].—Canadian Eng. Nov. 9 1916; p 383; pp 3¼*; 35c.

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Larson, A. G.; Lakes, Arthur, Jr.—*Sloan Star Mine, British Columbia.* [Abstract of a report made by the authors on this mine, in which details regarding it are given].—Mg. & Engg. Rec. Oct. 1916; p 96; pp 4¼*; 35c.

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Accounts and Bookkeeping

Huac, A. J.—*Cost Accounting for the Clay Plant.* [A complete system in the form of a series. Accounting forms and description are given].—B. & C. Rec. Nov. 7 1916; p 806; pp 2*; 35c.

Mining Miscellany

Jackman, A. N.—*Russian Mines.* [A handbook of mining concessions worked by British interests in Siberia].—Financial Times, London; book; 50c.

MILLS AND MILLING

Crushing, Grinding, Etc.

Gahl, Rudolph.—*Operations and Methods in Use at the Inspiration Property, Arizona.* [A flow sheet of the mill, with considerable statistical data on the distribution of power, milling and flotation work].—Mg. World Nov. 11 1916; p 825; pp 3*; 10c.

Merrill, F. J. H.—*Recent Ball Mill Types for Grinding Ores.* [Detailed description of Hardinge and Marcy ball-mills].—Mg. & Oil Bull. Nov. 1916; p 273; pp 2½*; 25c.

Rickard, T. A.—*The Britannia Mine and Mill, British Columbia.* [Details on the mill equipment and operation, with

further information on the mine workings and deposits].—M. & S. P. Nov. 11 1916; p 693; pp 8*; 20c.

Flotation

Clayton, Charles Y.—*Sizing Flotation Concentrates.* [Abstract from an article in the Bulletin of the Missouri School of Mines, in which the results of tests made are given and discussed].—E. & M. J. Nov. 11 1916; p 867; pp ¾; 25c.

Gahl, Rudolph.—*Operations and Methods in Use at the Inspiration Property, Arizona.* [A flow sheet of the mill, with considerable statistical data on the distribution of power, milling and flotation work].—Mg. World Nov. 11 1916; p 825; pp 3*; 10c.

Stander, H. J.—*Alaska Has One Up-to-Date Flotation Plant—the Kennecott.* [A description of the plant and the results which have been obtained].—Mg. World Nov. 11 1916; p 822; pp 1¼; 10c.

Stander, H. J.—*The Flotation Process.* [A text with subjects in logical sequence for the student and others. Various methods are described in detail, methods of testing, costs, practice, etc., are dealt with separately].—Mining World Co.; book; pp 175*; \$3.

Concentration: Sorting, Sizing, Washing

Deshler, George O.—*Ohio Copper Concentrator, Utah.* [A description of the flow of the ores and the slime plant and method for water recovery].—E. & M. J. Nov. 11 1916; p 855; pp 1*; 25c.

Gahl, Rudolph.—*Operations and Methods in Use at the Inspiration Property, Arizona.* [A flow sheet of the mill, with considerable statistical data on the distribution of power, milling and flotation work].—Mg. World Nov. 11 1916; p 825; pp 3*; 10c.

Rickard, T. A.—*The Britannia Mine and Mill, British Columbia.* [Details on the mill equipment and operation, with further information on the mine workings and deposits].—M. & S. P. Nov. 11 1916; p 693; pp 8*; 20c.

Scott, W. A.—*The Tonopah Extension Mines in Nevada.*—Mg. World Nov. 11 1916; p 831; pp 1; 10c.

Chlorination

Neal, Walter.—*The Manganese and Silver Problem.* [Notes on investigations made to find a satisfactory method for treating silver-manganese ores. — Jnl. Chem. Met. & Mg. Soc. Aug. 1916; p 9; pp 9½; 35c.

Mill and Smelter Costs

Foot, Frederick W.—*Estimating Construction Costs.* [The present status of estimating, with examples from practice based on the ratio of labor and materials entering into the work].—E. & M. J. Nov. 11 1916; p 857; pp 3¼; 25c.

Stander, H. J.—*The Flotation Process.* [A text with subjects in logical sequence for the student and others. Various methods are described in detail, methods of testing, costs, practice, etc., are dealt with separately].—Mining World Co.; book; pp 175*; \$3.

CHEMISTRY AND ASSAYING

Chemistry

Drakeley, T. J.—*The Examination of Coal and Coke.* [Deals with methods for determining the sulphur in coal].—Sci. & Art. of Mg. Nov. 4 1916; p 148; pp 2*; 35c.

Hoffman, E. J.—*The Nitration of Toluene*. [On the formation of nitrates of toluene of different valences from toluene as a byproduct from water gas].—U. S. Bur. of Mines Tech. Paper 146; pp 31; 15c.

Assaying

Scott, W. A.—*The Tonopah Extension Mines in Nevada*.—Mg. World Nov. 11 1916; p 831; pp 1; 10c.

Analysis

Drakeley, T. J.—*The Examination of Coal and Coke*. [Deals with methods for determining the sulphur in coal].—Sci. & Art of Mg. Nov. 4 1916; p 148; pp 2; 35c.

Harger, F. D.—*Gas Analysis Applied to Brick Kilns*. [With the results of analysis and tests, utilization of waste heat and kiln economy are dealt with].—B. & C. Rec. Nov. 7 1916; p 803; pp 3; 35c.

METALLURGY

Electrochemistry

Heath, George L.—*The Analysis of Copper and Its Ores and Alloys*. [Methods of analysis and assay for different products containing copper].—McGraw-Hill; book; pp 292*; \$3.

Electrometallurgy

Antisell, F. L.; Skowronski, S.—*Electrolytic Copper Refining*. [Abstract of a paper read before the Amer. Inst. of Metals. The process is described from the melting of blister copper into anodes to the thermic refining of the cathodes resulting from electrolysis].—E. & M. J. Nov. 11 1916; p 874; pp 2½; 25c.

Stander, H. J.—*The Flotation Process*. [A text with subjects in logical sequence for the student and others. Various methods are described in detail, methods of testing, costs, practice, etc., are dealt with separately].—Mining World Co.; book; pp 175*; \$3.

Thermic Metallurgy

Antisell, F. L.; Skowronski, S.—*Electrolytic Copper Refining*. [Abstract of a paper read before the Amer. Inst. of Metals. The process is described from the melting of blister copper into anodes to the thermic refining of the cathodes resulting from electrolysis].—E. & M. J. Nov. 11 1916; p 874; pp 2½; 25c.

Metallurgy General

Fulton, Charles H.—*The Buying and Selling of Ores and Metallurgical Products*. [Methods of sampling and the different ways in which ores are settled for and penalized are explained].—U. S. Bur. of Mines Tech. Paper 83; pp 42; 15c.

POWER AND MACHINERY

Electricity

Buck, A. M.—*Some Graphical Solutions of Electric Railway Problems*. [Formulas, description and curves on various problems].—Univ. of Ill. Bull. July 24 1916; pp 36*.

Gahl, Rudolph.—*Operations and Methods in Use at the Inspiration Property, Arizona*. [A flow sheet of the mill, with considerable statistical data on the distribution of power, milling and flotation work].—Mg. World Nov. 11 1916; p 825; pp 3*; 10c.

Murphy, S. J.—*A Submarine Pipe Line Across the Atlantic*. [A scheme for the under-sea transportation of oil and similar liquids].—Petro. World Nov. 1916; p 530; pp 2½*; 35c.

Sibley, Robert.—*The Most Powerful Dredge Afloat*. [The dredge is in California and is electrically operated].—Jnl. of Elect., Power & Gas Nov. 11 1916; p 371; pp 3¼*; 35c.

Compressed Air

Ayer, Frank.—*Reducing Air-Drill Repair Costs*. [A general talk pointing out various ways by which this cost can be reduced].—E. & M. J. Nov. 11 1916; p 864; pp 2*; 25c.

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Combustion Engines

Clapp, W. Howard.—*Economics and Costs of Motor Truck Operation*. [A paper read before the Amer. Soc. of Mech. Eng. The costs of trucks and various details in the cost of their operation is given].—Canadian Eng. Nov. 9 1916; p 383; pp 3¼*; 35c.

Smith, P. H.; Primrose, H.—*Cylinder Liner Wear and Remarks on Piston Seizures*. [The information is on Diesel and other types of internal-combustion engines].—Petro. World Nov. 1916; p 540; pp 5*; 35c.

Wilkins, F. Trevor.—*Diesel Engine Trials*. [A paper read before the Inst. of Mech. Eng., England. Details of tests of various kinds are given].—Engg. Oct. 27 1916; p 422; pp 4*; 35c.

Steam and Steam Engines

Fulton, A. D.; Parlett, R. C.—*The Effect of Surface Conditions Upon the Rate of Heat Transmission Through Steam Pipe Coverings*. [A thesis on the rate of heat transmission as noted from tests].—Wis. Eng. Nov. 1916; p 67; pp 8*.

Streeter, Robert L.—*Power Equipment for Steam Plants*. [A description of and discussion of the use of poppet and corliss valve engines].—Engg. Mag. Nov. 1916; p 193; pp 13*; 35c.

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Gahl, Rudolph.—*Operations and Methods in Use at the Inspiration Property, Arizona*. [A flow sheet of the mill, with considerable statistical data on the distribution of power, milling and flotation work].—Mg. World Nov. 11 1916; p 825; pp 3*; 10c.

Taylor, M. T.—*Deep-Lead and Drift Mining in Victoria, Australia*. [Describes methods and details of methods used in going underground for gravel].—Mg. Mag. Oct. 1916; p 207; pp 12*; 50c.

IV. MISCELLANEOUS

Miscellaneous Costs

Foote, Frederick W.—*Estimating Construction Costs*. [The present status of estimating, with examples from practice based on the ratio of labor and materials entering into the work].—E. & M. J. Nov. 11 1916; p 857; pp 3¼; 25c.

Huac, A. J.—*Cost Accounting for the Clay Plant*. [A complete system in the form of a series. Accounting forms and description are given].—B. & C. Rec. Nov. 7 1916; p 806; pp 2*; 35c.

Testing

Clayton, Charles Y.—*Sizing Flotation*

Concentrates. [Abstract from an article in the Bulletin of the Missouri School of Mines, in which the results of tests made are given and discussed].—E. & M. J. Nov. 11 1916; p 867; pp ¾; 25c.

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Harger, F. D.—*Gas Analysis Applied to Brick Kilns*. [With the results of analysis and tests, utilization of waste heat and kiln economy are dealt with].—B. & C. Rec. Nov. 7 1916; p 803; pp 3; 35c.

Lasier, E. L.—*The Strength of Clamped Splices in Concrete Reinforcement Bars*. [Abstract of a paper read before the A. S. of Testing Materials. Curves and the results and nature of tests are described].—Canadian Eng. Nov. 9 1916; p 373; pp 2¼*; 35c.

Stander, H. J.—*The Flotation Process*. [A text with subjects in logical sequence for the student and others. Various methods are described in detail, methods of testing, costs, practice, etc., are dealt with separately].—Mining World Co.; book; pp 175*; \$3.

Wilkins, F. Trevor.—*Diesel Engine Trials*. [A paper read before the Inst. of Mech. Eng., England. Details of tests of various kinds are given].—Engg. Oct. 27 1916; p 422; pp 4*; 35c.

Law, Legislation, Taxation

Colby, William E.—*The Extra-Lateral Right—Shall It Be Abolished?* [Discussion].—M. & S. P. Nov. 11 1916; p 701; pp 4; 20c.

History

Rickard, T. A.—*The Britannia Mine and Mill, British Columbia*. [Details on the mill equipment and operation, with further information on the mine workings and deposits].—M. & S. P. Nov. 11 1916; p 693; pp 8*; 20c.

Stander, H. J.—*The Flotation Process*. [A text with subjects in logical sequence for the student and others. Various methods are described in detail, methods of testing, costs, practice, etc., are dealt with separately].—Mining World Co.; book; pp 175*; \$3.

Societies

McCullough, Ernest.—*The Engineering Society, Its Past, Present and Future Activities*. [A general talk on societies, what they are, have been and should be].—Jnl. West. Soc. of Eng. Oct. 1916; p 697; pp 12; 35c.

—*Institution of Mechanical Engineers*. [Proceedings of the meeting held on Oct. 20, 1916, England].—Engg. Oct. 27 1916; p 399; pp 3¾*; 35c.

Financial

—*Transvaal Chamber of Mines August Analysis of Gold Production*. [Tonnage, yield, working costs, profits, dividends, etc., are given separately in tabulated form for each company].—Transvaal Chamber of Mines Aug. Report; pp 6.

General Miscellany

McBride, D.—*A Trip Through Honduras, C. A.* [Deals mainly with the people, means of travel and accommodations, with more brief notes on copper and gold found in the country].—E. & M. J. Nov. 11 1916; p 851; pp 3½*; 25c.

Ore and Metal Markets; Prices-Current

New York, Nov. 23, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended November 22 were as follows:

	New York, cents.	London, pence.
Nov. 16.....	71½	34
17.....	71½	34
18.....	71½	34½
20.....	72½	34½
21.....	72½	34 9/16
22.....	72½	34 13/16

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London	
	High.	Low.	Avg.	Standard Oz.	1915.
January.....	57½	55½	56.775	48.890	26.875
February.....	57	56½	56.755	48.477	27.000
March.....	60½	56½	57.935	49.926	27.080
April.....	73½	60½	64.415	50.034	31.375
May.....	77½	68½	74.27	49.915	34.182
June.....	68½	62½	65.02	49.072	31.038
July.....	65	60	62.94	47.519	29.870
August.....	67	64	65.50	47.178	31.25
September.....	69½	67½	68.515	48.68	32.18
October.....	69½	67½	67.855	49.385	32.21
November.....	.....	.....	.....	51.713	.....
December.....	.....	.....	.....	55.038	.....
Year.....	.....	.....	.....	49.690	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—For the first time in the history of the copper trade the red metal has sold above 30 cts. on deliveries to be made a year in the future. Other records have also been established. Spot copper has sold at 31¾ cts., December electrolytic sold at 34½ cts., first quarter at 33 to 33½ cts., second quarter at 32½ cts., and third quarter at 31½ cts., while for the fourth quarter of next year business has been done at 30 to 30¼ cts. The extent of the forward business in copper is alone sufficient to furnish an index as to the trend of affairs but in addition the heavy buying of the red metal for nearby deliveries creates an unparalleled situation. Business since our last report has been on an active scale. Buying for delivery this year as well as over the first half of next year did not abate. Consumers who were thought to be protected for this period came into the market and took sizable blocks of the metal. Melters who underestimated their requirements or were dilatory in covering were also in the market.

The tremendous business done by dealers in the past 3 weeks has led to the question arising as to where these dealers obtained the copper they are selling. In one quarter it was asserted that consumers were reselling copper they had purchased around 27 cts. and taking their profit. The fact that important as well as small consumers have been buying recently appears to eliminate this suggestion from consideration. Another report, one that created amusement, was that the Entente Allies were reselling copper they had purchased in the block of 448,000,000 lbs. and for which they paid around 25 cts. Producers who were concerned in this sale characterized this report as laughable as they would know very quickly if such were the case. They pointed out that England instead of being so well supplied with the red metal that it could turn speculator and sell what it had purchased recently under difficulties, could use several hundred million pounds more of copper in the first half if it could be obtained. The dealers who are now selling copper and are obtaining the high prices, were steady buyers of the metal when prices were low. They foresaw the coming of the day when full realization would come that production was not equal to consumption, and they prepared for that day. There has been no reselling of copper by consumers, either domestic or foreign.

Business since our last report has amounted to fully 275,000,000 lbs., the bulk of this tonnage being sold by dealers

for first and second quarter delivery. It has become known that the steamer *Rowanmore* which was sunk by a German submarine had 1000 tons of copper aboard. In these days of copper shortages the loss of this amount of metal is very serious. October production is estimated at 172,000,000 lbs., but some producers expected that November will show a yield close to 180,000,000 lbs.

Prices are difficult to quote, all transactions being subject to individual negotiation. Thus while one sale for the first quarter may be made at 33¼ cts., the next may be done at 33½ cts. Striking a balance, however, first quarter metal may be quoted at 33½ cts., second quarter at 32½ cts., third quarter at 31½ cts., and fourth quarter at 30 to 30¼ cts. Lake copper for the first quarter was sold at 32¼ to 33 cts. Spot and December casting copper is unquotable. One producer is asking 33 cts. for December casting. For January and February delivery casting has sold at 31 cts. and at 30¾ cts. for March. Some large sales of lake arsenical copper for first quarter delivery have been put through at 32¼ to 33 cts. One producer found a ready market for a large amount of off grade copper which consumers quickly took.

The London market has advanced steadily. Last week electrolytic advanced £10 to £158 with further gains this week. Standard copper advanced £14 10s. in spot and futures.

Quotations for copper per pound at New York for the week ended Nov. 22, were as follows:

(For First Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
Nov. 16.....	31½ @ 32	31½ @ 32½	30 @ 30½
17.....	32 @ 32½	32 @ 32½	30 @ 30½
18.....	32½ @ 32½	32½ @ 33	30½ @ 30¾
20.....	32½ @ 32½	33 @ 33½	30½ @ 30¾
21.....	32½ @ 32½	33 @ 33½	30½ @ 30¾
22.....	32½ @ 32½	33 @ 33½	30½ @ 30¾

Quotations for copper per ton at London for the week ended Nov. 22, were as follows:

	Spot.	Standard—Futures.	Electrolytic.
Nov. 16.....	£135 0 0	£136 10 0	£154 0 0
17.....	139 0 0	135 0 0	158 0 0
18.....	139 0 0	135 0 0	158 0 0
20.....	141 0 0	136 10 0	160 0 0
21.....	144 0 0	139 10 0	162 0 0
22.....	144 0 0	139 10 0	164 0 0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915.
	High.	Low.	Average.	
January.....	25.50	23.00	24.101	13.891
February.....	28.50	25.25	27.437	14.72
March.....	28.25	27.25	27.641	15.11
April.....	30.00	28.50	29.40	17.395
May.....	29.75	28.25	29.05	18.812
June.....	29.25	27.25	27.90	19.92
July.....	27.20	26.10	26.745	19.423
August.....	28.00	25.00	26.320	17.472
September.....	29.00	28.00	28.75	17.758
October.....	29½	29.00	29.18	17.925
November.....	.....	.....	.....	18.856
December.....	.....	.....	.....	20.375
Year.....	.....	.....	.....	17.647

Month.	New York—Electrolytic.			1915.
	High.	Low.	Average.	
January.....	25.50	23.00	24.101	13.707
February.....	28.50	25.25	27.462	14.572
March.....	28.25	27.25	27.410	14.96
April.....	30.50	28.25	29.65	17.057
May.....	29.75	28.00	28.967	18.601
June.....	29.25	27.25	27.90	19.173
July.....	27.20	26.10	26.745	19.08
August.....	28.00	25.00	26.320	17.222
September.....	29.00	28.00	28.75	17.705
October.....	29½	29.00	29.18	17.559
November.....	.....	.....	.....	18.826
December.....	.....	.....	.....	20.348
Year.....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	1916	1916	1916	1916	1916
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.33	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	27.00	25.50	26.40	116.10	68.560
October	28.50	27.00	27.31	117.25	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—A scarcity of spot tin has projected itself as the dominant factor of interest in the tin market. Price advances have been steady and at some times very sharp. Spot straits tin sold up to 45½ cts., while spot Banka sold up to 44¼ cts.

Arrivals since the first of the month total only 850 tons. The *Suruga* will not make November delivery so that indications are that November imports on the Atlantic available for delivery will not total over 1200 tons. The Pacific coast will not bring in much more than 800 tons. Against this 2000 tons there is a monthly consumption of 4200 tons. English officials have withheld permits because of the excessive holdings there. The decrease in stocks will therefore result in freer granting of permission.

Quite a good business has been done in April, May and June arrivals since our last report, but beyond these months buyers were not interested. Straits tin for December delivery was quoted at 44½ cts., with January arrival held at 44¼ cts., February at 43½ cts. and March at 43½ cts. London and Singapore advanced steadily last week except for a minor recession at the close, while this week foreign markets were irregular.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Nov. 22, were as follows:

Month.	New York		London		Singapore	
	Spot.	December.	Straits, spot.	Shipments.	Shipments.	Shipments.
Nov. 16.....	45c	44½c	£190 15 0	£192 10 0	£191 0 0	£191 0 0
17.....	45c	44½c	188 15 0	191 0 0	191 0 0	191 0 0
18.....	45c	44½c	188 15 0	191 0 0	191 0 0	191 0 0
20.....	45½c	44½c	188 10 0	191 0 0	191 0 0	191 0 0
21.....	45.30c	45½c	188 15 0	191 5 0	191 5 0	191 5 0
22.....	45½c	45½c	191 0 0	.....	.....	.....

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.88
May	52.00	46.75	49.86½	38.871
June	45.50	38.75	42.16	40.873
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.68	34.886
September	39.50	38.00	39.00	33.13
October	44.00	39.37½	41.17	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—It develops that leading independent producers have done a substantial business for December delivery, although information as to these transactions has been withheld. One producer reports taking sizable orders for December delivery from domestic consumers at 7.02½ cts, St. Louis, whereas up to late last week these producers asserted that their price was 6.95 cts. St. Louis. Canadian consumers have not as yet reentered the market for December metal but their advent as buyers is not far off, sellers reporting that they have been drawing heavily against their November allowances.

Business in lead for December has not as yet reached its crest. The leading interest adheres to its quotation of 7 cts. New York, and 6.92½ cts. St. Louis, but is not doing business at these prices. The leading interest is reported to be largely sold out for December and even January on open price contracts. In any event the belief is gaining ground that the official quotations will be changed to higher ones with the turn of the month. At London the market has remained dormant.

Quotations for lead per pound at New York and per ton at London for the week ended Nov. 22, were as follows:

Month.	New York			London		
	Indpts.	A. S. & R. Co.	Spot.	Spot.	Futures.	Futures.
Nov. 16.....	7.05c	7.00c	£30 10 0	£29 10 0	£29 10 0	£29 10 0
17.....	7.10c	7.00c	30 10 0	29 10 0	29 10 0	29 10 0
18.....	7.10c	7.00c	30 10 0	29 10 0	29 10 0	29 10 0
20.....	7.10c	7.00c	30 10 0	29 10 0	29 10 0	29 10 0
21.....	7.15c	7.00c	30 10 0	29 10 0	29 10 0	29 10 0
22.....	7.20c	7.00c	30 10 0	29 10 0	29 10 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London		
	1916	1915.	1916.	1915.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	23.010
April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	6.75	6.88	5.875	29.760	25.760
July	6.85	6.25	6.37	5.738	28.035	25.611
August	6.70	5.95	6.32	4.760	30.260	22.150
September	7.10	6.70	6.88	4.627	31.25	22.953
October	7.10	7.00	7.05	4.612	30.20	23.932
November .....	.....	.....	.....	5.152	.....	26.240
December .....	.....	.....	.....	5.346	.....	28.884
Year .....	.....	.....	.....	4.675	.....	23.099

Lead Ore.—During the week ended Nov. 18 the lead-ore market remained about as during the previous week in the Missouri-Kansas-Oklahoma district and ores sold at from \$85 to \$87.50. Shipments during the week of 2,002,320 lbs. were considerably above those of the previous week and were valued at \$85,832. The total for the year to date was 90,749,022 lbs., valued at \$3,760,442.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.46	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	76.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	48.25
October	87.00	70.50	79.875	51.80
November .....	.....	.....	.....	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—The strength of the previous week continued during the week ended Nov. 18 and prices were up \$5. The better grades brought \$95 per ton and this price ranged down to \$85 for the poorer grades. Sales made during the week amounted to \$502,330 for 11,639,615 lbs. of concentrates. This made the total for the year 618,986,387 lbs., valued at \$24,681,113.

Calamine.—No change was noted in this market and prices remained firm at \$45 to \$50. There were 1,352,300 lbs. of concentrates valued at \$32,790 shipped during the week. The total for the year was placed at 33,405,905 lbs., valued at \$1,003,112.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	68.75	60.25
September	65.00	45.00	55.00	76.75
October	75.50	50.00	63.875	82.40
November .....	.....	.....	.....	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Buying of spelter has been on a very large scale with consumers taking metal for delivery over the second quarter as well as the first quarter. With the market ranging about 11 cts for first quarter delivery some producers entered the market as sellers but others refrained from offering, asserting that they expect to secure 13 cts.

and perhaps better for their production. The entry of some producers into the market as sellers did not at first have any repressive effect on prices but later on the freer offerings resulted in concessions from dealers. Spot prime western sold up to 12½ cts. New York, and 12¼ cts. St. Louis. Spot brass special sold at 13 cts. St. Louis, while business in higher grades than brass special was done at 13½ cts. St. Louis for spot. Prime western for the first quarter sold up to 12¼ cts. with some small lots done at 12 cts., but later on the market moved off to 11½ cts. For the second quarter business was done around 11 to 11½ cts. Zinc sheets have been advanced twice each time one cent so that the price is now 19 cts. base. The London market advanced last week but receded this week.

Quotations for spelter per pound at New York and per ton at London for the week ended Nov. 22, were as follows:

	New York.		London—	
	Spot.	Spot.	Futures.	
Nov. 16.....	12½c	£56 15 0	£55 5 0	
17.....	12½c	57 10 0	55 5 0	
18.....	12½c	57 10 0	55 5 0	
20.....	12½c	56 10 0	54 10 0	
21.....	12½c	56 10 0	54 10 0	
22.....	12½c	57 5 0	55 0 0	

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1915		1916	1915	
	High.	Low.	Avg.	Avg.	Avg.	Avg.
January	19.42½	17.30	18.801	6.619	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July	10.75	8.75	9.80	20.803	53.00	98.150
August	9.75	8.37½	9.11½	16.110	56.00	68.259
September	9.70	8.12½	9.22	14.493	51.30	64.400
October	10.42½	9.42½	9.99	14.196	53.15	64.196
November				16.875		88.240
December				16.675		89.153
Year				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Although mercurial drugs have been advanced the situation in quicksilver shows no change, sellers continuing to quote \$80 per flask. When drug makers put up their prices it was thought that quicksilver would go higher, but leading sellers state that no change will be made as yet. There is a steady demand with supplies fair to good.

Antimony.—Information as to this metal has been conflicting. Some Chinese interests contend that spot is selling at 14 cts., but other sellers put the price at 13¼ cts. and in some cases a flat 13 cts. A Canadian inquiry for December and January delivery is in the market.

Sheet Zinc.—On Friday, Nov. 17, and on Monday, Nov. 20, advances were made in the price of sheet zinc, the quotation now being 19 cts. a pound base. Thus far three advances have been announced this month, each of one cent a pound.

Pig Iron.—The upward trend of pig iron prices has not been headed, although the demand for iron is less excited. Furnaces are not quoting except on firm inquiries. Large sales of basic and bessemer have again been made while a considerable business has been done in foundry grades, Birmingham furnaces selling about 60,000 tons and northern furnaces about 45,000 tons. No. 2 iron at Buffalo is quoted at \$28 with eastern Pennsylvania furnaces asking \$27, valley furnaces \$27, Birmingham furnaces \$20 and Ohio furnaces \$26 to \$27.

Ferromanganese.—There has been no essential change in the situation, English and domestic ferromanganese being quoted at \$160 to \$165 per ton. Demand is only fair.

Nickel.—Business in this metal is fairly active with the market remaining at 45 cts. for ordinary forms and 50 cts. for electrolytic.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06¾	to	.06¾
Nitric, 40 deg.....	.06¾	to	.07
Alcohol—U. S. P., gal., Grain, 190 proof.....	2.74	to	2.75
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.90	to	.95
Denatured. bbl.....	.60	to	.62
Alum—Powdered, lb.....	.04½	to	.04¾
Lump, lb.....	.04	to	.04½
Ground, lbs.....	4.10	to	4.12½
Ammonia—			
Muriate, white grain, lb.....	.12½	to	.13
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06	to	.06¾
Red, lb.....	.62½	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	7.00	to	8.00
Foundry.....	10.00	to	11.00
Copperas—Spot, bbl.....	1.25	to	1.50
Ferrosilicon, 50%.....			100.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glauber's Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			4.45
Bessemer, Mesabi.....			4.20
Non-Bessemer, old range.....			3.70
Non-Bessemer, Mesabi.....			3.65
Lead—Granulated, lb.....	.14¾	to	.15¾
Brown sugar.....	.11½	to	.11¾
White crystals.....	.13	to	.13½
Broken, cakes.....	.12½	to	.13
Powdered.....	.13¾	to	.14
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13¾	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.23	to	.28½
Nickel Salt, double.....	.07¾	to	.08¾
Single.....	.10½	to	.11
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Platinum—Oz. ref.....	105.00	to	111.00
Potash Fertilizer Salts—			
Kalnit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
Refined, bbl.....			.12
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.40	to	.42
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.75	to	1.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.90	to	.95
Prussiate, red.....	2.35	to	2.50
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.31	to	.31½
Soda—Ash, 48% (43% basis), bbl.....	3.00	to	3.60
Strontia Nitrate, casks, lb.....	.32	to	.35
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.14¾	to	.14¾
Crystals, bbls., lb.....	.29	to	.29½
Oxide, lb.....	.48	to	.50
Zinc Chloride.....	.10¾	to	.11¾

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to date	Latest Date Amt.					Paid in 1916	Total to Date	Latest Date Amt.		
Acacia, g.	Colo.	1,438,959	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,915	\$1	\$.....	\$98,915	Sept. '01	\$0.01
Adams, s. l. c.	Colo.	80,000	10	.....	778,000	Dec. 18, '09	.04	Golden Star, g.	Ariz.	400,000	5	.....	120,000	Mar. 15, '10	.05
Adventure, c.	Mich.	100,000	25	50,000	60,000	July 20, '15	.50	Gold Com. Fra. g.	Nev.	922,000	1	.....	92,111	Oct. 15, '09	.10
Alhambra, c.	Mich.	200,000	25	2,000,000	5,050,000	Oct. 10, '15	4.00	Goldfield Con.	Nev.	3,559,148	10	.....	28,999,831	Oct. 31, '15	.10
Alaska Goldfields.	Alaska	250,000	5	.....	403,250	Jan. 10, '15	.15	Good Hope, g. s.	Colo.	600	100	.....	941,250	Jan. '03	.25
Alaska Mexican, g.	Alaska	150,000	5	.....	3,507,381	Nov. 23, '15	.10	Good Sp. Anchor, z.s.	Nev.	550,000	1	33,000	119,755	June 15, '16	.01
Alaska Mines Sec.	U. S.	500,000	5	.....	90,000	Nov. 1, '06	.....	Grand Central, g.	U. S.	600,000	1	20,000	1,635,250	Oct. 25, '15	.04
Alaska Treadwell, g.	Alaska	200,000	25	250,000	15,780,000	May 29, '15	.50	Grand Outch, c. a. s.	Nev.	239,845	2.50	17,790	19,187	Sept. 5, '15	.03
Alaska United, g.	Alaska	150,200	5	54,060	2,045,270	Feb. 28, '15	.30	Granite, g.	Alaska	430,000	1	17,200	17,200	May 10, '15	.02
Allouez, c.	Mich.	100,000	25	700,000	800,000	Oct. 4, '15	2.50	Gwin, g.	Cal.	100,000	10	.....	481,500	Feb. '06	.25
Amalgamated, c.	Mont.	1,538,529	100	.....	103,444,983	Aug. 30, '15	3.77	Hazel, g.	Cal.	900,000	1	.....	1,114,000	Jan. 5, '15	.01
Am. Sm. & R. com.	U. S.	600,000	100	2,500,000	31,533,333	Sept. 1, '15	1.50	Hecia, s. l.	Idaho	1,000,000	0.25	1,250,000	5,005,000	Oct. 20, '15	.15
Am. Sm. & R. pf.	U. S.	600,000	100	2,625,000	57,421,385	Sept. 1, '15	1.75	Hercules.	Idaho	1,000,000	1	2,200,000	13,000,000	Oct. 15, '16	.20
Am. Sm. Sec. A. pl.	U. S.	170,000	100	1,020,000	11,720,000	Oct. 2, '15	1.50	Hidden Treasure, g.	Cal.	30,000	10	.....	457,452	Sept. '00	.10
Am. Sm. Sec. B. pl.	U. S.	300,000	100	1,400,000	17,010,000	Oct. 2, '15	1.25	Holy Terror, g.	S. D.	500,000	1	.....	172,000	Jan. '00	.01
Am. Zinc, L. & Sm.	Mo.	193,120	25	2,756,130	3,800,000	Aug. 1, '15	1.50	Homestake, g.	S. D.	251,160	100	1,632,540	37,333,248	Oct. 25, '15	.65
Anacosta, c.	Mont.	2,331,250	50	11,656,250	175,914,271	Aug. 28, '15	2.00	Hope Dev.	Cal.	500,000	1	.....	5,000	Dec. 31, '15	.01
Annie Laurie, g.	Utah.	25,000	100	.....	439,561	Apr. 22, '06	.50	Horn Silver, i. s. z.	Utah.	400,000	1	40,000	5,182,000	June 30, '15	.05
Argonaut, g.	Cal.	200,000	5	55,000	1,695,000	Sept. 25, '15	.07%	Imperial, c.	Ariz.	500,000	10	.....	300,000	June 24, '07	.20
Arizona, c.	Ariz.	.....	.....	521,164	20,212,164	Apr. 1, '15	.....	Inspiration Con.	Ariz.	920,687	20	5,454,989	5,454,989	Oct. 31, '15	2.00
Atlantic, c.	Mich.	100,000	25	.....	990,000	Feb. 21, '06	.50	Intermountain, c.	Mont.	1,515,020	1	8,075	8,075	Oct. 1, '15	.005
Bagdad-Chase, g. pf.	Cal.	84,819	5	.....	202,394	Jan. 1, '09	.10	Inter'l Nickel, com.	U. S.	1,673,384	25	7,948,574	33,451,414	Sept. 1, '16	2.00
Bald Butte, g. s.	Mont.	250,000	1	.....	1,354,645	Nov. 1, '07	.04	Inter'l Nickel, pf.	U. S.	89,126	100	401,067	5,748,513	Aug. 1, '15	1.60
Baldie, c.	Mich.	100,000	25	.....	7,950,000	Dec. 31, '15	2.00	Intern'l Sm. & Ref.	U. S.	100,000	100	.....	4,100,000	May 2, '14	2.00
Barnes-King, g.	Mont.	40,000	5	60,000	60,000	June 1, '15	.07%	Interstate-Callahan	Idaho	464,990	10	2,092,455	4,649,990	Sept. 30, '15	1.50
Beck Tunnel Con.	Utah.	1,000,000	0.10	.....	940,000	Nov. 15, '07	.02	Iowa, g. s. l.	Colo.	1,666,667	1	.....	270,187	Dec. 31, '15	.00%
Big Four Expl.	Utah.	400,000	1	100,000	110,000	Sept. 4, '15	.05	Iowa Tiger, g. s. l.	Colo.	3,000	1	.....	25,179	Jan. 15, '15	.50
Board of Trade, z.	Wis.	120,000	1	.....	78,000	Jan. 15, '11	.05	Iron Blossom, i. s. g.	Utah.	1,000,000	1	360,000	2,850,000	Oct. 20, '15	.10
Bonanza Dev.	Colo.	300,000	1	.....	1,425,000	Oct. 28, '11	.20	Iron Cap pf. c.	Ariz.	33,481	10	6,422	29,903	July 1, '15	.35
Booth (Reorganized)	Nev.	998,395	5	349,949	349,949	June 25, '15	.05	Iron Clad, g.	Colo.	1,000,000	1	.....	50,000	Nov. '06	.05
Boss, g. c.	Nev.	408,500	1	.....	40,850	Dec. 10, '14	.10	Iron Silver	Colo.	600,000	20	.....	5,050,000	Dec. 31, '15	.10
Boston & Colo. Sm.	Colo.	15,000	10	.....	402,350	Oct. '02	.75	Isabella, g.	Colo.	2,250,000	1	.....	742,500	Mar. '01	.01
Bost. & Mont. Con.	Mont.	200,000	25	.....	63,225,000	May 15, '11	4.00	Isle Royale, c.	Mich.	150,000	25	450,000	600,000	Oct. 31, '15	2.00
Brunswick Con., g.	Cal.	300,000	1	.....	220,000	Dec. 15, '13	.10	Jamison, g.	Cal.	390,000	10	.....	378,300	Jan. '11	.07
Brullion-B & Champ	Utah.	100,000	10	.....	203,315	Sept. 15, '15	.05	Jerry Johnson, g.	Colo.	2,600,000	10	.....	187,500	Nov. 5, '14	.00%
Bunker Hill Con.	Cal.	200,000	1	50,000	2,768,400	July 11, '09	.10	Jim Butler	Nev.	1,718,020	1	343,604	516,406	Aug. 1, '15	.10
Bunker Hill & Bull.	Idaho	327,000	10	1,397,750	871,000	Oct. 4, '15	.02%	Joplin Ore & Spelter	Mo.	400,000	5	62,000	82,000	July 22, '15	.04%
Butte Alex Scott	Mont.	75,000	10	844,662	18,152,750	Oct. 5, '15	.20	Jumbo Exl., g.	Nev.	1,550,000	1	194,000	684,998	June 30, '15	.05
Butte-Balaklava, c.	Mont.	250,000	10	.....	1,064,119	Apr. 10, '15	10.50	Kendall, g.	Mont.	600,000	5	60,000	1,555,000	Apr. 3, '15	.10
Butte Coalition, c.	Mont.	1,000,000	15	.....	125,000	Aug. 1, '10	.50	Kenecid Zinc	Mo.	200,000	.....	60,000	60,000	June 30, '15	.10
Butte & Superior, z.	Mont.	272,697	10	7,676,734	4,700,000	Dec. 1, '11	.25	Kennecott, c.	Alas.	2,780,999	10	11,200,000	16,200,000	Sept. 30, '15	1.60
Caledonia, i. s. c.	Idaho	2,605,000	1	791,500	13,196,758	Sept. 30, '15	6.25	Kennedy, g.	Cal.	100,000	100	.....	1,801,001	June '00	.05
Calumet & Ariz., c.	Idaho	641,923	10	3,849,522	1,684,231	Oct. 5, '15	.10	King of Arizona, g.	Ariz.	200,000	1	.....	396,000	Aug. 2, '09	.12
Calumet & Hecia, c.	Mich.	100,000	25	5,000,000	26,997,847	Sept. 25, '15	2.00	Klar Piquett, z.	Wis.	20,000	1	.....	157,500	Dec. 16, '12	.25
Camp Bird, g.	Colo.	1,750,000	25	113,584	134,250,000	Sept. 22, '15	20.00	Knob Hill, g.	U. S.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%
Cardiff, g. s.	Utah.	500,000	1	375,000	10,243,964	Jan. 1, '15	.17%	La Fortuna, g.	Ariz.	250,000	1	.....	200,600	Oct. '02	.01%
Carlin, g. a. c.	Utah.	600,000	25	.....	500,000	Sept. 19, '15	.25	Lake View	Utah.	500,000	.05	50,000	114,500	June 12, '15	.01
Centennial, c.	Mich.	1,000,000	1	100,000	60,000	Dec. '05	.01	Last Dollar, g.	Colo.	1,600,000	1	.....	180,000	Feb. 23, '03	.02
Centennial Eureka.	Utah.	100,000	25	100,000	100,000	Sept. 1, '15	1.00	Liberty Bell, g.	Colo.	133,551	5	.....	1,752,795	Jan. 31, '15	.05
Center Creek, i. z.	Mo.	100,000	10	85,000	4,000,000	Apr. 25, '15	1.00	Lightner, g.	Cal.	102,255	1	.....	331,179	June '06	.06
Central Eureka, g.	Cal.	100,000	1	.....	750,000	Oct. 1, '15	.15	Linden, z.	Wis.	1,020	10	.....	11,200	Dec. 31, '15	3.00
Century, g. s. l.	Utah.	1,000,000	1	44,000	739,159	Mar. 5, '06	.05	Little Bell, s. l.	Utah.	300,000	1	15,000	75,000	Apr. 22, '15	.05
Cerro Gordo, i. a. z.	Cal.	1,000,000	1	25,000	392,997	Feb. 15, '15	.05	Little Florence	Nev.	1,000,000	1	.....	40,000	Jan. '00	.03
Champion, c.	Mich.	100,000	25	6,280,000	25,000	Sept. 23, '15	.02%	Lost Packer	Idaho	150,000	1	.....	37,500	Oct. 23, '15	.25
Chief Con.	Utah.	882,960	1	132,323	16,280,000	Oct. 8, '15	6.40	Lower Mammoth.	Utah.	1,000,000	1	.....	57,000	Dec. 15, '15	.01
Chino Copper c.	N. M.	589,980	5	5,002,385	483,360	Aug. 2, '15	.05	MacNamara, g. s.	Nev.	734,576	1	.....	46,800	Apr. 23, '05	12.00
C. K. & N. g.	Cal.	1,431,901	1	.....	11,700,377	Sept. 30, '15	2.25	Magma, c.	Ariz.	240,000	5.00	360,000	600,000	Sept. 30, '15	.60
Cliff, g.	Alas.	100,000	1	.....	171,828	Nov. '04	.01	Mammoth, g. a. c.	U. S.	400,000	10	60,000	2,380,000	Sept. 30, '15	.05
Clinton, g. s.	Colo.	1,000,000	1	.....	115,000	Feb. 5, '14	.06	Manhattan-Big 4, g.	Nev.	762,400	1	.....	30,248	Aug. 15, '11	.02
Clinton, g. s.	Colo.	1,000	100	.....	90,000	Jan. 1, '13	.10	Mary McKinley, g.	Colo.	1,309,252	1	.....	1,189,308	July 28, '14	.02
Colo. G. Dredging.	Colo.	200,000	10	100,000	60,000	Dec. '03	.30	Mary Murphy, g. s. l. z.	Colo.	370,000	5	25,067	93,106	May 1, '16	.07
Colorado, s. l.	Utah.	1,000,000	0.20	.....	425,000	Feb. 23, '15	1.00	Mass Con. c.	Mich.	100,000	25	100,000	100,000</		

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah..	600,000	\$ 1	\$.....	\$65,000	Aug. 9, '06	\$0.04	Success.....	Ida..	1,600,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03
Pharmacist, g.	Colo..	1,600,000	100	9,000,000	91,500	Feb. 1, '10	.00%	Superior, c.	Mich..	1,000,000	25	100,000	100,000	Oct. 10, '16	1.00
Phelps, Dodge & Co	U. S. ..	450,000	100	9,000,000	57,371,627	Sept. 30, '16	8.00	Superior & Pitta, c.	Ariz..	1,499,792	10	10,318,568	10,318,568	Dec. 11, '16	.35
Pioneer, I. z.	Alaska	5,000,000	1	.....	2,041,626	Oct. 7, '11	.03	Tamarack, c.	Mich..	60,000	25	9,420,000	9,420,000	July 23, '07	4.00
Pittsburg, I. z.	Mo..	1,000,000	1	.....	20,000	July 15, '07	.02	Tamarack-Custer..	Idaho..	2,000,000	1	71,050	71,050	Aug. 30, '16	.62
Pittsburg-Idaho, I.	Ida..	1,000,000	1	42,500	281,004	Oct. 2, '16	.04%	Tennessee, c.	Tenn..	200,000	25	300,000	5,206,250	Apr. 15, '16	.75
Platts Silver Peak..	Nev..	2,790,000	1	.....	840,600	Dec. 1, '14	.02	Tightner.....	Cal..	100	100	160,000	160,000	Jan. 3, '14	.....
Platteville, I. z.	Wis..	600	60	.....	179,500	June 15, '07	10.00	Tomboy, g. s.	Colo..	310,000	5	74,400	3,861,555	June 30, '16	.24
Plumas Eureka, g. ..	Cal..	150,625	10	.....	2,831,294	Apr. 9, '01	.06	Tom Reed, g.	Ariz..	909,555	1	2,655,394	2,655,394	Sept. 5, '16	.01
Plymouth Con.	Cal..	240,000	5	116,500	289,300	Aug. 10, '16	.24	Ton-Heimont, g.	Nev..	1,600,000	1	750,000	8,393,027	Oct. 2, '16	.12%
Portland, g. s.	Colo..	3,000,000	1	360,000	10,537,090	Oct. 20, '16	.03	Ton-Extension, g. s.	Nev..	1,272,301	1	604,580	1,591,776	Oct. 1, '16	.15
Prince Con. s. l.	Nev..	1,000,000	2	200,000	325,000	Oct. 5, '16	.02%	Tonopah, g. s.	Nev..	1,000,000	1	600,000	13,600,000	Oct. 21, '16	.15
Quartette, g. s.	Nev..	100,000	10	.....	375,000	July 31, '07	.20	Tonopah Midway, g.	Nev..	1,000,000	1	250,000	Jan. 1, '07	.05%	
Quicksilver, pf.	Cal..	43,000	100	.....	1,931,411	Apr. 8, '03	.50	Tremm.....	Cal..	200,000	2.50	231,000	Apr. 28, '15	.02	
Quilp, g.	Wash.	1,500,000	1	.....	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich..	100,000	25	1,100,000	Oct. 30, '12	3.00	
Quincy, c.	Mich..	110,000	25	1,210,000	22,987,500	Sept. 25, '16	4.00	Tuolumne, c.	Mont..	800,000	1	496,525	Apr. 15, '13	.10	
Ray Con. c.	Ariz..	1,671,279	10	2,743,748	7,322,875	Sept. 30, '16	.75	Union Sam Con. s.	Utah..	600,000	1	470,000	Sept. 20, '11	.05	
Red Metal, c.	Mont..	100,000	10	.....	1,200,000	Apr. 1, '07	4.00	Uncle Basin, z.	Ariz..	835,350	1	167,070	Nov. 16, '11	.05	
Red Top, g.	Nev..	1,000,000	1	.....	129,176	Nov. 25, '07	.01	United, c. pf.	Mont..	50,000	100	1,600,000	Apr. 15, '07	3.00	
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont..	450,000	100	6,125,000	Aug. 6, '07	1.75	
Richmond, g. s. l.	Nev..	54,000	1	.....	4,459,797	Dec. 23, '00	.01	United, z. l. pf.	Mo..	19,556	25	211,527	Oct. 15, '07	.60	
Rocco Home, I. z.	Nev..	300,000	1	.....	152,500	Dec. 22, '06	.02	United Copper, c. s.	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01	
Rochester Id. & L.	Mo..	4,900	100	.....	190,846	July 1, '12	.60	United (Crip. Ck.)	Colo..	4,009,100	1	440,435	Jan. 1, '10	.04	
Round Mountain, g.	Nev..	889,018	1	.....	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz..	23,000	100	1,173,000	3,749,000	Sept. 30, '16	18.00
Sacramento, g.	Utah..	1,000,000	5	.....	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S. ..	50,000	100	11,000,000	Sept. 23, '10	5.00	
St. Joseph, I. z.	Mo..	1,409,468	10	1,761,830	12,029,729	Sept. 10, '16	.75	United Verde, c.	Ariz..	300,000	10	3,150,000	38,947,000	Oct. 1, '16	.75
St. Mary's M. L.	Mich..	160,000	25	2,720,000	7,520,000	Oct. 14, '16	2.00	United Verde Ext.	Ariz..	1,000,000	50	600,000	600,000	Aug. 1, '16	.60
Schenbr-Wal'n, z. l.	Mo..	10,000	10	.....	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo..	59,108	100	414,078	Oct. 9, '03	1.00	
Scratch Gravel.	Cal..	1,000,000	1	20,000	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo..	39,458	100	1,775,936	Oct. 1, '07	1.50	
Seven Tro. Con. g. s.	Nev..	1,443,077	1	36,076	262,532	Apr. 1, '16	.02%	U. S. S. R. & M. com.	USMx	351,116	50	1,316,681	7,941,860	Oct. 15, '16	1.00
Shannon, c.	Ariz..	300,000	10	.....	750,000	Jan. 10, '13	.50	U. S. S. R. & M. pf.	USMx	486,350	50	1,718,224	18,513,922	Oct. 15, '16	.87%
Shattuck-Ariz.	Ariz..	350,000	10	1,663,300	4,637,000	Oct. 30, '16	1.25	Utah, c.	Utah..	1,624,490	10	13,808,165	46,530,062	Sept. 30, '16	3.00
Silver Hill, g. s.	Nev..	108,000	1	.....	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah..	528,200	6	396,154	462,179	Sept. 30, '16	.25
*Silver King Coal'n	Utah..	1,250,000	6	750,000	14,334,985	Oct. 1, '16	.16	Utah Con. c.	Utah..	300,000	6	675,000	9,825,000	Sept. 26, '16	.75
Silver King Con.	Utah..	637,682	1	191,274	1,006,131	Oct. 22, '16	.10	Utah M. & T. l.	Utah..	750,000	1	325,000	1,285,492	Aug. 15, '16	.60
Silver Mines Expl..	N. Y. ..	10,000	100	.....	250,000	June 16, '10	2.00	Utah-Missouri, z.	Mo..	10,000	1	10,000	May 23, '16	1.00	
Sloux Cons. I. z. c.	Utah..	745,389	1	.....	872,106	July 20, '11	.04	Victoria, g. s. l.	Utah..	250,000	1	207,600	Apr. 25, '16	.04	
Skiddo, g.	Cal..	1,000,000	6	.....	365,000	Oct. 2, '14	.01	Vindicator Con, g.	Colo..	1,600,000	1	225,000	3,457,500	Oct. 25, '16	.06
Smuggler, s. l. z.	Colo..	.....	1	.....	2,235,500	Nov. 22, '06	.03	Wasp No. 2, g.	S. D. ..	600,000	1	100,000	619,466	May 15, '16	.02%
Snowstorm, c.	Idaho	1,600,000	1	.....	1,169,610	Oct. 10, '13	.01%	Wellington, I. z.	Colo..	10,000,000	1	600,000	1,250,000	Oct. 1, '16	.02
Socorro, g.	N. M. ..	377,342	5	66,599	196,070	Sept. 1, '16	.06	West End Con.	Nev..	1,788,486	1	89,424	625,969	Oct. 24, '16	.06
South Eureka, g.	Cal..	299,981	1	167,920	1,409,754	Aug. 15, '16	.07	West Hill.	Wis..	20,000	1	8,000	40,000	June 29, '16	.20
South Hecla.	Ida..	600,000	1	39,450	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal..	200,000	10	60,000	190,000	Aug. 25, '16	.10
So. Swansea, g. s. l.	Utah..	300,000	1	.....	287,600	Apr. 3, '04	.01%	Wilbert.....	Ida..	1,000,000	1	30,000	40,000	Aug. 15, '16	.01
Spearfish, g.	S. D. ..	1,600,000	1	.....	165,500	Jan. 7, '05	.01	Wolverine, c.	Mich..	60,000	25	720,500	9,120,000	Oct. 2, '16	6.00
Standard Con. g. s.	Cal..	178,394	10	.....	6,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c.	Ariz..	118,574	16	53,403	Dec. 15, '15	.25	
Standard, c.	Ariz..	425,000	1	.....	69,600	Sept. 8, '05	.60%	Work, g.	Colo..	1,600,000	1	1,697,686	Apr. 11, '12	.02	
Stewart, I. z.	Idaho.	1,238,362	1	.....	2,043,297	Dec. 31, '05	.06	Yak.	Colo..	1,000,000	1	190,000	2,197,686	Sept. 30, '16	.07
Stratton's Crip. Ck.	Colo..	2,000,000	1	.....	300,000	Sept. 6, '08	.02%	Yankee Con. g. s. l.	Utah..	1,000,000	1	167,500	Feb. 1, '13	.01	
Stratton's Ind.	Colo..	1,000,000	5	.....	6,028,568	Dec. 23, '06	.012	Yellow Aster, g.	Cal..	100,000	10	25,000	1,280,785	Oct. 6, '16	.05
Str'n's Ind. (new)g.	Colo..	1,000,000	30	160,000	691,250	Jan. 31, '16	.15	Yellow Pine, z. l. s.	Nev..	1,000,000	1	800,000	1,693,008	Oct. 25, '16	.10
Strong, g.	Colo..	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal..	24,000	10	102,553	July 15, '14	.10	

Corrected to November 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,875,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest		
						Date	Amt.								Date	Amt.		Date	Amt.
Ajuchitlan.....	Mex...	50,000	\$ 6	\$.....	\$237,600	July 1, '13	\$0.25	Las Caballitas.....	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00		
Amistad y Concordia g.	Mex...	9,600	60	.....	429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C. ..	120,000	25	.....	1,527,320	Dec. 15, '16	\$0.24
Amparo, s. g.	Mex...	2,000,000	1	300,000	2,232,176	Aug. 10, '16	.06	Lucky Tiger.....	Mex...	715,337	10	386,281	3,649,673	Oct. 20, '16	.10		
Bartolo de Medina Mill	Mex...	2,000	25	.....	103,591	Aug. 1, '07	.60	McKinley-Darragh-Sav.	Ont..	2,247,692	1	269,724	4,677,492	Oct. 2, '16	.03	
Batopilas, a.	Mex...	446,268	20	.....	55,870	Dec. 31, '07	.12%	Mexican, I. pf.	Mex...	12,500	100	.....	1,018,750	May 1, '12	3.50
Beaver Con., s.	Ont..	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex...	240,000	10	.....	660,000	Mar. 10, '08	.25	
Boleo, g.	Mex...	120,000	20	.....	721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex...	180,000	5	.....	4,475,500	June 26, '14	.96
British Columbia, c.	B. C. ..	691,709	5	.....	616,399	Jan. 5, '13	.15	Minas Pedrazini.....	Mex...	1,000,000	1	.....	497,600	Jan. 23, '11	.06%
Buena Tierra.	Mex...	330,000	6	.....	169,350	Jan. 30, '16	.24	Mines Co. of Am.	Mex...	900,000	10	.....	4,958,600	July 25, '13	12%
Buffalo, Ont.	Ont..	1,000,000	1	.....	2,787,000	July 1, '14	.05	Mining Corp. of Canada.	Can..	2,075,000	1	570,625	1,348,750	Sept. 30, '16	.16	
Canadian Goldfields..	Can..	600,000	0.10	.....	237,099	July 15, '14	.01%	Montezuma, I. pf.	Mex...	5,000	100	.....	402,500	Nov. 15, '16	3.50
Cananea Central, c.	Mex...	600,000	10	.....	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex...	500,000	1	.....	100,000	July 20, '09	.04
Cariboo-Cobalt.....	Ont..	1,000,000	1	.....	295,000	Sept. 1, '15	.09	Mother Lode.....	B. C. ..	1,250,000	1	137,500	137,500	Jan. 3, '16	.11	
Cariboo-McKinney, g.	B. C. ..	1,250,000	1	.....	58,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex...	100,300	100	.....	3,190,000	Oct. 11, '09	\$23
City of Cobalt.....	Ont..	500,000	1	.....	138,375	May 15, '09	.01	N. Y. & Hond. Rosario.	C. A. ..	200,000	10	300,000	4,050,000	Oct. 28, '16	.50	
Cobalt Central, s.	Ont..	4,761,500	1	.....	192,645	Aug. 24, '09	.01	Nipissing, s.	Ont..	1,200,000	6	1,500,000	14,940,000	Oct. 28, '16	.50	
Cobalt Lake, s.	Ont..	3,000,000	1	.....	465,000	May 22, '14	.07%	North Star, s. l.	C. A. ..	1,300,000	1	.....	633,000	Feb. 1, '10	.02
Cobalt Silver Queen ..	Ont..	1,500,000	1	.....	315,000	Dec. 1, '08	.03	Paloma, g.	Mex...	3,000	.....	.....	99,600	Dec. 1, '10	5.00
Cobalt Townsite, s.	Ont..	199,282	5	.....	1,042,259	Aug. 20, '14	.24	Panuco.....	Mex...	10,000	.....	.....	7,465,000	Nov. 4, '09	5.00
Conlagas, s.	Ont..	800,000	5	400,000	8,240,000	Aug. 5, '16	.25	Penoles, s. g.	Mex...	120,000	20	.....	6,451,687	Sept. 30, '13	1.25	
Con. Mg. & Sm., g. s. c.	B. C. ..	58,050	100	313,204	2,951,341	Oct. 1, '16	2.50	Peregrina, pf.	Mex...	10,000	100	.....	328,556	Sept. 1, '10	3.50	
Crown Reserve, s.	Ont..	1,999,857	1	.....	6,102,408	July 15, '15	.03	Peterson Lake.....	Ont..	2,401,820	1	126,096	382,319	Oct. 2, '16	.01%	
Dolores.....	Mex...	400,000	5	.....	1,374,865	July 24, '11	.22%	Pingulco, pf.	Mex...	20,000	100	.....	780,000	Apr. 15, '13	3.00
Dome Mines, s.	Ont..	400,000	10	500,000	1,900,000	Sept. 1, '16	.50	Porcupine Crown.....	Ont..	2,000,000	1	240,000	660,000	Oct. 2, '16	.03		
Do Estrellas, (El Oro)	Mex...	300,000	0.50	.....	5,400,000	Sept. 1, '16	.50	Proctor Star, s. l.	Mex...	10,000	100	.....	9,800,000	Apr. 1, '16	1.00
El Oro, g.	Mex...	3,500,000	1	.....	210,000	Apr. 30, '14	.01	Rambler-Cobloo.....	Mex...	17,600	100	.....	490,000	Apr. 1, '16	.03
El Oro, g. s.	Mex...	1,147,500	1	.....	9,136,442	July 11, '13	.24	Rea Mines, Leasing ..	Ont..	200,000	1	.....	12,750	Feb. 20, '15	.01%
El Rayo, g. s.	Mex...	260,020	2	.....	140,410	Apr. 24, '11	.15	Right of Way.....	Ont..	1,685,500	1	25,251	569,090	Sept. 15, '16	.03%	
El Triunfo, c.	Mex...	2,000,000	1	.....	20,000	Aug. 28, '11	.01	Rio Plata.....	Mex...	374,518	5	.....	345,744	Feb. 1, '13	.05
Esperanza, s. g.	Mex...	450,000	5	.....	12,521,260	Dec. 31, '15	.10	San Francisco Mill ..	Mex...	6,000	25	.....	445,086	Oct. 15, '08	1.00
Granby Con., c. g. s. ..	B. C. ..	149,985	100	749,926	6,350,311	Aug. 1, '16	2.00	San Rafael.....	Mex...	2,400	25	.....	6,798,260	Jan. 11, '12	2.00	
Oreene-Cananea, c.	Mex...	474,411	100	2,431,045	5,666,850	Aug. 28, '16	2.00	San Toy, s. l.	Mex...	6,000,000	1.00	.....	540,000	July 24, '13	.01	
Oreene Con., c.	Mex...	1,000,000	10	3,500,000	13,544,000	Oct. 25, '16	.07%	Santa Gertrudis, Hdgo.	Mex...	1,500,000	6	364,500	2,819,772	June 16, '16	.24		
Oreene Gold-Silver, pf.	Mex...	300,000	10	.....	194,871	Mar. 27, '16	.40	Sta. Gertr'y Guadalupe, g. s.	Mex...	60,000	100	.....	3,960,000	Mar. 27, '09	1.00
Quanaajuto Con., s.	Mex...	540,000	5	.....	600,000	Oct. 8, '06	.07%	Sta. Marie del Paz.....	Mex...	9,800	12%	.....	3,606,000	Jan. 7, '13	2.50
Quanaajuto Dev., pf.	Mex...	10,000	100	.....	274,356	Jan. 1, '11	3.00	Seneca-Superior.....	Ont..	478,844	1	881,982	1,783,194	Oct. 14, '16	20	
Guangetelm Explorat.,	Mex...	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.85	Soledad, s. l.	Mex...	960	20	.....	4,439,840	Oct. 17, '11	5.00	
Hallebury, s.	Ont..	80,000	1	.....	50,000	Apr. 5, '11	.50	Sorpresa, g. s.	Mex...	19,200	20	.....	3,979,240	Jan. 5, '11	34.00
Hallebury, s.	B. C. ..	120,000	10	180,000	2,003,520	Sept. 30, '16	.50	Standard, s. l.	B. C. ..	2,000,000	1	500,000	2,300,000	Oct. 10, '16	.02%		
Hinds Con., g. s. l.	Mex...	5,000,000	1	.....	88,000	Feb. 27, '05	.02	Temiscamg' & Hud. Bay	Ont..	7,761	1	.....	1,940,250	Nov. 10, '14	3.00
Hollinger.....	Ont..	4,000,000	1	1,680,000	5,850,000	Oct. 2, '16	.06	Temiskaming, s.	Ont..	2,500,000	1	150,000	1,699,156	Oct. 22, '16	.03		
Juanico, c.	Mex...	100,000	10	.....	100,000	Mar. 27, '11	.40	Thornton, C.	Ont..	1,000,000	1	.....	1,655,000	Jan. 1, '16	1.50
Kerr Lake, s.	Ont..	600,000	5	450,000	5,570,000	Sept. 15, '16	.25	Tough-Oaks.....	Ont..	531,000	1	.....	332,150	Jan. 3, '16	.12	
La Blanca.....	Mex...	140,000	20	.....	2,775,700	Mar. 31, '13	.90	Trotheway, s.	Ont..	1,000,000	1	.....	1,061,958	July 15, '14	.03%
La Republica, s.	Mex...	400,000	5	.....	110,000	Aug. 15, '11	.05	Wetlaufer-Lorrain, s.	Ont..	1,416,690	1	.....	656,356	Oct. 20, '13	.05
La Rose Con., s.	Ont..	1,498,627	5	299,724	5,856,844	Oct. 20, '16	.05	Yukon, g.	Y. T. ..	3,500,000	6	787,500	8,370,610	Sept. 30, '17	.07%		

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December 2, 1916.

Aspen, Over the Range in Pitkin County, Colorado

W. A. ROOT.

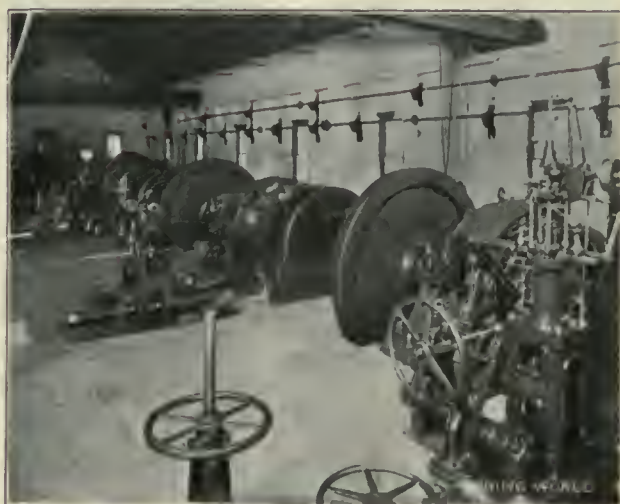
The days of the excitement and advent into the Black Hills of South Dakota and to Leadville, during 1876, and from that time on for several years, will long be remembered, and in fact, are a portion of the historical records of mining districts and mine development. About the time of the wild excitement over mineral discoveries in the Black Hills there was much seeking for gold by sluicing and other primitive methods in California gulch, the waters of which, a tributary to those of the Arkansas river, whose real source

wonderful history of that world renowned camp—Leadville—of the naming of it, nor of the enormous fortunes realized and afterward scattered broadcast over the land. The story of Leadville's remarkable days is now before the public in a neat volume by C. C. Davis, of Los Angeles, for many years a resident of Leadville.

"On to Colorado," "On to Pike's Peak or Bust," were painted or draped on the bull-whacking trains crossing the plains in 1859, and into the 60s, and so in



SMUGGLER AND MOLLIE GIBSON MINES.



INTERIOR ROARING FORK ELECTRIC PLANT, ASPEN, COLO.

were only a few miles away and near to the summit of the Continental divide.

The finding of boulders largely composed of carbonate of lead and silver while working the dirt of the bed and channel of California gulch caused the prospecting for ledges, leads or bodies of ores on the hillsides above the gulch. Among the first discoveries were those of the Galligher Bros., and the sale of their locations for something above \$100,000 was soon heralded abroad, causing the influx into the district of thousands, embracing all classes, many of whom were prospectors and miners from almost every known mining district.

It is not my purpose to enter into detail of the

the days of Leadville in 1879, upon hundreds of freight wagons and other vehicles could be seen the nearness of the old inscription, "On to Gunnison," "Gunnison or Bust," and so during that year every canyon and gulch on the eastern slope of the Rocky mountains from the headwaters of Arkansas down to the mining camp of Salida, were filled with prospectors and seekers after mineral wealth; and the same of the western slope.

The peculiar character of the earth's formation at Leadville was seemingly unknown, and caused much study of Hayden's Atlas, so much so that old-time gold seekers in granite formation left the gold-bearing sections to hunt for that of a salurian, namely, when the

ores, silver and lead-bearing, would be found in deposits forming a contact between lime, porphyry or quartzite.

The prospectors who made their way into the Roaring Fork district and discovered the Smuggler, Mollie Gibson and Della S. upon one side of the Roaring Fork river, and the Spar, Durant, Emma, Vallejo, Broadway and others on Aspen mountain, came mostly from Buena Vista over Cotton Wood pass, through Union and Taylor parks, over Elk Mountain spur, and then down Castle creek. A few did get over Independence pass at head of Lake creek above Twin lakes. In February and March, 1880, nearly every claim in the district was bonded for goodly sums to eastern men of means, and from the money expended by them and others, the big mines of the district were developed. The years from 1887 till 1892 were prolific for nearly every one who came to Aspen seeking fortunes,



HOPE LEASING CO.'S TUNNEL, ASPEN, COLO.

and undoubtedly, only for the demonitization of silver, Aspen would be a city of many thousands today. The mining men who have remained at Aspen are possessed of much abiding faith and contend that with proper underground developments millions of silver, lead and zinc values can be mined from the interior of Aspen mountains.

The Smuggler Leasing Co.

This company, with David M. Hyman of New York, president; Edwin M. Rogers of New York, vice-president and consulting engineer, and C. E. Anderson, superintendent, was organized in 1911, and at once took over the Smuggler and Durant mines, the latter on Aspen mountain; afterward leasing the Mollie Gibson, Della S., Bushwhacker, Mineral Farm, Park Regent and Argenta. The identity of the Mollie Gibson is absorbed with that of the Smuggler. The greater portion of the regular production comes from the shaft of the Della S., amounting to about 400 tons every 24 hours, while that of the few leasers is hoisted from the Smuggler. The values are in lead and silver, the former 78% and a few ounces of silver. The greatest depth of the workings are on the 18th level at 1600 ft. below the surface, with greater portion of the ore

mined on the 15th, and exploitation constantly below the 13th level to the 18th. On the 15th level are five Aldrich Queen duplex electric pumps, each of 200 hp., and on the 18th, two Aldrich electric pumps, and with the other pumps about the mine, together raise 3000 gpm., causing the drainage of a very large area. All electric power is furnished by the Roaring Fork Electric Light & Power Co.

The Wet Concentrating Plant.

The Houghton and Harding mill on the Roaring fork, in close proximity to the Smuggler mine, is equipped with a Dodge crusher, three sets of rolls, 10 sets of 4-compartment jigs of the crank arm type, originally manufactured in Germany. The motion is an accelerated one, with a quick down stroke and of a slow return, with force from the plunger. There are 7 Wilfleys and 6 Frues on primary feed, and 8 Frues and 12 Wilfleys on regrinding the tailings, making 19 Wilfleys and 14 Frues in the mill. About 90% of the 400 tons of ores treated come from the Smuggler, and the other 10% from leasers on the Durant. All machinery and electric lights are run by power from the Roaring Fork Electric Light & Power Co.

The Durant Compressor.

At the base of mountain above Aspen is situated the 80-hp. Norwalk compressor and 80-hp. boiler with a Leyner tool sharpener. At the shaft of the Durant, several hundred feet up the mountain, is a 130-hp. hoist and a 65-hp. motor. The shaft is double compartment, with the double and single deck cars working tandem. The ore is sent down to cars by aerial tram, and then hauled to the mill. The compressor furnishes air for 10 miles of underground workings in Aspen mountains, and also for the air drills in use. Chas. O. Kane is in charge.

The Roaring Fork Electric Light & Power Co.

The plant of this company is located west of the town line and is of much importance, furnishing water, light and power for everything in and about Aspen—the mountain, the mines and the mill. The reservoirs are on Castle and Hunter creeks and its pipes and flumes extend for miles.

The power plant has three 400-kw. and two 200-kw. generators, each generator having in one end of shaft a Pelton-Doble tangential water wheel, and on the other end of the shaft, a heavy cast steel flywheel of 105 ins. in diameter. The generators are direct-current machines, 600-volt, operated two in series on a 600 to 1200 volt, 3 wire system; distance of transmission is 1 to 2 miles. David R. C. Brown, for nearly 20 years connected with Aspen enterprises, is president; C. F. Brown is secretary and C. E. Doolittle, manager.

Hope Mining, Milling & Leasing Co.

One of the greatest of propositions put forth in the Roaring Fork mining district, and with many good

signs of ultimate success, was the organization of the Hope Mining, Milling & Leasing Co. Its principal stockholders are residents of the Roaring Fork valley, and no salary or compensation is paid to any officer or director acting in official capacity. Besides the ownership of four full claims, several fractions and a mill site, it has secured a lease on the Little Annie and other propositions, controlling an area of 400 acres. Equipment consists of a compressor plant consisting of an 80-hp. boiler, a 4-drill air compressor, blacksmith shop and a ventilating plant, the power for which is obtained from utilizing the water flowing from the Famous tunnel. The physical condition of the property improves with the advancement of the tunnel toward the vein of the Little Annie mine, the reaching of which is the object of driving the tunnel. The tunnel known as the Famous is in about 6000 ft., and will cut the vein at about 1100 ft. further in. In



MOLLIE GIBSON'S SILVER NUGGET, WEIGHING 1840 LBS.

driving the tunnel, ore of high grade has been met with.

The Little Annie mine is expected to be the great proposition of the Hope Co., especially when the Famous tunnel reaches the vein at a point 1500 ft. below the surface. The property is located on the Castle creek fault, and its workings are in porphyry and shale on the west side of the fault, and it also crosses the fault into silurian-dolomite. On the lower levels the ore is a sulphide of lead, zinc and silver, with a considerable amount of barite. The galena is sometimes beautifully crystallized, and the silver is often found native. The first section of 250 ft. in the 2250 ft. on the dip produced more than \$7,000,000, and if the future undertakings of the present organization prove successful, the production will reach millions more in silver, lead, zinc, and probably much copper.

The officials of the company are Charles O'Kane, president; H. W. Clark, secretary, and J. B. Stitzer, treasurer.

The West Contact.

It can be surmised that two contacts exist in general formation of the Roaring Fork mining district, and that they are separated by several hundred feet

of short line. All these properties owned by and under lease to the Smuggler Leasing Co. are in the eastern contact, while the west contact takes in, the Copperopolis, Jute Smith, Ducey and Monarch claims. Passing south there are the Great Pacific, Keystone, Mayflower, Saddle Rock group, and still further south occur the Morning and Evening Star, New York and Queens Gulch group. A tunnel driven 1200 ft. along the contact from this group opens up rich bodies of ore. The objective point of this tunnel is to reach ore bodies of the Midnight and other claims. Development for a distance of 3 miles or more shows there is an east and west contact of the ore zone of the district. The values are mostly silver-lead, while part of the west contact produces considerable zinc. The Saddle Rock, Jute Smith and Copperopolis group, under management of Capt. Geo. W. Thatcher, with \$150,000 expended in development, produced ore shipments to the amount of \$500,000. He asserts from developments of the next 2 years the product will amount in value to a far greater sum.

Exports of Non-Ferrous Metals.

Exports of non-ferrous metals for 8 months ended in August were \$412,140,072 in 1916, against \$136,397,922 in 1915, and \$105,386,742 in 1914. The average rate of export in 8 months of 1916 has been four times corresponding figures of 1914, a representative year just before the war. Brass and brass manufactures were \$203,097,551 in 8 months of 1916, or eight times the figures of 1914.

Exports of copper group in 1916 have increased in value 64% over corresponding figures of 1914. Zinc and zinc manufactures exports were more than 50 times figures for 1914, and aluminum and manufactures nearly 10 times. Exports of 6 principal non-ferrous metals compare for 8 months ended August:

	1916.	1915.	1914.
Brass and manufactures...	\$203,097,551	\$ 26,602,575	\$ 4,559,204
Copper and manufactures..	148,163,887	74,344,509	89,713,158
Zinc	36,172,790	18,270,512	698,512
Lead and manufactures....	10,701,465	6,865,205	3,524,337
Nickel and manufactures...	7,817,061	7,635,651	6,249,378
Aluminum and manufactures	6,187,318	2,678,770	642,153
Total	\$412,140,072	\$136,397,922	\$105,386,742

Average export prices show considerable differences in degree of inflation. Average export price of copper for 8 months of 1916 was 26 cts., and for same periods of 1915 16 cts., and of 1914 14 cts. Prices of brass bars as averaged were 29 cts. in 1916, 17 in 1915, and 14 in 1914. Figures for nickel were 39 cts., 38 and 32 for 1916, 1915 and 1914. Lead average prices were 6.7 cts. for 1916, 4.3 cts. in 1915 and 3.9 in 1914. Average advance in prices for first 8 months of 1916 over 1914 comparison for copper, brass, nickel and lead was 72%.

By a special process of annealing, toughness and malleability may be developed to a remarkable degree in white cast iron. In this way castings are made to answer for forgings in many cases.

Sulphidizing Carbonate Tailings for Treatment by Oil Flotation

W. A. SCOTT.

The Prince Con. Mining & Smelting Co. has begun the operation of a plant at the old site of Bullionville, 2 miles west of Panaca, Nev., for the treatment of 120,000 tons of mill tailings. About 70,000 tons are deposited on the flat at Bullionville, and 50,000 tons are in Dry valley, 12 miles to the northwest. These tailings resulted from operations of mills on Pioche ores 35 to 40 years ago. These old milling points are on the edge of Meadow Valley wash, where water for mill work was easily obtained. The tailings are silicious and thoroughly oxidized. It is stated they have an average content of 8.2% lead, 11 ozs. silver and \$1.40 gold. The lead is in the form of carbonate, the silver as a chloride. The original treatment was by concentration and pan-amalgamation, and a part of them have since been re-treated by cyanidation.

The new mill, which consists of new equipment in an old building, was designed by C. F. Sherwood, metallurgical engineer, Salt Lake. It is equipped for concentration by flotation machines, with table concentration as accessory thereto. In order to make oil flotation effective on carbonate ores, a method was adopted for sulphidizing the lead carbonates with sodium sulphide, giving the mineral particle an exterior film of sulphide.

A considerable portion of the tailings at Bullionville has an overburden of material deposited by flood waters. This has to be removed by scrapers. The mineralized tailings are moved by scrapers and dumped into a hopper-bottomed bin, and thence loaded into ore cars, and hauled by a 40-hp. gasoline winding engine to a 200-ton bin at the head of the mill. It passes from this bin to a 5 by 18-ft. Denver Engineering Works tube mill, which serves to reduce the pulp's original mesh to some degree but principally to break up and polish the surfaces of the mineral particles. The tube product passes to a Dorr thickener, and thence to two mechanical agitators, and during the agitating process a solution of sulphide of sodium is drawn into and mixed with the pulp. The sulphidizing of the mineral particles requires 30 to 40 minutes. The pulp is now ready for emulsifying and flotation. It is discharged from the agitators to the boot of an elevator, and is raised and discharged into two Pachuca tanks, each 4 by 18½ ft. In these tanks the pulp and flotation oils are thoroughly mixed by air lifts, after which the mixture passes to six Callow roughing cells. This rougher product is re-treated in two Callow cleaner cells. The tailings from the roughing cells go to a Dorr classifier, the overflow from which is returned to a small Pachuca tank in which more oil is added, and the mixture re-treated by flotation. The sand from

Dorr classifier is passed over four concentrating tables of Deister Machine Co. The table middlings are returned to the head of the mill circulation; the tailings go to the waste dump and the concentrates, after being passed through a Dorr thickener, are further de-watered by an Oliver filter. The concentrates from the cleaner cells are likewise reduced as to moisture by an Oliver filter, and the cleaner cell tailings are returned to Pachuca tanks. It is expected that the mill soon will be treating 200 tons per day.

The source of power is a vertical, 3-cylinder, 150-hp. gas engine of Fairbanks-Morse make, using "tops" as fuel. The engine power is transmitted by a belt drive to a 100-kw. Westinghouse 440-volt generator, supplying power to motors throughout the mill for driving the machinery. This includes a blower for the flotation machines, an air-compressor for starting the engine and to supply air for Pachuca tanks. A water tank above the mill is filled by means of a pipe line from springs on the flat, where an electric-driven centrifugal pump is operated.

The sulphide of sodium is received in metal drums, in fused state, and is readily dissolved in water in a small tube mill. The flotation oils comprise coal tar, coal tar creosote and Pensacola Tar & Turpentine Co.'s tar oil, and Naval Stores Co. oil. Murray C. Godbe, Salt Lake, general manager of the company, has general direction of the operations. F. H. Franklin is mill superintendent, with F. S. Shepherd in charge of the flotation work.

These operations are separate and apart from the extensive mining operations of the same company at Pioche, where the Prince Con. mine is producing 300 to 400 tons of ore per day, which is shipped direct to the Salt Lake valley smelters.

Gold Output on the Rand.

The Rand gold output in October was 792,000 fine ounces, comparing as follows:

	1916.	1915.	1914.	1913.
January	787,000	714,984	651,000	789,390
February	753,000	476,000	626,000	734,122
March	796,000	753,000	686,000	790,000
April	754,000	744,000	684,000	784,000
May	777,000	763,000	720,000	794,000
June	761,000	755,000	717,000	547,000
July	761,000	770,000	732,000	655,000
August	781,000	778,000	711,000	728,000
September	771,000	776,000	702,000	706,000
October	792,000	797,000	733,000	718,000
November .....	.....	781,000	715,000	673,000
December .....	.....	781,000	672,000	776,400
Total .....	.....	8,888,984	8,580,512	9,124,296

Too often elevators are run until they break, and to this practice the troubles experienced with elevators are generally to be attributed.

Flotation of Gold and Copper Ores at Mount Morgan Mine, Queensland

W. SHELLSHEAR.*

Notes on Different Oils Used.

Eucalyptus.—Laboratory tests, backed up by large-scale ones, clearly indicated that, of the eucalyptus oils used, those of the types containing phellandrene gave better results than those of other types which did not contain phellandrene. Various tests were made on this point.

Eucalyptus distilled off local plants of the type *Eucalyptus citriodora* and oil distilled from box were tried, but results were not as good as from oils of the phellandrene type just mentioned.

Addition of Oil.—In the large-scale plant it was found that the flotation was influenced by an excess of oil almost as much as by too little oil. It was sensitive in this respect, as too much oil caused a heavy float in the residue launder. In the small-scale laboratory machine, of the ordinary spitz-box type, this was not found to be the case. Experiments on the large scale, adding oil continuously for a long period on the dry feed in the Challenge feeders, proved that the percentage of insoluble in the concentrates did not increase above normal. Experiments were also made to determine the effect of oil in varying quantities to the different agitators. The best results were obtained by adding oil partly in No. 1 and partly in either No. 2 or No. 3 boxes. Many oils were tried in the laboratory, but the writer confines himself to two.

Oleic Acid, in flotation without acid, is interesting in its action, as it floats everything; in fact, so great is its tendency to pick up sand, that a mixture of 5% oleic acid and 95% eucalyptus gave a concentrate with over 50% insoluble.

Residuum Oil.—Although the results obtained by residuum oil alone were only moderate in the laboratory and had on the large-scale plant, residuum-eucalyptus mixture proved very successful.

In order to compare results obtained in the laboratory with those from actual large-scale experiments, tests are given in each case. In connection with this matter, it is of importance to mention that the eucalyptus which is used must be of a good quality, as a poor brand of eucalyptus cannot be made to give good results by blending it with residuum oil.

A Comparative Laboratory Test of Eucalyptus and Eucalyptus-Residuum Mixtures.

Samples were crushed through 50-mesh screens in large plant, and treatment conditions were kept as nearly as possible identical in each case. Laboratory tests, therefore, indicated that an equal weight of

mixed oil gave higher recoveries in gold and copper and a reduction in cost of oil, as eucalyptus cost 20 cts. per lb. and residuum 2½ cts. per lb., but the concentrates were higher in insoluble.

The following tests were carried out on the large scale in the experimental plant, the tests averaging about 5 to 6 hours each: Mixtures of two parts eucalyptus to one part residuum, one part eucalyptus to one part residuum, up to one part eucalyptus to four parts residuum, were successfully used. For a considerable period eucalyptus and residuum mixtures only were used. The oil cost during this period was reduced from 18 to 10 cts. approximately per ton of crude ore treated. All tests were carried out under identical conditions, the feed being 15 tons per hour in each case and dilutions 3 to 1. Tests were daily runs in large-scale plant.

The tests proved that eucalyptus-residuum mixtures gave as good results as eucalyptus, with a saving in the cost of oil. Observations during the runs indicated that oil conditions were not so sensitive with the mixed oils as with eucalyptus. Results were not quite so good on the large scale with eucalyptus-residuum mixtures as in laboratory tests. This was probably due to the time factor, as the time of treatment was less in the large scale plant. This also may account for the fact that the silica in the concentrate was lower in large-scale tests.

The following are assays of each flotation box using a mixture of one part eucalyptus to three parts residuum:

	Gold. dwt.	Copper. %	Silica. %
No. 1 box concentrate.....	39.01	16.08	7.91
No. 2 box concentrate.....	33.47	14.72	10.56
No. 3 box concentrate.....	35.92	15.72	11.40
No. 4 box concentrate.....	32.66	15.64	13.72
No. 5 box concentrate.....	13.38	6.07	32.60
No. 6 box concentrate.....	6.19	2.08	69.56

No. 6 box was returned. Sand floated in Nos. 5 and 6 boxes.

Method Adopted in Large-Scale Concentration Plant.

Although in some cases very little extra gold was recovered by vanning and flotation tests as compared with straight flotation tests, in most cases the extra recovery obtained was appreciable, and this fact was really the main one in considering the erection of tables before flotation in the large treatment plant.

Other advantages were:

(a) Recovery of a large proportion of coarse iron concentrates, which, when mixed with finely ground flotation concentrates, would give a product easy to handle.

(b) Possibilities of treating smelting ore in the concentration plant.

The method adopted for this plant was, therefore,

*Excerpts from paper read before the Australian Institute of Mining Engineers; other excerpts were published, this journal, Oct. 28, 1916, pages 741, 742, 743.

briefly this: Primary crushing to about 40-mesh and tabling. Re-crushing table rejects to, say, 80 or 120-mesh and treating them by flotation.

Smelting Ore.

Tests showed that this also required very fine crushing to get good recoveries. As no work was done with the large-scale experimental plant on this class of ore, the writer confined himself briefly to some laboratory tests, comparative tests on dish vanning and flotation, and straight flotation on smelting ore. Crude ore sample assayed 9.37 dwt. gold, 3.42% copper, 19% iron, 55.34% silica.

The tests show the advantage of combined treatment. The high percentage of iron in the residue should be noted. The brief summary of results which were obtained by the experimental plant when worked on the large scale may be of interest. Results for monthly period ending October 19, 1913, were:

Crude ore milled—tons daily, 83.
Breaker—average rate, 12 tons per hour.
Ball mills—average rate, 0.98 tons per hour per mill.
Flotation plant—average rate, 17.3 tons of feed per hour.

	Gold, dwt.	Copper, %
Crude assayed	6.01	2.10
Concentrate	26.16	10.66
Residue	2.50	0.48
Actual recoveries	68.58%	80.00

The following figures show the actual costs of complete treatment of the ore during the period including trucking from the shaft-bins to the mill and delivery of the concentrates to the smelting works:

	s.	d.
Haulage	8.94	
Breaking	6.86	
Milling	2	2.88
Flotation	1	5.18
Residue .....		.13
Handling concentrate		3.83
Sundries .....		.27
	5	4.09 per ton

Flotation costs were divided up as follows:

	d.
Supervision	0.9
Wages operating	1.82
Power	1.46
Stores, general	0.10
Oil (eucalyptus and residuum).....	4.98
Maintenance	2.85
Plant and general maintenance.....	0.62
Sampling and assaying.....	4.45
	1 5.18

Foreign Copper Visible Supply.

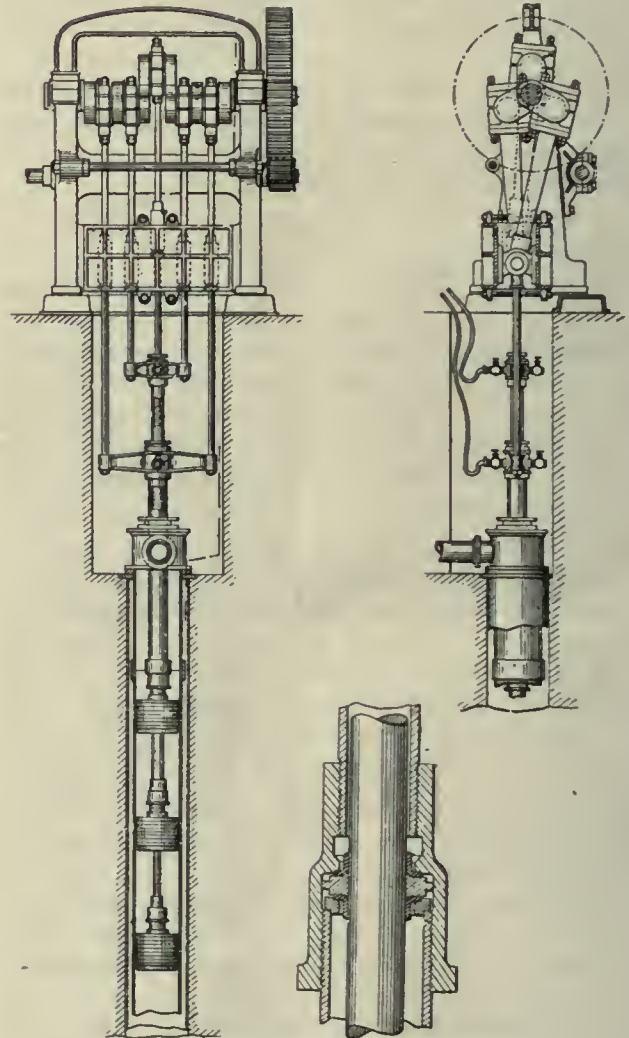
Copper visible supply in England, France and afloat thereto decreased 491 tons from Nov. 1 to Nov. 15, being 11,165 tons on latter date. Recent figures of visible supply compare as follows:

	1916.	1915.	1914.	1913.	1912.	1911.
Jan. 1.....	20,064	30,309	21,034	40,380	57,283	83,700
Feb. 1.....	17,646	30,002	16,865	38,228	55,570	83,196
Mar. 1.....	16,734	29,252	18,559	36,176	51,507	82,387
Apr. 1.....	12,201	23,883	17,923	32,291	50,175	82,267
May 1.....	16,046	26,314	20,360	30,467	49,771	78,069
June 1.....	15,310	28,917	24,352	29,634	44,618	72,613
July 1.....	15,376	32,868	25,698	28,172	41,623	70,172
Aug. 1.....	13,188	35,063	26,739	28,374	45,026	68,025
Sept. 1.....	13,062	34,064	27,932	26,536	45,666	66,914
Oct. 2.....	11,919	28,933	29,671	22,583	44,238	67,340
Nov. 1.....	11,656	24,835	31,443	21,380	43,330	61,836
Dec. 1.....		20,895	30,626	21,514	40,746	58,680

Efficiency engineering is the outgrowth of scientific management.

A Deep-Well Pump.

A high volumetric efficiency can be obtained in deep-well pumping with a triple-acting power pump. The three pistons, operated by cranks set 120° apart, give a powerful and nearly uniform thrust to the water column. The pump here illustrated, after the designs of a Massachusetts inventor, William B. Hewitt, works upon this principle, and is especially constructed to prevent grinding action of sand or grit carried in the water, leakage of water past the buckets.



TRIPLE-ACTING PUMP FOR DEEP WELLS.

loss of vacuum between the buckets, and provides ready means of lubricating the packing rings between the several plungers. As will be seen, the plungers operate one within another, the inner two plungers being each held away from the next outer one by a suitable packing ring. The space above this ring is filled with lubricant, which is injected through flexible tubes as shown. The special packing ring mentioned is shown in the small detail drawing and effectually prevents the passage of liquid downward from the space between the plunger into the similar space next below.

Daily Sampling in Square-Set Mining, Arizona

F. B. HANCHETT.

Too often the metallic contents of ore shipped from the mine to the mill or smelter is far below what it is thought to be by the management, because of inadequate mine sampling. Like some oldtimer who is sure he can make the tunnels meet without the use of a transit, the mine foreman or shift boss thinks, from the appearance of the ore, that it has a good enough content to warrant taking it out for shipment. That may be right in some cases, but in many it is not, and the content of the rock should be known without question before it is mined for shipment.

This requires such a system as the one in use in some of the copper mines of the Clifton-Morenci district. At the particular mine where it is being used, a caving system was adopted some years ago with no

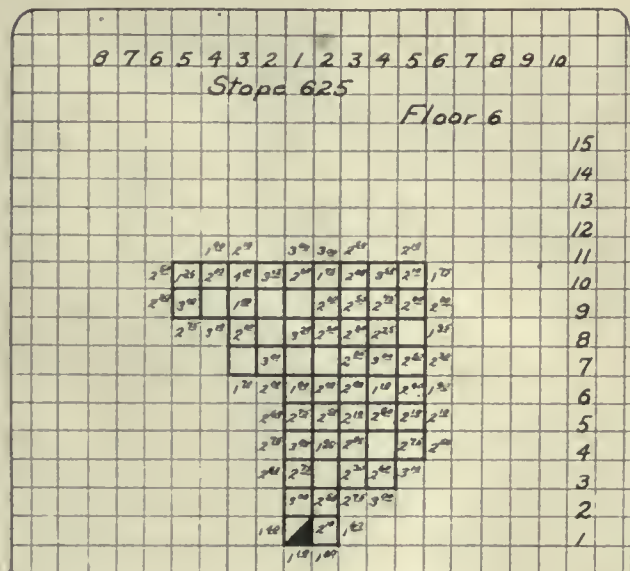


FIG. 1. A PAGE OF SAMPLER'S RECORD BOOK.

success, and the square-set system was resorted to. The ore occurs in different parts of the mine both as a sulphide and an oxide, and in one stope some silicate is taken out to permit of the correct mixture of ores for the smelter. The ores are found in altered limestone and porphyry which are often difficult to distinguish because of the degree of alteration. With the exception of the stope producing silicate, all of the formation is fairly soft, and a sample groove can be made with the ordinary geologist's pick. Ore from stopes producing sulphide is sent to the concentrator at Clifton, and the oxides are shipped direct to the smelter.¹

Two of the companies in the district follow the practice of employing one head sampler with both white and Mexican helpers. These companies, how-

¹For handling and transportation of ore see Mining and Engineering World, Sept. 4, 1915, p. 567.

ever, do not attempt to sample each set before it is taken out, but just sample in places selected by the head sampler from time to time. In the system here considered it will be noted that a sample of each set is obtained and the results posted on the timbers for the use of shift boss and foreman, before the ore of

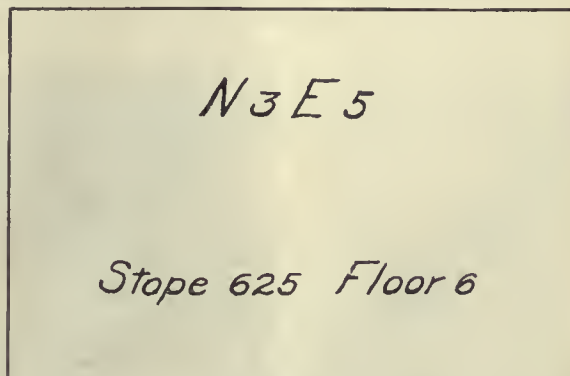


FIG. 2. SLIP TO BE PLACED IN SAMPLE SACK.

the set is mined out, thus enabling him to avoid doubt as to the contents before the ore is mined for shipment. The samplers are under the direction of the chief mining engineer and are usually recent graduates from a mining school. Each sampler is provided with a large shoulder bag in which to carry 20 to 30 sample sacks, an ordinary geologists's pick, a record book and small block of paper. On an average, one sampler can take 30 samples per day, there being usually three samplers in the mine. The best possible

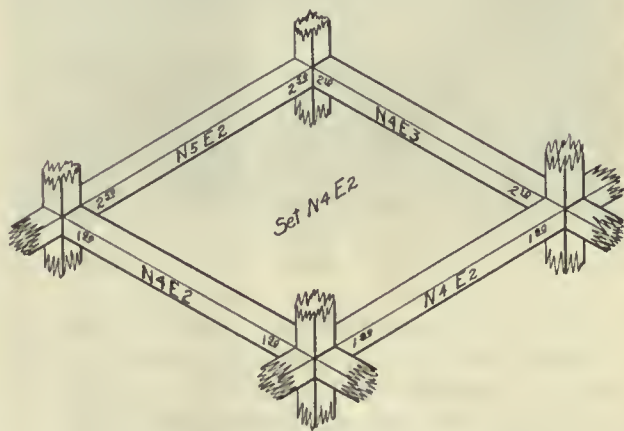


FIG. 3. SHOWING METHOD OF POSTING RESULTS ON TIMBERS.

groove sample, with a geologist's pick, is taken according to the sampler's opinion, while with the other companies the head sampler notes the place and position of the groove for the sampler and the samples are taken with a mall and hammer.

In order to make it possible to get a sample of the

set before it is mined, the sample is taken from any face exposed to sets already taken out. For example, a sample of set N3E5 in Fig. 1 could be taken from the face exposed to set N4E5 or N3E4 both of which have been mined out. For the purpose of recording and locating the position of samples, the following system is used, as noted, in the recording book (Fig. 1). Each stope is first arbitrarily numbered. Each floor is then numbered, beginning with "floor 1" at the tunnel level, from which the raise to the stope is started, and each floor above is numbered successively. That noted in the illustration of the record book is six floors or sets above the level from which it, or the



SURFACE WORKINGS OF ARIZONA COPPER CO.

raise leading to it, was started. Beginning with the set which was part of the raise as an origin co-ordinates are numbered north, east, south and west, each co-ordinate being a set. In this way each set is designated as being so many sets north or south and east or west from the original set. In going up or down to the next floor, the set directly below or above the one in question would be numbered with the same co-ordinates; the only difference being in the floor number. The sampler after having taken his sample places a slip of paper in the sack with the stope, floor and set number on it as shown in Fig. 2. The samples are then thrown down the raises and taken to the

laboratory for assaying. The sacks are usually picked up by the mule-men or trammers on the level and carried to the mouth of the tunnel, where they are again picked up and taken to the laboratory. The assays of these samples are made by the usual KCn volumetric method. As soon as results are obtained they are posted on a sheet and designated by the set, floor and stope number. Each time the sampler comes to surface he posts these results in his record book in red ink. The assay is posted in the record book in the square representing the set from which it was taken. On returning underground these results are posted on the cap timber with blue timber crane, as also is the set number or co-ordinates. When the set is taken out it is outlined with pencil as noted by the dark lines in Fig. 3.

The results are posted on the timbers in what may seem an unnatural way. Referring to Fig. 3 it will be seen that they are not posted on the face of the timber inside of the set, which it is supposed to designate, and this it will be noted would be impossible if the results are to be posted before the set is mined out, for the ore is inside the set and the sampler cannot get there to post his results. This data therefore is always placed on the outer face of the cap timber with respect to the set it designates. So as not to become confused with the results he has not posted, the sampler goes over the red-ink assay results in his record book with black ink after he has posted the sample underground.

At the end of each month the sampler posts the assays from his record book onto the mine maps.

Miami's Flotation Results.

The Miami Copper Co. has filed with the United States Circuit Court its first statement ordered in connection with the Minerals Separation litigation. The figures, given below, pertain only to that product handled by flotation:

Tons feed	102,698
Tons concentrates	1,370
Per cent copper in feed	1.119
Per cent copper in concentrates	40.987
Per cent copper in tailings	0.58

Despite the fact that it is paying the highest wages in the district and in face of higher cost of all material, Miami has been able to keep its copper costs well in hand. Unless this item shows a substantial increase during the last three months of the year, the average for 1916 will be between 9 and 9¼ cts. a pound.

Many mining companies lose thousands of dollars in wasting time and power, as well as much valuable tonnage, by being too niggardly in the matter of level bosses or under-foremen.

Of the total production of precious metals which ultimately reaches the U. S. mints, more than one-half has previously been refined at the custom smelters.

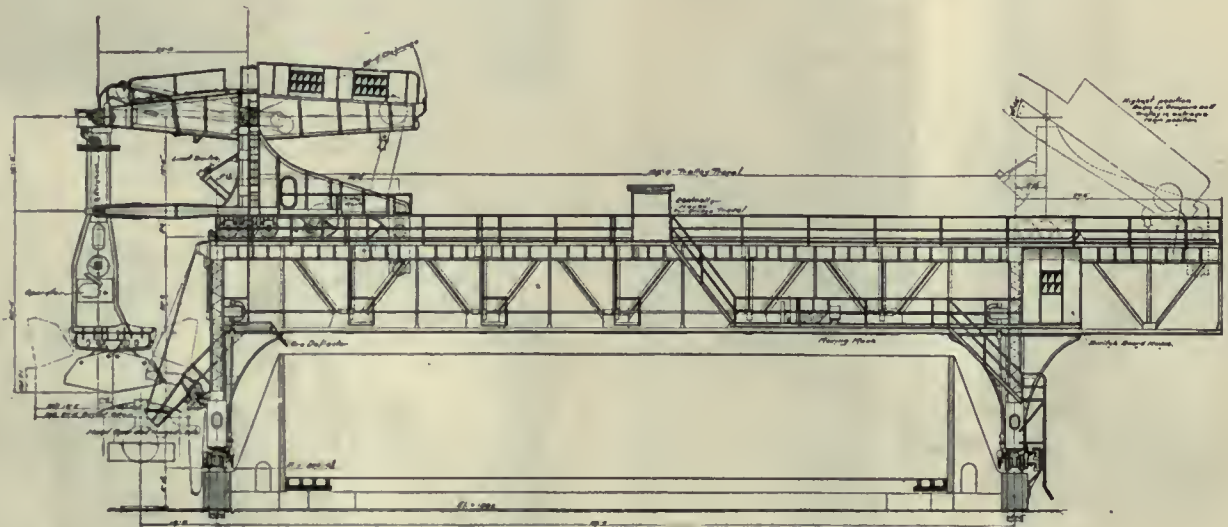
Hulett Unloader as Applied to the Handling of Copper Ore

The excavator shown was designed for the New Cornelia Copper Co., Warren, Ariz., to remove tailings from leaching vats after the copper has been taken from the ore. In the leaching process the ore is crushed to $\frac{1}{4}$ in. and put into a leaching vat by a filling machine, which distributes the crushed ore evenly in the vats. These vats are 75 ft. wide, 101 ft. long and 13 ft. deep, each holding about 4000 tons of ore. The vats, of which there are 12, are in two rows, placed six in a row with a wall between on which the excavator and filling machine travel.

After the ore has been treated for sufficient length of time, the excavator travels over the vats and re-

suspended a bucket leg, carrying at its lower end the bucket shells and operating parts. The leg brace is introduced between the trolley and the bucket leg to maintain the leg in a vertical position at all times. The bucket leg is mounted on a swivel bearing, which will allow the bucket to be rotated seven-eighths of a revolution in either direction from the central position, thus enabling the bucket to reach into the corners of the tanks for cleaning up the tailings. The entire machine is electrically operated.

The bucket shells have a capacity of 10 tons of ore. All of the movements of the bucket and trolley are controlled by one operator, who is located in the bucket



EXCAVATOR FOR REMOVING TAILINGS FROM LEACHING VATS.

moves the tailings and places them into dumping cars. The cars are then taken away by a locomotive and dumped. After the tailings are removed the vats are again filled with ore and treated.

The excavator consists of double-riveted trusses or girders supported on legs and mounted on wheels with a span of 106 ft. One end of the girders is extended to the rear of the machine, forming a cantilever approximately 27 ft. 6 ins. long; this cantilever extension being provided to enable the bucket to reach all parts of the leaching vats.

The trolley carrying the walking beam and bucket leg is designed to travel on rails secured to the top of the main girders. This trolley is similar to those used on the Hulett ore unloaders used for unloading ore from lake vessels, except that it is considerably shorter. The trolley is provided with a moving mechanism, consisting of a rack and pinion, the rack being secured to the main girders of the machine and the pinion on the trolley framework. The trolley will support a walking beam from the outer end of which will be

leg, just over the bucket. In this position the operator is close to his work at all times.

An adjustable limiting device will be provided to prevent the excavating bucket, from damaging the matting on the bottom of the tank.

The runways are elevated 5 ft. above the tailing tracks. This is for the purpose of securing the necessary height for the transfer table, which will be used for transferring the machine from one row of tanks to the other. This elevation is necessary for the reason that the tracks for the transfer table are obliged to cross over the tailings track between the two rows of tanks, and the consequent necessity of having the transfer table tracks and the tailings tracks on the same elevation. The capacity of the machine is 500 tons per hour.

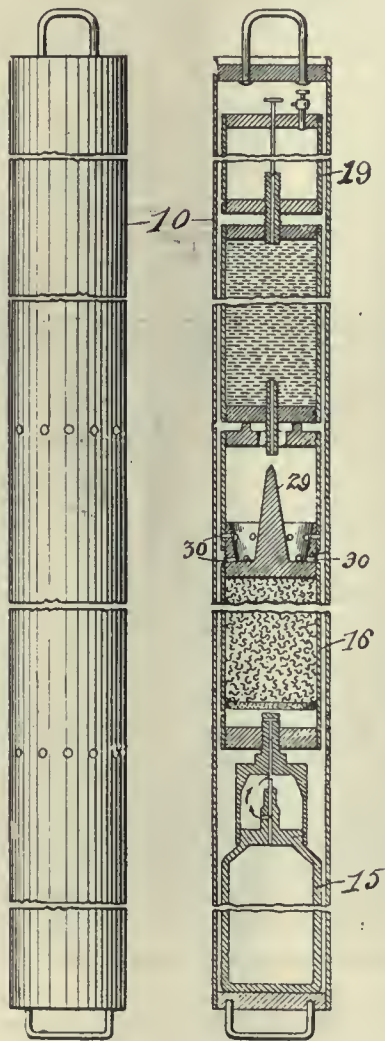
The mechanism for controlling the movements of the trolley, walking beam, bucket-opening and closing and the rotating, are located in the rear end of the walking beam, and are controlled by the operator located in the lower end of the bucket leg over the

bucket. The machinery for moving the excavator along the walls is located on the side of the girders, as shown on the cut.

The excavator and transfer table are being designed and built by the Wellman-Seaver-Morgan Co., of Cleveland, O.

Device for Cleaning Oil Wells.

The oil-bearing section of an oil well is apt to become clogged with paraffine, the thickened product of petroleum, and other substances, which prevent free flow into the well. Heat of sufficient volume, applied steadily for a considerable period of time will loosen and melt these deposits. To apply heat under



DEVICE FOR CLEANING OIL WELLS.

the above conditions, thousands of feet below the surface, is a task requiring specially constructed heater, and one used for this purpose is shown in the diagram. It is the invention of Frank A. Monroe, of Jamestown, N. Y.

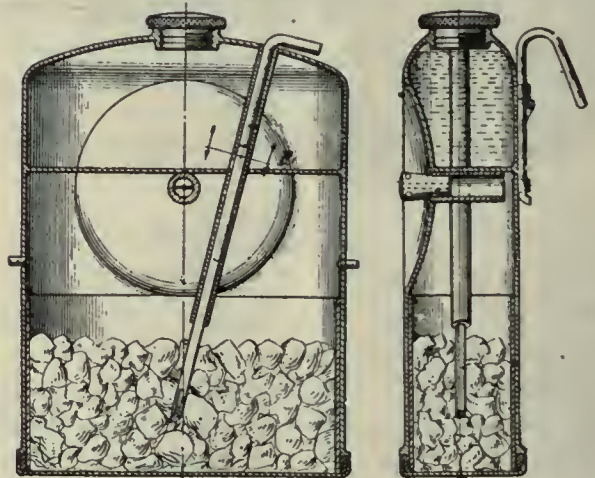
There is a long tubular casing (10) adapted to be lowered into the well, the two rows of holes shown are for the escape of the steam. Within this casing are five units, one above the other.

At the bottom is a gas receptacle (15) the burner of which is lighted before it is lowered into place. Above this is a fuel (charcoal) chamber (16). The fuel is ignited by the gas flame and kept burning by the latter during the underground operation of the heater.

The burning fuel heats the cone-shaped member (29), which projects up into an open steam chamber. Onto this cone, water is caused to drip from a chamber (18), slowly and uniformly through a needle valve. Pressure in this water chamber is kept practically constant through compressed air admitted to it from the fifth and last unit (19). As the water drips on the heated cone, steam is formed steadily, as long as the fuel lasts. This steam passes out through holes into the outer casing, circulates freely through that, and out through the two rows of holes first mentioned into the well itself.

A Compact Miner's Lamp.

This acetylene lamp is of a size convenient to fasten to the miner's cap, or it can be slipped into the pocket. The two parts telescope together, fitting tightly over a rubber gasket. The water is contained in the upper part and the carbide in the lower, the gas



COMPACT MINER'S LAMP.

chamber being between. To admit water to the carbide, simply pull up the little plunger in the inclined tube, which allows the water to pass through a slot in the wall of the tube. This lamp is the invention of Fred E. Wilkinson of Fairbury, Neb., and Geo. I. Mitchell of Chicago, Ill.

Fuse may become injured in transit, storage or handling, and it is important that fuse be stored in a cool, dry place. Fuse stored in too warm a place is liable to be affected by the melting of the waterproofing materials, and their penetration to the powder. Fuse should be warmed to a temperature from 60 to 70° F before uncoiling, because in cold weather, the waterproof material becomes brittle and will crack, unless the fuse is carefully handled.

Stream Tin Mining on Malay Peninsula. The Alameda-Success Ore Trespass Suit.

Andrew Nesbitt, San Francisco, who went to Singapore, the Straits Settlement, Malay Peninsula, several months ago to install and direct the operation of three Evans hydraulic elevators, built by Union Iron Works,



TIN PLACER MINING NORTH OF SINGAPORE.

San Francisco, has returned for a vacation. This equipment is being operated on stream tin deposits, or tin placers, situated in Simpan valley, 200 miles north of Singapore. The tin occurs as cassiterite, or tin dioxide, containing 75 to 78% metallic tin. It is mined and recovered by hydraulic methods similar to those



EVANS HYDRAULIC ELEVATORS.

employed in placer gold mining. The property mentioned is being operated by the Simpan Valley Hydraulic Mines, Ltd., the gravel yielding 1-3 lbs. of tin dioxide per cubic yard. The product is shipped to smelters in Singapore. Nesbitt, who expects to go back to the property in October, states that other similar properties are to be opened and equipped in Leange Valley, Malay Peninsula, next season.

The Idaho Supreme court has reversed the decision of Judge W. W. Woods of the district court of Shoshone county in the Alameda-Success ore trespass case, in which it was alleged that the Success Co. had entered Alameda ground and extracted ore valued at more than \$50,000, according to the findings of Referee Lawrence E. Worstell of Wallace, Ida., whom Judge Woods commissioned to take testimony and award damages. The decision was written by Chief Justice Isaac N. Sullivan, and was concurred in by Justices William Morgan and Alfred Budge.

The decision of the Supreme court, in part, follows:

The district court erred in not making a direct and positive finding as to whether the apex of the Granite vein of the Success is within exterior boundaries of the claim. We conclude that under the evidence the said Granite vein has its apex within the boundaries of the Granite claim, and that



TAIL SLUICES AND UNDERCURRENTS, MALAY, PENINSULA.

such vein crosses the east end line of the claim and its westerly end terminates against the Granite or Monzonite, and that at that point the vein is nearly vertical, and that it extends down into the earth at a slight dip to the southwest. Simply because the vein is cut off at that point by the Granite or Monzonite is no reason why it may be followed on its dip downward within vertical planes between the east end line and the point where the vein ends against the Granite.

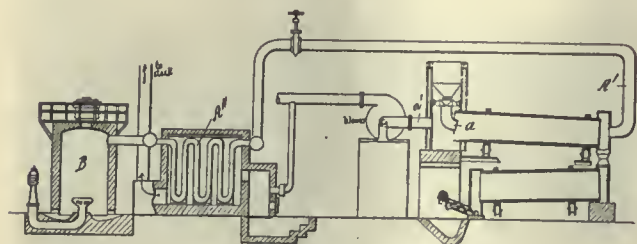
Under the provisions of section 2322, Revised Statutes, the appellants are given the right to pursue the vein, lodes and ledges throughout their entire depth, the top of the apex of which lies inside the surface lines of said claim extended downward, although such vein, lodes or ledges may so far depart from the perpendicular in their course downward as to extend outside of the vertical side lines of the surface location. The appellant has pursued the vein within the vertical planes of the end lines, and has not passed beyond them, and the evidence clearly shows the existence of the vein or lode in the Granite claim and establishes its identity and continuity from surface downward in the 1200 level.

The case is to be carried to the Supreme court of the United States, according to Charles McKinnis, managing director of the Alameda Co., in which Spokane men, including William A. Nicholls, Frederick Burbidge, general manager of the Federal Mining & Smelting Co., and F. J. Finucane, president of the Holley-Mason Hardware Co., are the controlling factors.

Removing Iron from Tin Ores.

Iron is one of the most unwelcome admixtures in tin ores, since it is reduced to the metallic state in the smelting of the ores in the calciner or furnace, or is dissolved in the tin bath and causes losses of tin owing to the formation of "hard heads"; generally speaking, as much tin is lost as there is iron contained in the ore. In order to reduce this drawback, it has been proposed to remove the iron from the ores in different ways, as by mechanical dressing, magnetic separation, and especially treating the concentrates with chemical solvents, for example hydrochloric acid. The ores contain the iron in the form of oxides or sulphides which by the roasting operation are converted into oxides soluble only with difficulty. On the other hand, lixiviation will produce compounds which are attacked only slightly even by concentrated acids, and therefore the final product obtained still contains a certain proportion of iron.

A better extraction of iron in the lixiviating of tin ores has been proposed by Günzel von Rauschenplat of



REMOVING IRON FROM TIN ORES.

Steglitz, Germany. By his treatment, the higher iron oxides of the original (or if necessary roasted) ore—in some cases after a preliminary concentration by any approved dressing process—are converted into products readily soluble in acids, for instance into Fe_3O_4 , FeO , or Fe . For the reduction of these higher oxides, any of the customary reducing agents may be employed, for instance solid coal, carbon monoxide or hydrogen, taking care to keep the temperature so low that the cassiterite is not attacked at all or but incompletely, so that there will be present a tin-oxygen compound insoluble in acids. Gaseous reducing agents are preferred, since with them it is easier to watch the reduction and to prevent contamination by ashes. For hastening the reduction, temperatures lying between 300° and 500° C. are employed, according to the nature of the ore. With these temperatures, the major part of the iron is obtained in the form of FeO , and only a small proportion in the form of metallic iron or Fe_3O_4 .

For the extraction of the iron from the reduced ore, an aqueous acid solution is used, for instance of hydrochloric acid or of sulphuric acid, the reduced product being treated in the well-known manner, say on the counter-current principle, if necessary with heating of the lyes or preferably hydrochloric acid

gas. The dry reaction product is treated with this acid at temperatures lying between 400° and 500° C. The iron is distilled in the form of volatile chloride.

The accompanying drawing shows apparatus suitable for carrying out the process. The ore, after being crushed to a fineness of from $\frac{1}{2}$ to 5 millimeters is fed at (A) into a revolving furnace, which also receives a supply of reducing gases, such as producer gas, from a producer (B) the hydrogen coke-oven gas, or blast-furnace gases, are admitted through a pipe (A') at the lower end of the revolving furnace or drum. This drum and the material are heated either externally, or as shown by preheating the reducing gases on their way to the drum, for instance in iron superheater tubes (A'').

The Manufacture of Ground Barytes.

The treatment of crude barytes to make ground barytes varies in different plants. The general practice, however, seems to be to crush to about 1 in. and log-wash and jig to remove clay, calcite, fluorite, silica, and part of the iron oxide. This cleaned material is next crushed to one-fourth to one-eighth inch at some plants, and at others ground fine and subjected to a bleaching process. The bleaching, largely to remove iron oxide, is accomplished by treating the material with sulphuric acid from 8 to 12 hours in lead-lined wooden tanks. The bleached product is washed several times and ground in burr mills or pulverizers to pass 200 to 300 mesh, and in some plants is water floated to insure a uniformly fine product, and is then dried, pulverized and packed. Much care is required not only in the bleaching, but also in the drying operation to insure a uniformly perfect color. Details of the manipulation during bleaching and of the drying machinery are not made public.

The softer grades of barytes are preferred by the grinders, as there is less wear on the machines in treating this class of material. However, in some plants, hard crystalline barytes is ground successfully. Several grades of ground barytes are on the market, varying from unbleached, coarsely-ground material to the finest grade of white-bleached and water-floated pigment. The following list includes all the companies reporting to the Geological Survey a production of ground barytes:

- Barbour Chemical Works, 707 West Coast Life building, San Francisco.
- Carolina Barytes Co., Stackhouse, N. C.
- Cherokee Chemical Co., 109 Hollingsworth street, Baltimore, Md.
- Elkhorn Chemical Co., Elsinore and Gilbert avenues, Cincinnati, Ohio.
- J. C. Fink Mineral & Manufacturing Co., 101 Barton street, St. Louis, Mo.
- Nulsen, Klein & Krausse Manufacturing Co., Levee and Sidney streets, St. Louis, Mo.
- Point Milling & Manufacturing Co., Mineral Point, Mo.
- Product Sales Co., 423-425 Equitable building, Baltimore, Md.
- Thompson, Weinman & Co., 100 William street, New York, N. Y.

Valuable Silica Property in Washington. Federal Mining Co.'s Last Dividend.

A quarry of very pure silica assaying 99.4% (quarry run) is owned by the Spokane Silica Co. of Spokane, Wash. This deposit is located 13 miles north of Spokane, close to the Spokane Falls & Northern railway, and has been a great source of wonder and interest to visiting mining engineers and geologists. It stands apart from the neighboring mountains in the heart of a farming district. The deposit is in the form of a small hill better than 100 ft. in height, and covers nearly 17 acres of ground. Large float boulders of granite near its base appear to be the closest associate formation. At a distance it does not appear distinctive, owing to a light covering of moss stain; but close inspection on the surface reveals an abundance of singularly pure natural glass in the form of quartz crystals.

It was originally located for placer gold, but later

The Federal Mining & Smelting Co. has declared the regular quarterly dividend of \$1.25 a share on the preferred stock, or \$150,000, payable Dec. 15, to stockholders of record Nov. 21. This will make the payments for the current year \$510,000 and will increase the grand total to \$15,795,545, of which \$2,708,750 was disbursed on the common stock prior to Jan. 14, 1909. The December payment will be at the rate of $1\frac{1}{4}\%$ of the capitalization, an advance of a one-fourth of 1% over former payments.

The Federal is operating mines at Mace, Mullan and Wardner, and it also holds a 51% interest in the Greenhill-Cleveland group. Its principal producer is the Morning property at Mullan, the chief product of which is lead-zinc, and development in recent months is said to have practically doubled the ore reserves, an excellent high-grade shoot having been opened in an



SPOKANE SILICA CO.'S PROPERTY IN WASHINGTON.

was found to be a very superior glass sand and has had quite a demand for that purpose. It is also used by steel manufacturers for converter lining, paint makers as a paint base, and is found to be invaluable as building sands and tile making material, owing to its brilliant white color and its exemption from impurities. As high-grade glass sand for optical lenses, mirror and bevel plate it is said to be superior to anything found in this country.

More American Tin.—The American Smelting & Refining Co., Perth Amboy, N. J., is planning to bring its electrolytic tin refinery up to its designed capacity. The plant was originally designed to produce 1000 tons per month. However, only half of the units were installed with which to start, bringing the capacity down to 500 tons estimated and 300 actually produced. The remaining units originally planned on will now be installed.

Great care should be exercised in putting on a new elevator belt. It is not wise to try and take out all the stretch at once. It takes the life out of a belt.

extension of the No. 6 tunnel. The mill at the property has been increased to 1500 tons daily, and a much higher saving of the metal values is being effected by the new flotation and separation equipment installed several months ago.

It has been announced by officials of the Federal that the Union mill at Wallace, formerly under lease to the Stewart Mining Co., and now being operated by the Hecla Co., will be utilized in treating the Morning ores as soon as it is surrendered by the Hecla Co., probably not later than Jan. 1. The company intends to crowd production at the Morning, to take advantage of prevailing lead and zinc prices. The mine is capable of furnishing enough ore to keep both plants working at the limit, and it is presumed that the output will be maintained at the maximum.

Work under the direction of a man who has a personal interest in the outcome of it generally results in its being more efficiently done than when otherwise.

The asphalt deposits found at Trinidad and the Red sea are practically pure bitumen.

Steel Production of Record Proportions

The Steel Corporation has produced more steel ingots, pig iron and rolled steel products during the first 10 months of 1916 than in all 12 months of 1915. Other companies have been equally industrious. It is thus evident that the 1916 statistical record will eclipse all previous achievements. Probability is that this year's output of crude and finished steel products will surpass maximum records of 1913 by 5% to 25%.

Corporation subsidiary companies up to Nov. 1 produced 16,482,000 tons of ingots, 13,800,000 tons blast furnace products and 12,790,000 tons of rolled steel products. During the entire year of 1915 the Corporation's total output was 16,376,492 tons of ingots; 13,641,508 of blast furnace products and 12,000,000 of rolled products, of which 11,762,639 were for sale.

Shipments of semi and of fully-finished products by Corporation subsidiaries during the first 10 months this year are estimated to have been 12,345,000 tons. In the whole of 1915 they were 11,681,889 tons.

Orders taken for rolled products from Jan. 1 to Nov. 1, 1916, have been 14,347,906 tons—with October bookings estimated at 1,300,000 tons; but it would not be surprising to find October orders were much heavier. Total bookings in 12 months of 1915 were 16,215,900 tons. Only in orders is the 10 months' record of 1916 less than 12 months' record of 1915; but even at this rate, total 1916 contracts will exceed orders entered in 1915 by about 730,000 tons—equivalent to about 4½%—estimating last two months' contracts on the basis of October sales.

Assuming that production, shipments and sales of independent steel companies rose and fell in same proportion to the Corporation's activities as in former years, the industry as a whole, in the last 10 months, has produced 31,700,000 tons of steel in ingots, 32,631,000 of pig iron—including charcoal iron—and 24,600,000 of rolled products; has shipped 23,740,000 tons of mill and forge shop products and has taken orders for semi and fully-finished products aggregating 27,600,000 tons.

In entire year of 1915 output by all companies included 32,151,036 tons of ingots; 29,916,213 tons of pig iron—of which 23,843,477 tons were used in making steel—and 24,392,924 of rolled steel. Shipments of mill and forge shop products were approximately 23,600,000 tons and contracts booked aggregated 31,500,000.

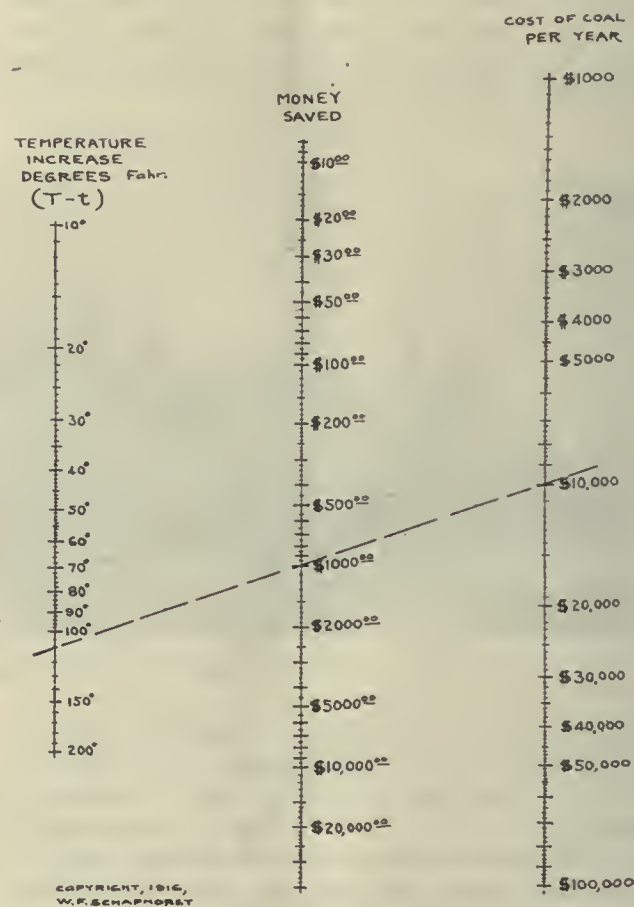
Indications point to output of 37,475,000 tons of ingots, 38,630,000 tons of pig iron and 26,100,000 tons of rolled steel products in 12 months of 1916. On this basis, shipments of 26,000,000 tons of mill products are indicated, and 1916 steel contracts are likely to be booked aggregating 32,200,000 tons.

Cinnabar, a sulphide of mercury, is the principal ore of that metal.

Whether it Would Pay to Install a Feed Water Heater.

This chart shows the money saving that accompanies the installation of a feed water heater. The old rule on which the chart is based is this: "Every eleven degrees temperature increase of the feed water saves one per cent of the coal pile."

For example, assuming that you spend \$10,000 per year for coal, and that by installing a feed water heater you could raise the temperature of the feed water 110° F. by using exhaust steam that is now going to waste, the money saved would amount to \$1000 per



COST OF INSTALLING FEED WATER HEATER.

year, which is a pretty good "salary" for a single piece of apparatus.

The dotted line drawn across the chart shows how the problem is solved. Just lay a straight edge across and it's "done." Or, stretch a thread across from known point to known point. The answer is always found in the middle column.

To find the increase in temperature just subtract the temperature of the water "entering" the heater from the temperature of the water "leaving" the heater. The difference (T-t) is the value to be used in the left-hand column.

As will be noted, the range of the chart is great enough to cover any ordinary case.

What the Mining Companies are Doing

Greene-Cananea, Mexico.

Results of the Greene-Cananea Co.'s operations in October were as follows:

	Copper, lbs.	Silver, ozs.	Gold, ozs.
October	6,036,000	177,999	815
September	4,900,000	153,495	814
August	5,000,000	144,480	862
July	4,600,000	116,800	745
June	4,500,000	128,700	800
May	5,948,000	183,809	1,199
April	5,348,000	205,748	1,193
March	5,388,000	200,709	1,146
February	5,180,000	181,895	984
January	3,348,000	113,691	716

On the basis of the October production the company has at last reached its normal production.

High copper costs prevail at Cananea due in part to higher cost of supplies, but to a greater extent to the various taxes which have been levied on the industry, including an export tax on bullion shipped into the United States.

Given uninterrupted operations Greene-Cananea could turn out 70,000,000 lbs. of copper per annum at a profit, even with a 13 ct. cost, of better than \$20 a share, against current dividends of \$8.

Barnes-King Development Co., Montana.

Report of the company for the quarter ending Sept. 30, 1916, shows as follows:

Receipts—	
Balance June 30, 1916.....	\$ 57,413.91
Received during quarter.....	203,036.62
Expenditures	\$260,450.53
Expense at properties.....	179,738.99
Balance	\$ 80,711.54

United Copper Co., Washington.

The report of the company for the third quarter shows as follows:

Receipts—	
Smelter returns from concentrates.....	\$ 38,276.48
Smelter returns from crude ore.....	15,767.40
Value of concentrates in transit Sept. 30.....	26,053.00
Value of crude ore in transit Sept. 30.....	6,713.84
Total value of returns for 3 months.....	\$ 86,810.72
Profit boarding-house	472.74
Total receipts for quarter.....	\$ 87,283.46
Cash on hand July 1.....	16,909.82
Total cash in third quarter.....	\$104,193.35
Disbursements—	
Operating expenses	\$51,408.09
Equipment	15,711.94
Land purchased	7,500.00
Bank loans retired.....	21,000.00
Balance total cash in third quarter.....	\$ 95,620.03
	8,573.32
	\$104,193.35

Tomboy Gold Mines Co., Colorado.

The company's report for the year ended June 30, 1916, shows as follows:

Realized profit for year ending June 30, 1916.....	\$76,923
Balance brought forward from last account.....	20,778
Total	\$97,702
Expenditures—	
Dividend No. 29, 1s per share, Dec. 31, 1915.....	\$15,500
Dividend No. 30, 1s per share, June 30, 1916.....	16,500
Written off property, plant and machinery.....	30,000
Income tax paid and reserved.....	17,000
Balance carried forward.....	19,702
	\$97,702

During the year 150,488 tons of ore have been milled, from which bullion to the value of \$1,074,088 has been realized, at a cost of \$720,866, resulting in a profit of \$353,222. If to this profit be added dividends from the Tomboy Tramway & Tunnel Company, and receipts from other sources, \$29,566,

the total surplus on the year's working is \$382,788. The average working costs for the year, including all expenses in America and London, were \$4.92 per ton.

Magma Copper Co., Ariz.

The following is a statement of the operations of the company for the third quarter of 1916 and comparison with the preceding quarter:

	Quarter ended Sept. 30.	Preceding quarter.
Copper produced, lbs.....	2,153,364	2,232,936
Cost of copper per pound, cts.....	9.95	10.47
Average price copper, cts.....	24.55	24.16
Operating profit	\$314,425.69	\$305,025.19
Average monthly profit.....	104,808.56	101,675.06

Chile Copper Co.

The Chile Copper Co. produced 4,542,000 lbs. of copper in October. Production for 1916 compares as follows:

	Lbs.
January	2,066,782
February	3,141,480
March	3,536,796
April	3,702,327
May	3,664,000
June	3,610,000
July	3,574,000
August	3,020,000
September	4,038,000
October	4,542,000

Chief Cons., Utah.

The report of receipts and expenditures for the first 9 months of 1916 is given as follows:

Receipts—	
Jan. 1, 1916, cash on hand.....	\$ 210,034.03
Ore sales, 9 months.....	976,389.05
Interest, 6 months.....	2,100.00
Eureka City Mining Co.....	71,173.49
Due from smelter.....	55,527.83
	\$1,315,224.40
Disbursements—	
Operating costs, 9 months.....	\$ 502,141.70
Machinery and equipment.....	11,274.14
Construction	14,135.06
Mining claims	153,594.97
Houghton expense, 9 months.....	2,664.63
Dividend No. 7.....	44,033.80
Dividend No. 8.....	44,148.15
Dividend No. 9.....	44,149.55
Due for labor.....	52,112.33
Oct. 1, 1916, balance cash on hand.....	446,970.07
	\$1,315,224.40

Standard Silver-Lead, B. C.

The financial statement of the company for September is summarized as follows:

Receipts—	
Preliminary settlements for 275 tons.....	\$33,056.63
Zinc sales	17,137.08
Final settlements for July.....	4,073.17
Boarding house	4,781.55
Store supplies	2,101.19
Total	\$61,149.62
Less zinc penalty for May.....	673.42
Balance	\$60,476.20
Disbursements—	
Ore production, including mining, shipping, marketing, power, salaries, expenses and taxes.....	\$36,287.98
Relative operating profit.....	24,188.22
Development	4,709.85
Construction	19.00
Aylard tunnel	1,683.30
Balance on hand Sept 30.....	\$254,219.01

Miscellaneous Company Notes.

It is estimated that the profits of the Calumet & Hecla Co. for 1916 will be better than \$115 a share on the main Calumet & Hecla mine alone. Counting its percentage of the estimated profits of subsidiaries for 1916, share profit will

run close to \$160. Output of refined copper from the parent company alone it is estimated was better than 6,500,000 lbs. for October.

The Alaska Treadwell reports net profits in September of \$64,356.75, Alaska Mexican \$1009.98 and Alaska United net loss of \$35,261.45.

The Kerr Lake Mining Co. in October produced 210,073 ozs. of silver against 203,074 ozs. in September and 244,020 ozs. in August; total production for 10 months was 2,129,805 ozs. of silver.

The Nipissing Mines production for October is valued at approximately \$233,646, showing a profit of about \$151,550, compared with production valued at \$236,873 in September, showing profit of about \$158,929.

More than 125,000 shares of the 200,000-share capital of the Tennessee Copper Co. have been deposited for exchange into certificates of the Tennessee Copper & Chemical Corporation. Outstanding obligations of the Tennessee Copper Co. will be paid off with proceeds from sale of new-stock at \$16 a share, and at the same time some much needed working capital will be provided.

The Davis-Daly Copper Co. has entered into an arrangement with the Butte-Detroit Copper & Zinc Co. for the milling of its zinc ore. It is probable that the Anaconda Copper Co. will handle the zinc concentrates produced. Davis-Daly, situated as it is, in the copper zinc area of Butte, should eventually become a substantial producer of zinc. The copper ore of the Davis-Daly will be treated by the Anaconda Copper Co. as heretofore.

Trustees of the Atlantic Mines Co. (in dissolution) the assets of which, with the exception of cash on hand, were sold to the Anaconda Copper Mining Co. at auction on Nov. 1, notify stockholders that after the payment of expenses of the sale and the discharge of all liabilities, there will remain in the treasury for distribution among the stockholders, a sufficient sum to pay \$12.50 on each share. The dividend will be paid on and after Nov. 29 to stockholders of record Nov. 20.

According to a mining engineer identified with the property, Kennecott Copper Corporation's development work is now proceeding so favorably that the mine looks better than it did a year ago. "The falling off in Kennecott's production," he said, "was due to perfectly natural causes. Production had been speeded up through the spring and summer so that company could avail itself of high prices being paid for copper and as might be surmised development work was not carried on as vigorously as it might have been."

It would not surprise those conversant with the affairs of the Utah Copper Co. if that company would declare a dividend of \$4 or \$5 a share. That the company can make such a declaration is evidenced by the fact that the company is earning approximately \$1,000,000 a week, which is considerably more than is necessary to the payment of \$16 or \$20 a year in dividends. Utah Copper is now making its copper at a cost of close to 6¼ cts. per pound. Notwithstanding the increase in wages and other producing costs, according to General Manager Jackling, the company can earn a profit \$15 a share on 15 ct. copper.

An official of the Calumet & Arizona Mining Co. in writing to a stockholder of the company has the following to say of the New Cornelia Copper Co.: "If you will refer to the annual statement of New Cornelia Copper Co. for the year ending Dec. 31, 1915, you will find that the time therein fixed when it is expected the leaching plant of that company will be in operation is June 1, 1917. While we may have had hopes that we might anticipate this time, you cannot expect that under the manufacturing conditions of the present year and the transportation difficulties, that the plant can be in operation as early as in February, and I believe that we should all feel well satisfied if it is not deferred to a date later than June 1. From the commencement of operations, the recovery should be not less than 3,000,000 lbs. of copper a month. Regarding the possible absorption of New Cornelia Copper Co. by Calumet & Arizona Mining Co., it is

impossible to say what the policy may be. Should the tax on corporations continue to increase and especially on that part of their income received from dividends of other corporations, which now pays a double tax, it may be a matter of economy to transfer all property to Calumet & Arizona Mining Co. and dissolve New Cornelia Copper Co. This matter has not been considered. Calumet & Arizona Mining Co. owns approximately 76% of the stock of New Cornelia Copper Co. and about the same proportion of the bonds. The stockholders of Calumet & Arizona Mining Co. will, therefore, benefit by three-quarters of the earnings of that company."

Referee Dexter has signed an order giving the stockholders' protective committee of the Ohio Copper Mining Co., in bankruptcy, right to receive, and directing trustees in bankruptcy to deliver to them, the deed for the property, on Nov. 20, 1916. Hearings were held by the referee on the 10th and 13th of November to fix amounts due on all claims and if said claims cannot be decided by Nov. 20 the committee is to pay over the sum of \$1,250,000. When this amount is paid the referee will set aside former sale and company will revert to the stockholders.

B. A. Brennan, well known to the engineering and industrial world as contract manager of the Westinghouse Machine Co., and later as sales manager of the power department of Bethlehem Steel Co., has resigned the vice-presidency of Mercantile Trust Co. of St. Louis, Mo., to accept the presidency of the Citizens Co., Inc., of Baltimore, Md., to which office he has just been elected. The Citizens Co., Inc., is an investment banking institution, which finances corporations, engages in underwritings, and handles complete issues of securities.

It is probable that the United States Smelting, Refining & Mining Co. will show earnings of better than \$10,000,000 in 1916. October and November showed fully \$1,000,000 net, with the possibility of better than that in December. With its present \$4 annual rate United States Smelting is distributing \$1,945,000 and with note interest and preferred dividends \$4,367,000 per annum. Against this is set \$10,000,000 profits, or two and one-third times all requirements. An increase in the annual rate to \$5 upon the common would involve only \$351,000. The company is selling copper for December-January delivery at 32 cts. a pound, silver is up to 71¼ cts. from the low of 60 cts. in July and spelter has markedly improved. Into the bargain the coal properties are giving a splendid account of themselves—good sales being made regularly.

The Shannon Copper Co. is now earning better than \$3 per share per annum on its 300,000 shares. For the first 9 months of this year profits were \$625,000, which is more than sufficient to meet a full year's dividend requirements. At current market prices of around 9 for the stock, earnings are at the rate of over 33% on the selling price and on the basis of dividends now being paid, Shannon yields 22% on the investment. The company recently had on hand \$1,200,000 in cash and receivables. The bulk of the earnings can therefore be paid out in dividends. Shannon's position has also been strengthened by the reduction of bonded debt. There now remains in the hands of the public only about \$125,000 Shannon Arizona Railway bonds out of the original issue of \$600,000.

The American Smelting & Refining Co. will earn practically \$35 per share on its common stock this year as a result of record-breaking operations. No efforts have been made as yet to resume operations at any of the five Guggenheim smelters in Mexico. The Mexican commission, which has been in this country for the past month or two, has before it all facts and figures pertaining to all the properties. Apparently the only tangible result to date was the recent Carranza proclamation extending for 60 days the time in which mining companies must resume work under penalty of forfeiting their holdings. Millions of dollars have been put into the expansion policy of the Guggenheim management in preparing to handle the rapidly growing tonnages of ores of all kinds which have been sent to smelters and refineries of the American Smelting & Refining Co. and its affiliated concerns.



FREDERICK LAIST.

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*Illustrated.

WHO'S WHO IN MINING.

The subject of this week's "Who's Who in Mining," Frederick Laist, has just succeeded to the responsible position of manager of the Washoe Reduction Works of the Anaconda Copper Mining Co., succeeding E. P. Mathewson, resigned. Mr. Laist has been connected with the Anaconda Co. for some time as metallurgical manager of the Washoe works, and has been responsible for many of the wonderful metallurgical improvements made in the past few years at that plant.

November Mines' Dividends Reach Record Proportions.

November, generally considered a so-called off-month in the matter of dividend payments, was a remarkable exception in this wonder year of 1916, for American mines and works, according to reports made to Mining and Engineering World, divided among shareholders \$15,986,455. Approximately one-half of this amount was paid by the copper companies or \$7,956,216; \$5,386,474 by the companies classed as gold-silver-lead-zinc producers, and \$2,643,765 by the metallurgical companies.

Added to the previous 10 months' disbursements this makes a total for the copper companies for the 11 months of 1916 of \$96,237,030 and a grand total of \$667,767,756.

While the so-called gold-silver-lead-zinc companies were not so prosperous as were their copper neighbors, yet they enriched shareholders in the 11 months of 1916 to the extent of \$81,525,739. United States companies contributed \$69,712,458, Canadian companies \$8,290,892, Mexican companies \$1,172,389 and South American companies \$2,300,000. The grand total for these companies to end of November, 1916, is \$389,394,010.

The six metallurgical companies had an exceptionally good 11 months' period for dividends were disbursed totaling \$22,043,680. Since incorporation these companies have paid dividends amounting to \$274,850,692.

The securities' holding corporations, eight in number, paid dividends during the 11 months of 1916 amounting to \$38,945,499 and their grand total to date is \$156,396,623.

The table following gives a list of the companies paying dividends in November with the date of payment, amount per share and total amount paid. For previous dividends by these and other companies the

reader is referred to tables published elsewhere in this issue:

	Nov.	Per share.	Amount.
American Z., L. & S., Mo.....	1	\$1.50	\$ 342,180
Amparo, Mex.	10	.03	60,000
Anaconda, Mont.	28	2.00	4,662,500
Arizona Copper	1	....	67,200
Boss, Colo.	1	.05	8,170
Bunker Hill Cons., Calif.....	4	.02½	5,000
Bunker Hill & Sullivan, Idaho.....	4	.40	163,500
Caledonia, Idaho	3	.03	78,150
Champion, Mich.	11	6.40	640,000
Chief Cons., Utah.....	14	.05	44,148
Cresson Cons., Colo.....	10	.10	122,000
Golden Cycle, Colo.....	10	.02	30,000
Granby, B. C.	1	2.00	299,970
Greene-Cananea, Mex.	27	2.00	972,418
Hecla, Idaho	20	.15	150,000
Hercules, Idaho	10	.20	200,000
Hollinger, Ont.	8	.05	240,000
Homestake, S. D.	20	.65	163,254
International Nickel, pfd.....	1	1.50	133,689
Lucky Tiger, Mex.....	20	.10	64,380
Mary McKinney, Colo.....	15	.01	13,093
Mass Cons., Mich.....	15	1.00	100,000
Miami, Ariz.	15	1.50	1,120,671
National Zinc, Mo.....	30	.02	10,000
New Jersey Zinc.....	10	9.00	3,150,000
Pacific Gold, Utah.....	1	.01	7,000
Rambler, Cariboo, B. C.....	15	.01	17,500
St. Mary's M. L., Mich.....	18	2.00	320,000
Seneca-Superior, Ont.	14	.20	95,768
Shannon, Ariz.	15	.50	150,000
Standard, B. C.	10	.02½	50,000
United Verde, Ariz.....	1	1.50	450,000
United Verde Ext., Ariz.....	1	.50	525,000
Wilbert, Idaho	15	.01	10,000
Yellow Aster, Calif.....	6	.05	50,000
Yellow Pine, Nev.....	25	.10	100,000

That New Mining Experiment Station.

The selection of Seattle for the location of the mining experiment station for the northwest, as announced by Secretary Lane, upon the recommendation of Director Van Manning of the Bureau of Mines, is not meeting with much favor by the mining interests of the northwest. It evidently was not Lane's or Manning's idea to have the station anywhere near the center of mining in the northwest. The Mining and Engineering World had no choice in the matter other than the best interest of the mining industry, but to chase Seattle in preference to Butte, Spokane or Salt Lake seems to be just pure politics—not common sense or good judgment, or knowledge of the situation at all.

The way it looks to the Butte people is set forth in the following editorial from the *Miner*:

Butte among several other western cities made a strong bid for the new mining experiment station authorized by congress.

Secretary of the Interior Franklin K. Lane had the selecting of the site and an official of his department came out this way to investigate.

Now comes the word that Seattle has been chosen as the place for it.

If Butte citizens are very indignant about it they are right.

If Butte is not the place for a mining experiment station, then certainly Seattle of all places is not.

Even Spokane, which is near a prominent mining locality, had far more right to it than Seattle.

Butte, of course, was the logical place for it and the official who advised that some such city as Seattle get it in preference to Butte certainly cannot expect this community to feel pleased about his judgment.

If it is logical that Seattle have a mining experiment station then it is just as logical that Butte have a long new line of government wharves built here, or have a navy yard

established on Silver Bow creek, or have that body of water dredged so that battleships can float on it.

Advices from Spokane are to the effect that the decision of Secretary Lane to place the third federal mining experiment station at Seattle will not be accepted as final and that the fight to secure this institution for Spokane will continue.

Spokane plans to appeal direct to President Wilson, contending that giving Seattle a station virtually means two for the Alaskan field, as there is already one at Fairbanks. They assert that Seattle has no tributary mining except coal and that some center of mining should have been chosen. Spokane papers express the opinion that Idaho and Montana mining cities would prefer Spokane as the site rather than Seattle.

An unfortunate tendency on the part of some of the smaller mine equipment houses to "farm out" a part of their work, has resulted from the present difficulty in making prompt deliveries. The danger of this course is well illustrated by the case of the compressor installed about 9 years ago at the Centennial-Eureka mine, Eureka, Utah, the air cylinders of which were Sullivan and the steam end built by another concern. This is known in the Tintic district and throughout Utah as a chronic source of irritation to the management. In the case of mine equipment it is particularly important that there should be an undivided responsibility which will insure the absolutely harmonious, efficient working of all parts.

It is to be regretted that the "Public Lands" conference, which was to have been a part of the nineteenth annual convention of the American Mining Congress, was so completely side-tracked. In fact but a handful of delegates—possibly not more than three or four—appeared to discuss a question which is vital to the entire west, as it involves the right of every state in which there are public lands, to develop its mineral and water-power resources. While in the main body of the Congress resolutions were passed, after but random discussion, covering the subject in a way, even these were lost sight of in the great multiplicity of topics which had been prepared for a three days' session of the Congress.

The committee of American mining and smelting interests which have properties in Mexico reached an agreement with Luis Cabrera, minister of finance in the Carranza government, by which taxes on mining properties in Mexico will be on basis about 40% less than present Carranza decree. In view of higher level of values in minerals at the present time, this agreement is considered satisfactory by American committee. The date when mines in Mexico shall become subject to forfeiture because of non-operation has been extended to Feb. 14 in cases where conditions have prevented operation. Nov. 15 was the date set for the forfeiture of mines which have been idle for 2 months, from Sept. 14, the date on which the forfeiture decree went into effect.

PERSONAL.

Frank G. Stevens is now manager of the Davidson mine, Porcupine, Ont.

D. Gaul, Los Angeles, Calif., is in Globe, Ariz., inspecting mining property.

Titus D. Crawford, mining engineer, Dixon, Wyo., is temporarily in Globe, Ariz.

Walter Neal, for some time in Hall, Mont., has again returned to Salt Lake City.

William Motherwell, flotation engineer, has completed an inspection in British Columbia.

John A. Metcalfe has become mining engineer for the Hobart Iron Co. at Gilbert, Minn.

G. F. Zoffman, Jalisco, Mexico, superintendent of the Cinco Minas, is in San Francisco.

J. Waldo Smith, mining engineer, has made an inspection of copper properties in **Arizona**.

E. B. Kimball, mining engineer, Piedmont, Calif., has returned from a trip to the Wyoming oil fields.

J. V. Richards, mining engineer, Spokane, Wash., is inspecting properties on the Mother Lode, California.

I. L. Merrill, Los Angeles, president of the Hedley Gold Mining Co., has been at the property at Hedley, B. C.

F. M. Field, consulting engineer for the Elling interests Virginia City, Mont., has returned to Los Angeles, Calif.

R. H. Shields, president of the New Arcadian and the New Baltic Mining companies, is in Boston on a business trip.

R. W. Bender, mining engineer, Salt Lake City, is in Elko, Nev., making preparations to operate in the Divide district.

Oscar A. Engelder, until last spring at Sardinia, has been made superintendent of the Verde Combination mine at Jerome, Ariz.

Frederic R. Weekes, mining engineer, New York, will return from a trip through California and British Columbia about Dec. 20.

Jas. T. Fisher of Laurium, Mich., president of the Jerome Victor Co., has returned from a visit to Jerome and other Arizona points.

Everett H. Pattison, mining engineer, Spokane, Wash., is inspecting properties in California and Idaho. He will return about Dec. 22.

F. G. Cottrell, chief metallurgist of the U. S. Bureau of Mines, has returned to Washington, D. C., from Salt Lake City and Butte, Mont.

James R. Finlay, mining engineer, New York, is on professional work in Arizona and will return during the latter part of December.

W. Earl Greenough and F. B. Davis, mining and consulting engineers, have opened offices in Old National Bank building, Spokane, Wash.

Allen Haskett, president of the Globe Bullion Mining Co., Globe, Ariz., has returned from a trip to Chicago, New York and other eastern cities.

Reginald Petre, mining engineer, Baltimore, Md., has been examining the Newray mine in the Porcupine district, Ontario, for American interests.

R. S. Foster, safety engineer of the Butte mines of the Anaconda Copper Co., has resigned to accept a similar position with the Doe Run Lead Co. at Flat River, Mo. He

is succeeded at the Butte mines by T. Oaas, formerly assistant to Mr. Foster. C. E. Calvert has been named assistant.

F. M. Manson, general manager of the Utah Ore Sampling Co., Salt Lake City, has returned from an extended trip to various Arizona camps.

Geo. W. Shaw, efficiency man at the Champion Copper property, has been appointed assistant to Superintendent Brady at the Michigan and Flint Steel property.

W. H. Seagrave, former general manager of the Kennecott Copper Corporation, has resigned and is now in Wallace, Idaho, from which place he will go to New York.

Mortimer North, recently with the Federal Syndicate Mining Co., whose property is near the Phoenix subsidiary of the Keweenaw Copper Co., will join the engineering staff of the Victoria early in December.

H. C. Bellinger, metallurgist, Spokane, Wash., has accepted the position of general manager of the Chile Exploration Co., Chuquicamata, Chile, and S. B. Williamson will have charge of construction for the company.

R. M. Edwards, president of the Franklin, South Lake, North Lake, Algoma, and Indiana companies, who has been at Houghton, Mich., for the summer supervising the management of these mines, has gone to Boston for the winter.

SCHOOLS AND SOCIETIES.

Michigan College of Mines.—Dr. H. M. Payne will deliver a lecture before the Copper Country Michigan College of Mines Club on Dec. 16, on "An Unusual Journey Around the World."

American Institute of Mining Engineers.—The first meeting of the fall season of the New York section was held Nov. 27 at the Machinery Club. Edgar Rickard of the Belgium Relief Commission spoke on the work of American engineers in Belgium. The annual meeting of the Utah section has been postponed to Dec. 16 at Salt Lake City.

NEW PUBLICATIONS.

The Golden Arrow, Clifford, and Ellendale Districts, Nye County, Nevada. By Henry G. Ferguson. Washington, D. C., U. S. Geological Survey. Bulletin 640-F; pp. 11; illustrated.

Each district is described separately as regards the general nature of its formation with respect to ore deposits and deposition. To date the district has not been opened up to any great extent.

Quicksilver in 1915. By H. D. McCaskey. Washington D. C., U. S. Geological Survey. Mineral Resources of U. S. 1:11; pp. 19.

Considerable attention is given to the resources, occurrences and developments in the different states and counties. Prices, imports, exports, world's production, production of the United States and uses of the metal are topics treated on more briefly.

A Method for Measuring the Viscosity of Blast Furnace Slag at High Temperatures. By Alexander L. Field. Washington, D. C., U. S. Bureau of Mines. Technical Paper 157; pp. 29; illustrated.

The variation in viscosity is being studied with respect to changes in temperature and composition and the effect of viscosity on the distribution of sulphur between molten iron and slag. The furnace, details of procedure and some of the results obtained from tests are given. The method consists essentially of an electric furnace into which the slag is put. The furnace is cylindrical and made to revolve on a shaft. At different temperatures the torque exerted from revolution is measured.

Progress Made in the Manufacturing Industries

Pumping Water with Compressed Air.

One of the most interesting air-lift plants in the southwest is located 3 miles northwest of Fort Bliss, near El Paso, Tex. One Class N-SO Chicago Pneumatic compressor pumps two wells each about 600 ft. deep, the water standing about 250 ft. from the surface. The compressor forces the air down into the wells, and although they are not yet



CLASS N-SO, CHICAGO COMPRESSOR PUMP.

entirely free from sand, the water is raised in sufficient volume to supply a town of 2,000 inhabitants. Class N-SO compressors are made in four standard strokes 8, 10, 12 and 14-in. with capacities from 70 to 300 cu. ft. They may be supplied portable (on truck) or skid mounted as well as stationary and are manufactured by the Chicago Pneumatic Tool Co., Chicago.

Gasoline Locomotives for Mine Work.

Gasoline-driven locomotives are solving the haulage problem in a number of mines, and satisfactorily. The first cost is comparatively low, as is the fuel cost. Maintenance and operation costs are moderate and when it comes to actual



PLYMOUTH GASOLINE LOCOMOTIVE HAULING ORE.

pulling power—the ability to do work—they stand up with any other type of locomotive.

In this illustration, for instance, taken in the mine of the American Gypsum Co., Akron, New York, and typical in a general way of conditions in many metal mines, the gasoline locomotive is handling a good string of loaded cars. The over-all height is a little greater than some types of electric locomotives, but at that they are able to negotiate workings of average height.

Some have considered that the exhaust gases might be objectionable, but in that connection S. E. Sill, manager

of the mine, has this to say: "We have been operating now for some 18 months one Plymouth in our No. 1 mine. Our roof is only 5½ to 6 feet high and ventilation is fair, but at no time have we been bothered with exhaust fumes, even when locomotive is working hard on up-grade, the gases seem to disappear at once. On some of our runs the locomotive goes 2100 feet."

The locomotive illustrated is made by the J. D. Fate Co. of Plymouth, O., and is of 24-inch gauge. It has a friction drive, a Continental motor, with certain changes and improvements adapting to the requirements, and Hyatt roller bearings.

Pipe Threading in Tight Places.

This pipe threader is designed to work in close quarters. It was necessary in this case to cut into a 3-inch high-pressure main in a tunnel. A part of the tunnel wall was removed, exposing the pipe, which was pulled over, giving but



PIPE THREADING IN A TIGHT PLACE.

8 inches of clear space for the tool to work in and only 18 inches of space for operation of the ratchet handle.

Threads were readily cut on the two ends, flanges screwed on, the tee inserted and bolted up and the job ready for the necessary extension.

The threader used is known as the "Toledo," manufactured by the Toledo Pipe Threading Machine Co., Toledo, Ohio.

Coupling Flexible in Three Directions.

Simple as it is, this new flexible shaft coupling effectively compensates for misalignment of shafts (off center or at an angle) and for endwise slide. It consists of two cast-iron or steel flanges connected by laminated steel spring pins instead of rigid bolts.

Each flexible pin unit is made up of a bundle of flat



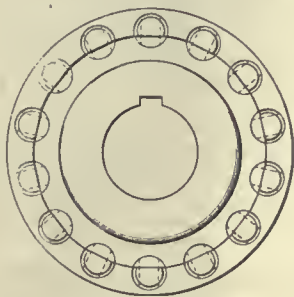
FLEXIBLE PIN UNITS TAKEN APART.

steel springs held flexibly in slotted radial keepers by means of a pin which passes through elongated holes in the spring bundle, as shown in one of the illustrations.

The drawings show how the coupling is assembled and made to compensate for the three irregularities in alignment. In assembling the pin units are inserted through holes near the outer circumference of the flanges, and then held in place at both ends by snap rings fitting into the continuous

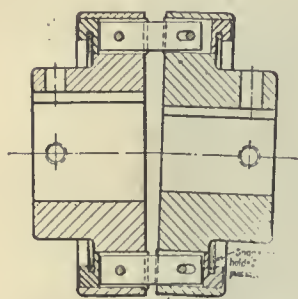
grooves formed by cross cuts in the keepers and an undercut groove in the flanges.

If the shafts are off center, the springs bend as shown in the partial-section drawing. If the shafts are inclined at an angle, the slotted holes in the springs allow each shaft

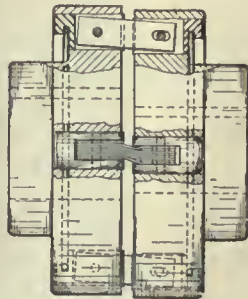


END VIEW OF COUPLING.

to ride on its own center as shown in the longitudinal section, the top edges of the coupling pulling apart and the bottom edges pushing together. When there is endwise



LONGITUDINAL SECTION.



PARTIAL SECTION.

float the slotted holes permit the flanges to draw together or pull apart, with their faces parallel.

These interchangeable parts are easily assembled, and the coupling operates smoothly, without noise or vibration.

A Boiler Purge Made from Wood.

Those who are operating boilers in districts where the water is hard, or contains injurious acid constituents, are anxious to know of anything which will lessen their troubles.

Of late they may have begun to hear of Caldera Purge. The makers of this liquid are just beginning to market it, and it is said that some surprising results have been obtained.

The peculiarity of this boiler cleaning agent is that it is entirely organic in its composition, in fact a wood product. In appearance it is a dark liquid like creosote and somewhat thinner. It does not react upon the water, but its action takes place upon the surface of the boiler tubes, lacquering them to a certain extent. It is said the fluid both removes scale and afterwards prevents its reappearance, by adding a small amount each day to the boiler feed.

Leak-Proof Rings in Oil Pumping.

A. L. Engels of the Shattuck Arizona Copper Co., Bisbee, Ariz., reports some remarkable results obtained by using leak-proof piston rings in oil $4\frac{1}{2} \times 4 \times 2\frac{3}{4}$ -in. Blake Knowles duplex piston packed pumps. These supply the five 100-hp. Atlas return tube boilers in this plant.

One of these pumps was fitted with the new type rings and, under continuous service, a reduction in piston speed of 38% was made possible and still accomplish the same work. The displacement on the pump plungers remained uniform and the danger of fibrous packing clogging the burner slots and valve ways was obviated.

TRADE PUBLICATIONS.

Gas Engines. Chicago Pneumatic Tool Co., Chicago. Bulletin 34-X; pp 20; illustrated.

The Giant gas engine in single cylinder and duplex types is described, the engine as to what it can do, where it is being successfully used about mines, smelters, etc., and what the cost of operation is. Its predominating features are then taken up and in furnishing a description of its construction most of the parts making up the engine are dealt with separately.

Vulcan Steel Frame Electric Hoists. The Hendrie & Bolthoff Mfg. & Supply Co., Denver. Booklet; pp 32; illustrated.

The company states that one object of the booklet is to put before customers something on which to base their requirements which often have to be specially made. A table of details for the different sizes is given. Separate descriptions of the different parts of the hoist and the entire hoist assembled are given. Briefs are included on steam and gasoline hoists, alarm indicators for hoists, electric mine pumps, cages, buckets, etc.

Manganese Steel Sand and Gravel Pumps and Wearing Parts for Pump Dredges. American Manganese Steel Co., Chicago. Bulletin 72; pp 16; illustrated.

With the ever-increasing use of centrifugal pumps in dredging work this bulletin will be found interesting. Illustrations are given showing the separate parts of the company's Acme centrifugal pump and accompanied with drawings to show its construction, besides views of the pumps installed at various places. Considerable manganese steel is used in their construction and the shell is not drilled for stud-bolts to fasten the side plates to the shell with, but a flange with slots for the holes accomplishes this.

Air Compressor and Pneumatic Rivetting Hammer. Ingersoll-Rand Co., New York. Forms 8311 and 3130; illustrated.

The hammers are offered in six sizes, the dimensions and specifications of which are listed in the descriptive table in the catalog. An important feature of this tool is the rivet set retainer designed to meet the regulations and requirements of the safety appliance laws enacted in various states. Form 3130 is on power driven single stage straight line air compressors. They are built in various sizes from 6 to 12-in. stroke with a piston displacement capacity of 52 to 955 cu. ft. per minute and are equipped with the Ingersoll Rogler type of air valve.

Electric and Compressed Air Drills and Sharpeners. The Denver Rock Drill Mfg. Co., Denver. Bulletins, 120-E-P; C-2 and Booklet; illustrated.

In the first bulletin electric rock drills are described, a complete view of the outfit being given besides a sectional drawing of the drill. In the second bulletin Clipper compressed-air drills are shown. They may be used either as one-man drills, mounted for drilling and stopping, or unmounted for quarrying, plugging and sinking. The description includes operation, construction and adaptability of the drill. The booklet is on the Sinclair drill sharpener. Its construction and operation are described and a general foreword regarding the sharpener given.

INDUSTRIAL AND TRADE NOTES.

The U. S. Smelting, Refining & Mining Exploration Co. has opened an office at room 1027 First National Bank building, Denver, Colo.

The Lidgerwood Mfg. Company, New York, has opened a branch office in the Hibernian bldg., Los Angeles, Calif., with Charles A. Baechtold in charge.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Dawson.

Many men are going to work this winter in the Chicken Creek district where antimony has recently been found. It assays \$125 a ton with a fair percentage of silver. The vein, it is said, is 18 ft. wide, but owing to the remote location it will not be opened at present. The property was found by Ben Nowall and is located 140 miles up Fortymile river from Fortymile post on the Yukon.

McCarthy.

The Erickson copper group has been purchased for \$100,000 by P. Bonner and associates of Spokane, Wash., and Wallace, Idaho. It is located on Glacier creek. Bonner will have charge of opening the property. To date he has been hauling in supplies and it is his intention to send out several cars this winter.

Seward.

Work of proving ground with an arastra has been stopped for the season by Ronan & James on their Moose Pass property. They are now going ahead with cross-cut work on the 100 level and the result of the work will prove whether the property will make a mine or not. If the result of the tunneling is satisfactory they will work all this winter and install a mill and tramway in the spring.

Operations at the property of the Cache Creek Dredge Co. were stopped Oct. 2 after a most successful season. Manager Harris will remain at the property this winter and it is said 200 tons of supplies will be taken in for the coming season. Two ditches have been constructed to the property so that with the commencing of operations May 1, 1917, plenty of water can be had.

Nome.

A. C. Stewart has located a pay streak 2 miles long on Sledge creek, 13 miles from here. With the spreading of the news most of the remaining ground was immediately staked by others.

Fairbanks.

Bill James has finished 5 holes to bedrock on his new find on Kokomo creek. He finished one hole in which he found pay that showed 65 cts. per foot. The last hole was put down 50 ft. from the first. The ground is 11 ft. deep and 6 ft. of the 11 is muck and 5 gravel. In each of the 5 holes excellent prospects have been found. Pay in the last 3 holes has run from 50 to 60 cts. per foot. The strike was made 2 miles above the forks.

ARIZONA.

Oatman.

Three advanced and modern gold reducing and extracting plants are being constructed, and will soon be under way, in the Oatman district. These mills will embody every late device and process for the treatment of the ores of the district, and will have a combined capacity of from 1000 to 1500 tons daily.

The United Eastern mill is practically completed, and will be grinding within the next 30 days, having a daily capacity of 400 tons. Crushing of the ore will be conducted by both ball and pebble mills, while the counter current decantation system of cyaniding will be used. The ores of the

Oatman district are all of the free-milling type, so that the problems presented to the mill designer are comparatively simple, the chief question being to reduce the costs so that comparatively low-grade ores may be utilized.

A total mining and milling cost of \$3 per ton is predicted when the three new mills of the district are in operation. The machinery of the United Eastern is all in place, and was turned over to the new owners last week, at the time of the annual meeting of the company.

The other two mills are being designed for the Tom Reed Gold Mines Co. and the Big Jim Gold Mining Co., all located on the same general lode system. The new Tom Reed mill will have a daily capacity of 500 tons, and the Big Jim mill either 400 or 500 tons.

The new Tom Reed mill will be located just below the Aztec shaft where an enormous body of ore is now being opened up, estimated to be from two to five times as great in extent and value as the original Tom Reed deposit, which yielded more than \$6,000,000. This deposit is now being explored by sinking a shaft to the 800 level (now down 500 ft.), and by drifting on the 400 level. It is 30 ft. wide, 1000 ft. long, and averages in value from \$15 to \$20 in gold. Orders have already been placed for the electrical equipment and some of the machinery, as from 5 to 7 months' time is necessary before deliveries can be made.

The general plans and specifications of the Big Jim mill are completed, but before the type of machinery is decided upon Manager A. C. Keating will spend a month or more studying the latest methods being used in gold and copper plants throughout the country. The Big Jim mill will be located just west of the working shaft of the company.

With these three mills reducing 1500 tons of ore daily, the output of bullion should be \$30,000 every 24 hours from these three properties alone. This is the production estimated by the managements of these three companies, based upon accurate knowledge of what their ore runs. All of them have ore reserves in sight sufficient to run their new mills from 5 to 10 years, with probabilities of double that amount still to be opened up.

Milling ore by an entirely new process is being done at the Gold Dust plant. This process consists of a Marks rotary pulverizer and a Simmer centrifugal separator, a combination which it is claimed will reduce milling and extracting costs to \$1 per ton. If this end is achieved it will mean that many properties in the Oatman district having reserves of low-grade ore will be able to mill it at a good profit, which has not been possible with costs of mining and milling running from \$8 to \$10 per ton.

The Arizona Gold Star, adjoining the Ivanhoe, is preparing to resume operations.

Boundary Cone is steady developing on the 550 and 750 levels, and reports satisfactory results in the way of milling ore.

The Gold Road mine is now being operated again, a new development campaign in the eastern end having been started.

The Gold Dust is blocking out ore on two levels, and will soon be milling about 25 tons per day in the Orion mill, which is being remodeled. The Zimmer amalgamation process will be used.

The Black Range is prosecuting a steady development campaign, and is using an old shaft just at the eastern end of the Nellie ground. The shaft is being retimbered down to the 150 level. This is about completed, and sinking will

be started in a few days. Some very fine ore has been cut by this shaft, which is an incline, on the vein.

Miami.

A number of Star churn drills have been ordered from Akron, Ohio, by the new Miami Con. Co. One drill has arrived and is now in operation and a second is on its way to the property. Drill hole No. 1 has been located 150 ft. from the drill hole No. 3 of Miami Southwestern. A good body of sulphides was encountered in drill hole No. 3 of the Miami Southwestern.

At Inspiration a large fan has been installed for taking care of smoke in the heading of the tunnel being driven to the Live Oak on the 6th level. On this same level progress is being made on the construction of a concrete pump station that adjoins the tippie station at the main east shaft. The pump station will be equipped with two units of Aldrich, electrically driven, geared, triplex, plunger pumps, each with a capacity of not more than 50 gpm. At the concentrator excavation has been going on to make room for a large Dorr thickener. This tank will have an inside diameter of 200 ft. and depth of 10 ft. It will be built of reinforced concrete. It will enable the return of clear water from an elevation just below the foot of the mill to the head of the plant. Water returned from this tank will not need to be pumped half as high as the water reclaimed from the tailings dam. In the operation the tailing from the mill is allowed to discharge at about the center of the tank. On entering its velocity is checked and consequently the solid material in the tailing stream settles to the bottom while the clear water overflows. This solid material, or sand collects on the bottom where it is scraped toward a discharge outlet in the center of the tank bottom by means of rabble arms. To carry the weight of the arms a truss will be made with one point of support at the center of the tank, and the other on a track extending around and on the top of the tank.

Aja.

Work will be commenced at New Cornelia not later than June 1, 1917. There are 1200 men now employed and stripping the ore body and grading for the track connecting the mine and mill are rapidly nearing completion. The power plant, being built by C. C. Moore & Co., San Francisco, is to contain five Stirling boilers. These have been placed, one being about half bricked. The building for the coarse crushing plant has been erected; the crane for handling the crusher parts is in operation; the four No. 8 crushers are in place, while 25% of the No. 24 has been erected. The trestle and the trailing track to this building are being completed. At the fine crushing plant the steel building has been erected, but has not yet been riveted. This is to enclose 12 Symons Disc Crushers. Four of these have been placed, while there are six being set up and two in transit. Seven of the 12 leaching tanks have been lined with lead. The concrete work on all of them has been completed. Two of the six central structures which are to contain the pumps and launders have the concrete work finished. The electrolytic tank house is to contain 152 electrolytic tanks, has 122 erected, of which 76 are completely lead lined. The solution sumps, one at each end of this building, have the concrete work completed.

Portal.

Houston.—The suit of the Willie Rose Development Co. against the Willie Rose Copper Co. of Portal for \$500,000 damages has just been dismissed by Judge Charles E. Ashe, in whose court at Houston, Tex., the case had been pending for some time. The motion for dismissal of the suit was made by the defense at the conclusion of the testimony offered by the plaintiff company, upon contention that the company did not have a permit to do business in this state and therefore could not be sued here. The claim for damages was based on the allegation that the defendants had not properly developed a copper, gold and silver mine in Arizona, which, had it been properly worked, should have yielded \$7,000,000 worth of ore. The property was worked under lease contract by the defendant company.

Turner.

Two Peak Co.'s stock was taken from the open market last May but now 100,000 more shares are to be placed at

25 cents. The proceeds will be used for the installation of a hoist and other allied equipment. In the 2-compartment shaft started in October ore is being encountered at a depth of 22 ft. The shaft is being sunk on a claim of the Larrieu-Chadwick group. It is the intention to sink the shaft 500 ft. and crosscut the ore body, which is a continuation of the deposit on the Buck claim, where the ore has been proved for 200 ft. The present shaft's collar is 300 ft. lower than the Buck workings, and when sunk the required depth will be 800 ft. The shaft will be sunk as far as possible by windlass, after which the completion of the wagon road will facilitate the bringing in of machinery.

CALIFORNIA.

Woody.

Weringer Mines Co. is building a concentrating mill of 100-tons capacity at its copper mine, at Woody, 25 miles east of Bakersfield. A gyratory crusher and a 6 by 22 Hardinge ball mill are being installed, the latter to operate in closed circuit with a Dorr classifier, the overflow from the classifier passing to Callow flotation machines. The ore to be concentrated is chalcopyrite.

Confidence.

The Confidence mine, Tuolumne county, which was long idle, is being reopened under direction of Edmund Juessen, mining engineer, San Francisco. The old workings, which go to a depth of 1,000 ft., on a dip of 33°, are being unwatered. A new hoist and air compressor are being installed for sinking and operating.

Scott Bar.

The water supply for the Milne and Andrews hydraulic mine is being augmented and two more giants installed. Ditches and flumes have been placed in good condition and the property will be worked on a broader scale this season than ever before. As soon as sufficient water is available six large giants will be steadily worked. The mine contains about 255 acres of rich ground, the gravel being fairly deep and well located for economical mining. The property was recently acquired by W. Barber of Boston.

Jackson.

The district is rapidly recovering from the effects of the late strike and most of the mines are again operating along normal lines, although there is stated to be a scarcity of desirable miners. However, this situation will soon be remedied, as miners are again coming into the various camps. At the Kennedy 100 stamps are dropping and a normal tonnage is being mined on the main levels. The company is also preparing for extensive operations at the Zelia, formerly one of the premier producers of the lode.

Forty stamps are in commission at the Argonaut, and within a short time the new mill will be placed in operation. This will give the company a total of 60 stamps. A small mill has been installed at the Easy Bird, and sulphurets are shipped daily to the Selby smelter. Unwatering of the Hardenberg and Old Eureka is proceeding satisfactorily. The South Eureka, Oneida, Bunker Hill, Fremont, and other prominent producers are rapidly resuming normal yields.

Angels Camp.

W. J. Loring has commenced operations on the Morgan mine, on Carson Hill, on which he recently secured an option. A new hoist is being installed and it is understood that the winze will be deepened about 200 ft. Loring has been developing the Calaveras and other property contiguous to the Morgan and now has a very extensive area under control, the successful development of which will mean a great deal to Calaveras county. The Morgan is one of the earliest mines of this district and is credited with a production of \$3,000,000. One pocket is said to have yielded about \$300,000, including one of the largest masses of gold ever unearthed. The property is owned by the Calaveras Mining Co.

The Maltman and Sultana properties have been merged into the Angels-Mohawk Co., and drifts from the 300 level have opened a fair tonnage of mill ore. It is planned to sink the shaft to a depth of 1500 ft., and extend drifts to

seek ore bodies opened in neighboring properties. A 5-stamp mill is in commission.

The Angels Deep Mining Co. has negotiated a deal for the Smythe-Brown-Ryland mine, adjoining the Pioneer, and is preparing for active work. The mine is equipped with a hoisting plant, 10-drill compressor, 10-stamp mill, and pumping machinery. At the Pioneer a hoist has been installed and the shaft is being sent to a depth of 500 ft. Some good ore is showing which will be milled at the Smythe-Brown-Ryland mill. John C. Benson is manager.

At the Gold Cliff the mill is running steadily and ore of splendid character continues to be drawn from the lower levels. Sinking is advancing and the shaft is expected to soon intersect a point where the main veins should come together. The Gold Cliff is said to be the most profitable of the mines now operating in this district. At the adjoining Waterman property a 3-compartment shaft has been started and surface buildings erected. The mine has produced much good ore and is well regarded by local operators.

Washington.

Rebuilding of the 10-stamp mill at the Ocean Star mine is being rushed to have it in shape for operation before deep snow sets in. The plant was recently destroyed by fire, supposedly of incendiary origin. Underground work continues and a large tonnage of good ore will be available for the plant. The Ocean Star and several nearby properties are controlled by the Columbia Con. Co., of which E. C. Klinker is manager.

Gaston.

A Hardinge pebble mill has been installed at the Gaston mine. Large bodies of good ore have been opened underground by tunnels and drifts, and the mine is expected to again become a heavy gold yielder. W. L. Williamson is manager.

Placerville.

The Eureka Slate Corporation has been incorporated by New York people to operate the slate quarries at Slatington, 6 miles from Placerville. It is capitalized at \$300,000. Directors are: George S. Day, Mary E. McLaughlin, Edward W. Campbell, J. Turner Grieve, and Rollo A. Sanborn, all of New York.

Carrville.

The main ledge has been struck in the lower adit of the Golden Jubilee mine and is being opened by drifts. Some good ore is exposed and indications are favorable for satisfactory results. Good ore is being opened at several points in the main levels. The mill has been improved and is reported to be making a good gold recovery from the refractory ores. The company has also taken a bond on the adjoining Poeth and has arranged for extensive work. The California Extraction Co., of San Francisco, is chiefly interested.

At the Strobe, which is being worked under a \$15,000 bond, a 750-ft. tunnel has been started to tap rich shoots exposed in the upper workings. The mine has been worked all summer and a good tonnage of ore milled. The same company has taken a bond and option on the Schlomberg hydraulic mine, on the north fork of Coffee creek, and is improving the water supply and preparing for a brisk season.

The Nash deep-gravel mine has been sold by English owners to San Francisco people for \$10,000 and is again being worked. At the Bonanza King the 10-stamp mill is running steadily on ore of good grade. The Williams & Carter hydraulic mine has passed into the hands of Atkins, Kroll & Co. and will be worked. The same people are reported to have taken a bond on the Headlight quartz mine, with a view to working the sulphide ore by a new process.

Dutch Flat.

Operations have been resumed at the Swamp Angel placer mine, with A. W. Hawkins in charge. Abundant water is now available and large deposits of excellent gravel ready for the working. The mine is an old producer.

Happy Camp.

The Mason Valley Mines Co. is building a 3-mile road from its Gray Eagle mine to the main highway to facilitate

shipment of machinery and supplies. It is planned to have considerable equipment at the mine before snow flies and underground work will be continued all winter. With the arrival of spring additional equipment will be installed and shipments made to the Thompson smelter.

The Savage & Jehogg Co. reports two important discoveries on Horse creek. The first find consists of a strong ledge of gold-bearing ore, about 3 ft. in width, occurring in a formation of limestone and slate. The second ledge averages 8 ft. wide and occurs in a talc-slate formation. Arrangements are being made for development of both deposits.

A road is under construction from the Bradley quartz mine on Independence creek to the Klamath river, a distance of 12 miles. As soon as work is finished large quantities of machinery will be freighted in, including mill and cyanide plant. A large tonnage of good-grade ore is exposed.

Several copper claims are attracting attention. The Williams group of 18 claims is being worked by a strong company, which holds a bond for \$50,000 on the property. The Fairview copper property has been taken over by J. F. McCoy, understood to represent eastern people. At the Ely a lower tunnel is being driven to intersect the ore body, which averages 15 ft. wide on surface. Ore has been intersected at three points and assays high in copper, silver, and gold. The Ely is located on Elk creek.

Alleghany.

The Twenty-One Mining Co. has arranged for the immediate erection of a 20-stamp mill at the Twenty-One mine, replacing the small roller mill at present on the ground. Late work in the mine has opened good ledges and the company is stated to have ample finances for prosecution of deeper developments.

Colfax.

Preparations are being made for resumption of work at the Golden Streak mine. A camp has been established at the property, which lies 2 miles from Colfax. Considerable equipment is on the ground, and sufficient water is available for a long season of operations.

Oroville.

The mill at the Cape Horn mine is being dismantled and moved to the Mascot property, which is being operated by W. T. Baldwin of Oroville. The Mascot is located north of the Old Glory in Morris ravine, and the ledge was recently intersected in the lower tunnel, which gives about 175 ft. of backs. The shoot is 20 ins. wide. It is planned to provide flotation equipment in the spring. The Banner, Butterfly, Bumble Bee, and several other mines are also showing good ore.

Nevada City.

The New England and Mohegan properties at Gold Flat have been taken under bond by J. C. Campbell, and arrangements are being made for early operations. Some rich quartz has been produced and the properties are favorably situated.

Grass Valley.

Reopening of the Norambagua mine has begun, with John M. Nicholls in charge. Unwatering of the lower levels is going ahead, and within a few weeks the new owners expect to start extraction of ore. Eastern people are interested in the company, which also controls the Prudential group.

Ione.

Comprehensive prospecting of the valley between Ione and Carbondale with diamond drills and shafts has established a strata of lignite underlying the area. Much of the coal is said to be of good grade and indications are considered excellent for development of a good coal industry. In pursuance of this plan the briquetting plant of the Lignite Fuel Co. of Ione, has been acquired for \$19,500 by C. A. Johnson, understood to be affiliated with eastern interests.

Plymouth.

In the Amador Star mine at a depth of 227 ft. a strong vein of milling ore has been encountered. It averages 4 ft. wide and is being developed by a drift. Shaft sinking continues and considerable work is going forward at other

points. The property is well equipped and favorably situated for economical operations. It was formerly known as the Rhetta.

Soulsbyville.

A hoist and compressor have been installed at the Addis & Harris mine and sinking is proceeding on a 4-ft. ledge of good ore. The work is now being done with power drills and lateral developments will begin soon. The property yielded rich ore near surface and is expected to become an important producer.

COLORADO.

Idaho Springs.

The Yukon group of the Consolidated Mines Dev. Co. are working 2 shifts on the lower levels. The breast of the tunnel is nearing the first of the four veins that will be intersected by this tunnel. All the buildings, such as blacksmith shop, tunnel house and ore plats, have been completed. On the upper level two veins have been opened. Drilling has been done on the Silver Moon vein for 200 ft. west. For this distance the vein will average 5 ft. wide and assay \$10 to \$32. A raise is now being put through from this level and is in ore that runs from \$30 to \$100, as shown by smelter returns. The last taken from a streak 2 ft. wide in the raise showed \$99.46. The Gold Quartz vein, which will be undercut by the lower level, is the largest vein of the four and has been opened by shallow workings on the surface for over a thousand feet and shows a vein of from 6 to 8 ft. wide from which good ore has been taken from a number of places. In the early spring a power plant will be erected at the portal of the lower tunnel and machine drills installed in the mine. A mill of the most modern type and suitable for the handling of the class of ore they have will also be built, and the flotation process will be one of the chief features in its construction.

Kokomo.

With the installation of new machinery and remodeling of the old Robinson mill which is doing some custom work much activity has been taken on in the district. The Progress Mining & Milling Co. is responsible for remodeling the mill. The mill has been remodeled by the Progress and equipped with new machinery. The process now employed in the mill is an original plan of treatment put into action by the company experts and is based on flotation. Plans for increasing the capacity are being completed and spring will find the mill handling double its present output. During the month of October nearly 1,000 tons of ore were shipped from the larger properties in the Kokomo-Robinson territory. The mill has a capacity of 500 tons. It is equipped with electric motors for power, Sturtevant heating plant, Symons No. 5 and No. 3 crushers, Traylor rolls, 10 Butchart roughing tables, ball mills, 12 Wilfley tables, and 3 flotation machines. The flotation product carries 45% zinc. The tables turn out 30 to 40% lead concentrate with most of the silver and gold. Some of the silver and gold values remain in the iron concentrate. Plans are being considered by the company for the installation of other treatment plants possibly including one for the electro-magnetic separation of iron and zinc.

Pitkin.

The Bon Ton Mining & Leasing Co. has started the Quartz Creek mill, where the success of flotating molybdenite and sulphide ores will be tried out. The mill will be put in operation as soon as new radiators can be installed and it is the intention to keep the plant running all winter. The plant includes a ball mill and flotation process, which were installed during the summer. If successful the capacity will be increased.

Silverton.

Pride of the West has the main raise timbered and all workings cleaned. Active development is now being carried on. As this work progresses all ore encountered will be extracted and sent to the mill. A large territory of undeveloped ground, through which several known veins extend, is to be opened. The old mill, which was operated by steam, has been thoroughly overhauled, and oil flotation for the

treatment of the ores has been installed. Electricity will drive all machinery. The capacity of the mill has been increased, and the management has planned to treat 100 tons daily.

The old mines of the Pride of the West and Green Mountain groups are to be reopened. Development was carried on several years ago at the Green Mountain. At present, the main tunnel is caved in for 400 ft. The tunnel is being cleaned out and the company expects to extract a large tonnage of good ore from ground already blocked, besides exploring new territory. The Green Mountain tunnel is in 1500 ft. At 600 ft. a raise was made to surface.

Telluride.

Mill Supt. W. L. Reid has proven flotation satisfactory for treating ores of the Smuggler Union Co. Old cyanide tanks are to be taken out and additional flotation units put in their place.

Black Bear shaft is finished from the 450 to the 200 level. When the shaft is completed the company expects to blast out a place for a big storage bin at the mouth of the shaft and arrange for a self dumping skip.

Carruthers mill, in Marshall basin, is ready to begin operations as soon as the tramway from the mine to the mill is in condition for use, which should be soon.

Nick Jurich Leasing Co. is taking ore from the Butterfly lease and milling it at the company mill. The mine is being worked steadily with a small force, but the mill is only used about one-third of the time.

Columbine.

The Royal Flush mine, owned by the Hahns Peak Gold Mining & Milling Co., Columbine, Routt county, after several years' dormancy, is now producing smelter ore and mill concentrates, under the supervision of Chas. T. Arkins, consulting engineer, of Chicago. Last winter and spring a raise 460 ft. was made, connecting the lower and upper tunnels, which raise was necessary for proper and natural ventilation of the mine, the raise being now also utilized as a working shaft, from which exploratory drifts, north and south, are being pushed for development of ore bodies. A recent strike of ore, carrying ruby silver, was made. A shipment of smelter ore and mill concentrates will soon be made. It will be recalled that the district in which this mine is situated, the Hahns Peak district, was the scene of great activity, 20 years ago, lode mining at that time receiving impetus by reason of placer gold production, previously, prospectors at that time searching for the source of the placer gold, which was generally believed to have had its origin on Hahns Peak.

IDAHO.

Wallace.

The Anaconda Copper Co. of Butte, Mont., operating the Douglas mine, under lease and bond, has let a contract until March 1, 1917, to C. M. Shipley and Bert Fox of Wallace, to transport ore to the railway at Pine Creek station, 9 miles. The contractors will employ five 4-horse teams, and will handle about 16 tons of ore daily until sufficient snow falls for sleighing, when the shipments will be increased. A compressor plant, hoist and pump have been ordered for the Douglas, and the equipment will be taken in by the ore teams on the return trips, the machinery having already been delivered at Pine Creek. It is said also that the company is preparing to install a concentrator at the mine, and that the ore will be given a "rough milling" to eliminate the haulage on waste material. The product is to be treated at the company's new electrolytic zinc smelter at Great Falls, Mont.

The Jack Waite Mining Company, which owns and has been developing the Jack Waite group of lead-silver-zinc claims, will resume shipments in a few days, according to announcement. A steam power plant, adequate to serve the needs of the property for several years, has been installed, and the management contemplates maintaining operations throughout the winter. Development for the last 18 months has opened several stopes of commercial ore, and the shoot in

the upper levels is said to average 6 ft. wide of excellent mill feed. Shipments will be made from Eagle, the nearest railway point. C. I. Grimsloe is in charge of operations, and Rush J. White, formerly mine superintendent for the Federal, is consulting engineer. The Jack Waite group comprises three claims and two fractions on Tributary creek, and the ore bodies have been extensively developed by several tunnels, drifts and raises, more than 1000 tons of ore having been shipped. E. Winsby, president of the United Iron Works at Oakland, Cal., is president of the company, and a number of Spokane men are heavy stockholders.

An important strike has been made in the claims of the Northern Light Mining Co., in the Pine creek district, according to the announcement by Ben G. Harmon, general manager. The discovery was made in a crosscut from the shaft on the 400 level, where it is said the vein is 25 ft. wide, 5 ft. of which, on the foot-wall side, is said to be high-grade lead and zinc, while the remainder of the body carries streaks of steel galena and high-grade zinc. Assays of the entire show average values of 7.5% lead, 9.5% zinc and 20 ozs. silver. Drifts are now being run east and west. Of the capital stock of the company, 1,200,000 shares are owned by St. Paul capitalists represented by Harmon, the manager of the property, leaving 300,000 shares in the hands of scattering stockholders. Tuesday T. C. Borg, head of the Borg Furniture Co.; Dr. M. C. Welch and Tom J. McGrath, treasurer of the company, all of St. Paul, arrived and will spend several days inspecting the property.

The Highland-Surprise mine on Pine creek, will practically double its milling capacity, and as soon as the improvements now under way are completed 30 additional miners will be put to work, according to W. W. Papesch, president of the company. Another cell is to be added to the flotation plant, and the present small crushers and rolls are being replaced by 40-in. rolls and crushers of double the former size. This will give the mill a capacity of from 150 to 175 tons daily. These changes will be complete in about 10 days. Physical condition of the mine shows an immense tonnage blocked out for shipment. The Highland ore body is being blocked for a length of 480 ft. with a vertical depth of 440. Stopping is under way on this body, which shows fine ore on both ends of the drift, running from 2½ to 12 ft. in width and carrying 14% zinc, 8% lead and 5 ozs. silver. The management expects to ship not less than 50 tons of concentrates per day as soon as the improvements are completed.

Mullan.

Owing to water pressure, estimated at 150 lbs. to the square inch, further diamond drill exploration of the strike recently made by drilling in the Copper King mine, has been abandoned temporarily, according to reports from H. W. Ingalls, secretary of the Copper King Co., who states that the drill had penetrated the ore body for 48 ft. without crosscutting the ledge. "The first 15 ft. is estimated to average 10% lead, and the last 15 ft. apparently is much better," said Mr. Ingalls. "We probably will begin crosscutting to the ore body soon from a point in the west drift about 400 ft. back from the face. This should tap the ledge in about 100 ft., and by drifting for about 400 ft. we should reach the place where the diamond drill broke into the ore. This we think will be better than crosscutting along the drill hole, which is about 480 ft., as we will be able to explore the ledge as we go, besides straightening out the workings."

Kingston.

Following an examination of the property by its representatives, the Rex Con. Mining Co. has taken a tentative option on the Hypotheek mine. The Hypotheek recently has been equipped with a 200-ton concentrator and power drills, and regular shipments are being made to the smelter at Northport, Wash. The crushing department is capable of handling 500 to 600 tons of ore daily, and the treating facilities can be increased to accommodate the output of the rolls with comparatively little expense. Current to operate the equipment is secured from the Washington Water Power Co.'s transmission lines.

Gem.

The addition to the Hecla Mining Co.'s mill is nearing completion and probably will be operating by Dec. 20, when

the company will surrender its lease on the Union mill of the Federal Co. at Wallace. The new unit will have a capacity of about 200 tons daily, increasing the entire plant to 700 tons.

The flooded workings of the Marsh, closed down for several months, are to be unwatered and active operations resumed. Search for the easterly extension of the Tiger-Poorman vein is to be continued, and other plans contemplated are to be made effective. These include sinking the shaft to the 1100 level, crosscutting from the 400 level south into the O'Neil claim and further exploration of the Got-Em-Now vein from the lower shaft levels. Accompanying the report is notice of the first assessment of the Consolidated Marsh Mines Co., 10 mills a share, delinquent Dec. 20. The company is incorporated for 2,000,000 shares at \$1 each, and approximately 1,500,000 shares are issued. The corporation now is controlled by Duluth men, closely identified with the Consolidated Interstate-Callahan Mining Co., who have acquired all the interests formerly held by the Dixon-Cowles coterie of Missoula, Mont.

Burke.

For a reported price of \$500,000, control of the Hercules mine has passed to the Day interests. The aggregate interests of the Days in the Hercules now amount to slightly more than a half interest.

LAKE SUPERIOR.

COPPER.

Houghton.

The older type of drills, like Sullivan and the original Leyners, are rapidly being displaced in both the copper and iron country by Ingersoll-Rand, water Leyners, Denver and others of modern design. Recent selections have been based almost entirely on actual working tests and represent an encouraging tendency of mine executives to follow very closely the recommendations of their superintendents.

Franklin is taking steps to increase its tonnage one-quarter to one-third, having begun this work about a month ago when it started to send to its mill about 1050 to 1100 tons daily where it had previously forwarded only 900 tons. This increase will result from the introduction of several ideas by Supt. Henderson. The improvements were adopted on the 28th level and are: a method of rope haulage using rope tramming operated by a compressed air engine; the "caving system of mining" by which the drifts are carried to the dividing lines between the shafts, the good rock is taken out with the clay seam 2 ft. thick to the hanging wall by a low-cost method of raising called "caving." Expensive timbering is avoided since it is no longer necessary to hold up the hanging wall to protect the drift; the concentration of 8 drills together in a row; the supervision by one boss, saving in the use of supplies; the handling by one man of the explosives, better drill service, etc., are among the items. The cost of tramming labor has been reduced from 20 cts. to under 5 cts. a ton, and the saving in the cost of breaking is in about the same proportion. Dec. 1 the same system with one 4½-ton tram car will be put in on the 30th level and about the 15th on the 31st level. A 4th level will be ultimately similarly equipped, but the mill capacity will have to be increased—a subject that is now under consideration. As the mine with a daily tonnage of 900 tons was earning \$30,000 it will be readily seen what it will earn with the 3 levels and the drifts breaking down steadily 1400 to 1500 tons.

The Baltic is finding the West vein quite dependable as a steady producer except at No. 3 shaft where it has not been fully tested. No. 5 is sending all its rock from this lode. No. 4 more than 50% of its output, and No. 2 has found it good where it was opened at the 16th level. Being within 40 to 150 ft. only from the Baltic lode itself, it can be very easily mined; and it is probable that when regularly and extensively mined the mineralization will have a much larger area.

Michigan will begin to drift on the Evergreen lode and for this purpose will transfer the drills that have been opening up the main crosscut, which has been driven 60 ft. be-

yond the lode. This lode in the crosscut had 25 ft. of vein carrying but little copper, then 15 ft. that was almost commercial, and 5 or 6 ft. of the same character as the first stretch followed by 8 inches of vein rock called epidote. The drill will be set to work in the second strip, which is considered most promising and which here is merely one of the poorer places that so often occur in amygdaloid. The Ogimah lode, which has been drifted on for 275 ft., gives a commercial average for the whole distance; the Butler is still seeking the mineralization that was interrupted by a fault some time ago on the western side and will connect its raise in the longitudinal fissure lying 6 ft. above with the drift on the level next higher, the 5th, in a few days. The copper from the Ogimah lode is all shot copper, and that from the Butler is largely mass of different sizes.

Victoria in 6 months, which time it will take to get everything at the mill and mine in the proper running condition, will be milling 700 tons a month as compared with 550 now. This will be up to the capacity of its stamp. New tables are being built for the mill which will be put in the highest state of efficiency. The ground at the bottom of the mine is developing satisfactorily as far as can be done at the present until the 12 new valveless drills of the Denver Rock Drill Co.'s Dreadnaught pattern arrive. The 23d and 26th levels are giving rich, heavy rock which was met with in wide stretches on the 24th level, the former being opened for 100 ft. The 25th is displaying excellent grades of shot copper with no mass or barrel. It will be remembered that all the machinery at this mine and mill is operated by compressed air from its hydro-pneumatic plant cut out in the sandstone cliff located close to them and that 10 lbs. of copper a ton will pay a profit, so that when the tonnage that now yields a handsome profit reaches its maximum for its one stamp, 700 tons daily, it will pay well.

Calumet & Hecla is getting 5500-5600 tons daily from its Calumet conglomerate where it has all the men that are needed. Men with previous experience in this district are preferred here and can be usually obtained. All men except timbermen are working on contract, and trammers, whose minimum here is \$2.75, are averaging from \$3.50 to \$3.75, and miners whose minimum is \$3.50 are averaging over \$4. There are now 170 drills in operation on this lode.

New Arcadian has probably the best strength yet met with at the mine on the 1050 level north at a distance of 450 ft. towards the New Baltic boundary which will be met with 700 ft. in. The northern drifts have been carried in further than the southern and have all averaged good.

Federal Syndicate Copper Co. has just been organized with a capitalization of \$1,000,000 with 1,000,000 shares and a par value of \$1 under the laws of South Dakota. It purchased the Federal Copper Company's lands, located southeast of the Phoenix from P. L. DeVoist of Duluth through H. E. Murray of Calumet, Mich., who is also negotiating with the heirs of Charles Kingston for two farms adjoining comprising 120 acres which, with the company's 360 acres, would give a total of 480 acres supposed to carry the Kearsarge lode. The new organization is a carrying company and its property will be worked by the Michigan Development Co., now in process of organization. The officers are: A. C. Steinlow, president; P. D. MacNaughton, secretary-treasurer; J. S. Sebree, assistant secretary; directors, the foregoing with P. L. DeVoist and Ernest LeDuc. Mortimer North is in charge of the engineering work.

Adventure will begin to make shipments from the Butler and Knowlton lodes about Dec. 1 to the Winona mill. The greater amount of the rock will come from the Butler, as it is the richer, though there are some good stopes on the Knowlton. It is expected that soon after the start three to four cars will be sent daily. At this mine when mining was closed down on the Butler and Knowlton lodes about six years ago the yield had run down to 10 lbs., but that can be made to pay now and it will give an opportunity to explore them, particularly the Butler that has encountered such good values at the South Lake to the north and at the Mass to the south.

Flint Steel has reached, in dewatering its No. 3 shaft, the 3d level, which is about the bottom, and has drained through this level its No. 2 shaft which is about 450 ft. distant. It

is learned from outside sources that the exposures of the metal are up to the average of the Butler lode on which these shafts are situated.

Cherokee has begun sinking and is in heavy copper, which was also found where the sump for collecting the water was cut out. The crosscut made from the other drift is 23 ft. across the width of the vein, assuming it to be the same as on the surface and the face of the crosscut is now in good copper. The showing as a whole averages high grade.

IRON.

Escanaba.

The Munro mine has commenced shipments via Escanaba, the first being made from the new open pit on Nov. 16. Two shifts are operating and Hoose & Person have the contract for both shipping and mining.

The Great Northern Ore properties have announced an increase of \$1 a ton for bessemer and non-bessemer. The increase will be effective Jan. 1, 1917, and will bring bessemer ore up to \$5.20 and non-bessemer \$4.55.

The ore rate from ports at the head of Lake Superior for 1917 were established, when two leading shippers made freight contracts to run for the season at \$1 a ton.

Chartering was not heavy, as the bulk of the tonnage was tied up ahead. It is estimated that the business done established the rate for more than 40,000,000 tons of vessel capacity. Nearly all the shippers have reserved tonnage at the going rates and now that carrying charges have been fixed the reservations will be turned into contracts. In 1900 the rate was \$1.25 per ton.

Ludington shaft stock-pile of the Oliver Iron Mining Co. is being loaded for an order received to ship an additional 25,000 tons. Including the shipment now in hand the company has shipped to the Escanaba docks this season about 550,000 tons of ore. This is an increase, in comparison with 1915 of over 100,000 tons.

Virginia, Minn.

The Oliver Iron Mining Co. intends to do considerable stripping here and in the Adams district. Orders for 100 all-steel 20-yard air dump stripping cars, to cost \$300,000, have been placed and are to be delivered by March 1.

Officers of the company believe that the cars will effect a saving in the cost of removing the overburden next season. They are of a heavier type than any that have been previously used. The total weight of the car and dirt carried by it will exceed the total load of the heaviest cars thus far used in ore transportation. Formerly in stripping narrow-gauge cars holding only 3 yds. were used. In the Virginia district the Mesaba mountain will be removed. It is said that under it lies a large bed of fine ore. In the Adams district work will be prosecuted at the Adams farm, where deposits that have been worked for several years through shafts will be uncovered and made open pits.

MISSOURI-KANSAS.

Joplin, Mo.

Under the stimulus of a strong spelter market and a shortage in production of both zinc and lead ores, the market climbed to \$105 top basis price Friday afternoon last week. Operators in the Joplin district who had confidently expected to receive \$100 per ton for their ores, the great majority of them holding their ore from the previous week, were rewarded in receiving even more than they anticipated, \$105 per ton. Lead sold for \$87.50 top price, \$85 base. Calamine sold for \$60 top price, \$55 base.

What promises to be one of the very best hand jig properties in the district is being developed by the Mary Jane Mining Co. at Tuckahoe. A battery of four jigs is being reinforced by three more this week, and it is expected more will be needed in the near future. Drifts have been sent out in three directions from this shaft, and in each an excellent face of ore has been developed.

The Etta May Mining Co. has installed another concentrating plant west of Bell Center. The mill started short

shift some weeks ago, and a number of small turn-ins have been made. W. P. Howard is superintendent.

Chas. Edwards and associates have proved up a rich ore body at Chitwood on the Granby land. A total of 10 holes have now been put down and in every one a good run of jack has been shown. Edwards expects to fully develop this property.

Operations for the erection of a 100-ton mill by the Mary L. Mining Co. on its 21-acre tract of the Missouri Lead & Zinc Co.'s ground, situated near 22nd street and Ohio avenue, have been begun. A deal has been closed for the purchase of a mill in the West Joplin district, the machinery of which will be installed in the new plant. In the course of sinking the shaft the company took out about 200 tons of dirt assaying on an average of about 20% blende, according to one of the partners.

A company of Joplin men has taken a lease on the old Aylor shaft, north of Joplin, installing a 4-in. Gardner pump. This was formerly a good property, operations being conducted at a depth of 125 ft.

Webb City, Mo.

The Twin City Mining Co., situated on a 14-acre tract of the Aylor land at Prosperity, is averaging about 100 tons of high-grade concentrates weekly. This company has one of the best equipped mills in the district, having several months ago erected a new 400-ton plant. Operations are being carried on in sheet ground, the dirt averaging about 3% recovery. Since February, 1916, \$90,000 dividends have been declared. George Moore of Webb City is president of the company.

The Bizzy Izzy Mining Co., east of Joplin, in the Duenweg camp, has opened up a good sheet-ground formation at the 180-ft. level. The ore is all high grade, and probably will average 4 to 5% lead and zinc.

The Schoolhouse mine at Carterville has been taken over by the Chapman-Hosley Mining Co. and will be operated once more as soon as necessary repairs can be made. This is a sheet-ground proposition and already a large tonnage has been taken from it. The lease consists of 120 acres of land.

Miami, Okla.

Another new mill is being erected by the Commerce Mining & Royalty Co. The new mine will be known as the Woodchuck, and should be ready for operation by the middle of February, if not sooner. The plant is located only a short distance from another new mill being erected by the same company, to be known as the Blue Jay.

The Rebekah Co., after a thorough prospecting campaign, has started the erection of a 250-ton mill. This company has leases on 250 acres of land slightly less than 4 miles north of Commerce. Out of a total of 10 holes put down, only one proved a blank, while in the others a rich formation is indicated by the cuttings. J. E. Hoeshal is president, Lewis Langhorn, vice-president, and W. A. Wood, general manager.

Several big mines have been developed in the Century Oklahoma zinc and lead field within the last year, the most important of which are the Welsh Mining Co., Montreal Mining Co., and the Mihoma Mining Co.

The Miami Zinc & Lead Co. is installing three 150-hp. pressure boilers to supply steam to make its electricity and to operate the hoists at the various shafts. Operations underground is being carried on at the 300 level.

MONTANA.

Butte.

Alleging that the Butte & Superior Mining Co. was disbursing dividends in excess of its earnings and was attempting to dispose of its assets through a contemplated merger with the American Zinc & Lead Refining Co., thereby leaving only a bond of \$75,000 to indemnify the Minerals Separation Co. in the event that the latter won the flotation case now before the supreme court, the Separation Co. has asked Judge Bourquin either to enjoin the Butte & Superior from

the payment of further dividends pending the final adjudication of the case and to restrain the proposed merger or else to require the Butte & Superior to increase adequately the amount of the bond.

H. D. Williams of New York, counsel for the Separation Co., stated that they claimed damages and profits on the flotation process, which patents the Butte & Superior is alleged to have infringed upon to an amount in excess of \$15,000,000, and that the last quarterly statement issued by the Butte & Superior showed its quick assets to be \$2,000,000, as compared with a statement of about a year ago, in which that item was given as \$5,000,000. He claimed Butte & Superior output had reached a value of more than \$16,900,000 at a cost of around only \$1,000,000 through the use of the flotation process.

Judge Bourquin intimated that he considered that the Minerals Separation Co. was entitled to greater protection than was afforded by the present bond, and he suggested that the Butte & Superior certify to the Separation Co. that a sufficient sum to cover all possible damages would be kept in the treasury in the event that the plaintiff won in the final issue. The court explained that this was only a suggestion, and Attorney J. Bruce Kremer for the Butte & Superior replied, stating that he was powerless at this time to assent to such a suggestion.

Judge Bourquin, continuing, expressed doubt as to his jurisdiction in the case, inasmuch as the appellate court for the Ninth district had reversed the decision of the district court, which had found for the Separation Co., and the supreme court had granted a writ of certiorari, removing the case from the appellate court. Judge Bourquin stated that he would have to look into the matter, and the petition of the Minerals Separation Co. was taken under advisement.

Anaconda has finished driving the crosscut, started several months ago, from the 1800 level of the Original mine, under the business section of Butte, to the 1600 level of the Emma. Sinking of the Emma shaft has started, simultaneously with upraising from the 1600 level, which work when completed will increase the depth of the Emma shaft from 800 to 1600 ft. The Emma shaft, when completed to the 1600 level, will provide an air chimney and help to cool the lower levels of the Original and Stewart mines. It is stated that drifting on the 800 level of the Emma has developed substantial ore bodies. The drift is said to be now at a point just south of the Oxford hotel, in the direction of the Davis-Daly ground.

A rich strike of copper ore is reported in the Butte Main Range. According to the statements the miners are in about 8 ft. on the vein and the ore body, which is reported to be about 4 ft. wide, runs all the way from 10 to 15% copper with some silver. The Butte Main Range shaft is down to a depth of 700 ft. and it is from this level the vein is being worked. The same vein is said to run through the Colusa-Leonard property, owned by the Tuolumne Co., and adjoins the Butte Main Range. The officials of the Tuolumne admit that a rich strike of ore has been made and also admit that they are in on the vein to about 8 ft. with every indication that the values will be maintained. As a result of the strike Tuolumne advanced several points on the local exchange today. The Tuolumne is a large stockholder in the Main Range. The Tuolumne has a contract under which it is purchasing monthly allotments of Main Range stock.

Articles of incorporation of the Summit Valley Security & Development Co. were filed with the clerk and recorder this week. The capital stock is \$100,000 with a par value of \$100 a share and the company is to have an existence of 40 years. The objects of the company are stated to be a general mining business with the usual conditions attached as to the purchase or leasing of properties and the erection of buildings in connection with the operation of mines. The five directors are Dr. T. V. Moore, G. O. Dayton, T. C. Truscott and R. M. Green of this city and M. W. Atwater of Basin.

A prominent Butte millionaire and retired banker, who wishes to keep his name out of the papers, gave assurance this morning that he will give a substantial amount to boost the movement on foot for the construction of a Miners' Home to which patients suffering from miner's consumption

will be admitted. Last night Patrick Wall declared he will donate \$1,000 to the fund and in addition will do everything possible to complete the work of building the home in Butte. "The committee may count on a substantial sum from me, but I do not want my name connected with the movement," said a wealthy man who is interested in the welfare and comfort of Butte miners. This man declared that he has been eager for a long time to do something of a substantial and direct benefit to the miners, the men who made Butte the city it is today.

Deer Lodge.

A. Rippingale, Frank Brown and Fred Mundinger were here this week from the Champion mining district. They are running a tunnel on the old Ben Franklin claim and expect to continue this work during the winter months.

Lewistown.

The Cumberland at Maiden this week shipped out to the Denver mint a \$7000 gold bar. This property, operated under a lease, has become a regular producer and is showing up better all the time. James Breen of Spokane is now the chief owner and he went out to inspect the property. The Spotted Horse and Maginnis at Maiden are also being successfully worked under lease.

NEVADA.

Goldfield.

Drifting has begun from the 1100-ft. level of the Silver Pick shaft to intersect the ore channels indicated by the Calyx drill. In the bottom of the shaft the quartz is showing higher assays than further up, with copper appearing in increasing quantities. Changes are being made in the pumping system to facilitate sinking of the shaft to the alaskite, and establishment of a level on the shale-latite contact.

The Silver Pick Extension Co. has been formed to work 120 acres adjoining the Silver Pick mine on the West. Herman Zadig is president, C. G. Patrick secretary-treasurer, and George F. Dyer consulting engineer. Developments will be by way of the deep workings of the Silver Pick.

Additional equipment for the 1000-ton flotation plant of the Goldfield Con. is expected to arrive shortly and the management is sanguine of resuming normal operations early in January. The sulphide gold-copper and the usual mine ores will be treated by flotation, and the cyanide department operated on tailings, of which about 2,000,000 tons are available. It is reported some custom ore may be also treated for neighboring companies.

Manhattan.

Sinking of the White Caps shaft is proceeding rapidly and as soon as the 435-ft. level is gained, east and west drifts will be extended to intersect the ore-shoots exposed at the 310-ft. point. Foundations are being erected near the main shaft for the roasting plant, and the mill and cyanide department will also be moved to this point.

Elko.

The Hidden Treasure group, 1½ miles from Aura, has been leased to W. D. Chambers and associates by R. S. Carmichael and William Vore of Elko. The ore carries gold, silver and lead, and about 1200 ft. of developments have been performed. A small force will be employed during the winter, but with the arrival of spring developments will be prosecuted on a broad scale. The Hidden Treasure produced some rich ore about 20 years ago and has been in the hands of the present owners about 14 years.

NEW MEXICO.

Mogollon.

Socorro Mining & Milling Co.'s product for first half of November was 18 bars gold and silver bullion.

Mogollon Mines Co.'s clean-up for same period yielded 820 lbs. gold and silver bullion and 2½ tons high-grade concentrates, from a reduction of 2000 tons of ore. The new

960-ft. shaft has been timbered to 700 level and is said to be the best executed piece of similar work in camp. Timbering will be extended to bottom as rapidly as possible.

The Oaks Co. is making another shipment to custom mill of ore from Clifton mine obtained in course of development. North and south drifts at 50-ft. level on Eberle mine are also yielding mill ore. Both of these properties are on the Queen vein.

At the Pacific mine, the ore bins are being filled and aerial tramway to Socorro's mill will be started this week and regular daily shipments maintained. A test run of the tram was entirely satisfactory.

Louis Gramas, who is conducting development work on his Gold Eagle group in north-central portion of camp, reports the presence of 3 ft. of pay ore in face of tunnel, and another shipment to custom mill will be made as soon as burros for its transportation can be secured.

Tuscarora.

Driving of the main tunnel at the New Tuscarora mine is approaching interesting ground and should intersect the first of several ledges within 75 ft. It is at present in 320. Some rich gold-silver ore has been taken from the mine, but little deep work has ever been attempted. Utah people are largely interested.

OREGON.

Sumpter.

It is probable that the Golden Chariot will operate through the winter months, according to O. E. Conner, Jr.

Since early spring I have been drilling on the vein with an electric core drill, and the results are rather encouraging. The winze we are sinking from the 200 level is still in free milling ore carrying good values.

SOUTH DAKOTA.

Custer City.

The Gladiator group is being thoroughly sampled on surface and underground with a view to reopening the property.

Customs ores are to be taken in by the Trojan Co. A 3-rail railroad convenient for either narrow or broad-gauge cars of the C. & N. W. or C. B. & Q. is to be built. On this track will be a scale for weighing the lots. From the cars the ore will drop to underground pockets and then be fed to a crusher, and next to a mechanical sampler. It will then drop to underground bins, which are old stopes, of several thousand tons' capacity. This equipment will cost somewhere between \$12,000 and \$15,000. At the mill, additional capacity will be secured by remodeling the slime department. This will include a tube-mill, classifier, thickener, agitators, and revolving-drum filter. The plant's daily capacity is now 350 tons.

The New Puritan Mining Co. has been formed to operate the Puritan mine. John McGoffin is general manager and J. R. Russell is secretary, both being residents of Deadwood, S. D.

Ore is being hauled by teams from tungsten mines of the Homestake to the Star shaft. Here it is crushed and passed to a belt-conveyor, from which the high grade is picked and the low grade fed to a 5-stamp mill. In front of the battery is a short amalgamating-plate where some free gold is saved. Concentration is accomplished on a Wilfley sand-table and two Deister sliming tables. About 20 tons per day is treated. The ore contains enough gold to reimburse the company for all expenditure of its milling and mining, thus leaving the tungsten concentrate as clear profit. The tailing from the mill goes to the cyanide department. At the company's fine grinding plant 3 new tube mills are to be installed. This will double the capacity of the unit, and permit of the grinding of all of the sand originating in the stamp mills. In addition to the extra saving by amalgamation, the reground product passes over amalgamating plates.

Increased extraction has been noted at cyanide plant No. 1, where the sand is treated by leaching. The company feed to this plant a sand just as fine as it is possible to leach within reasonable time.

UTAH.

Midvale.

The new blast furnace of the U. S. Smelting & Refining Co. has been completed and announced a success by C. F. Morse, consulting engineer, Boston. This is the 6th furnace to be blown in at the plant of the type for handling silver-lead ores. The furnace will handle 240 tons per day. About 200 employes have been added to the payroll, making 800 men in all. The company, at a cost of \$20,000, has just completed a brick thaw house, a structure large enough to hold an entire trainload of cars. It is heated by the direct fire system and is used to thaw out the frozen ore from Bingham during the winter.

Alta.

A shortage of teams for hauling ore is curtailing operations at the South Hecla, where 60 men are now being employed. There are 3000 tons ready. The road down Little Cottonwood is icy in places, bare in others, making it not good for either wagon or sled. A fall of snow and the production could at once be increased to 50 tons daily.

South Hecla Extension has two shifts driving the main drift. The raise is retimbered 70 ft. Some ore is being extracted and a car of silver-copper ore is ready for shipment. At the Alta Germania the Dominic tunnel is in 235 ft. It is approaching the Germania fissure, and the face is heavily mineralized.

The tunnel at the Big Cottonwood Bonanza is now in 280 ft. The full face is in the material from which samples were taken, and assays show 3.3 ozs. silver, with a trace of gold. The formation is of such a character that in the opinion of experts the increasing depth gained with the advancement of the tunnel will lead to enrichment of values.

Bingham.

At a recent meeting of Bingham Amalgamated W. P. Davis was made general manager and work under company management will be started. The first work will be from the incline shaft, which is down 600 ft. At the 300 level some drifting has been done. This work will be taken up and one of the drifts continued to the limestone contact. In the adjoining Congor, ore is coming from this limestone, and it is said that the Congor has proven ore up to the Bingham Amalgamated lines on three levels. A drift on the 300 level is out 60 ft. south. This work is in the quartzite. A raise is in the porphyry. The new work will run back into the limestone, which has never been prospected.

At the Silver Shield the winze from the Snowstorm tunnel is down 50 ft. and the 15-in. vein, which was followed is now being opened for stoping in this the Beal lease. They are saving a considerable tonnage from a stope in the tunnel 70 ft. above the Snowstorm. Engineers say that the ore showing is a continuation of the enrichment found in the Highland vein in the Shield's deep tunnel, 750 ft. lower on the dip of the vein. The company's force is mining a splendid quality from the Highland on and just above the lower tunnel level. In the back vein, which contains many large bunches of first class in a mass of milling ore, lessees are making a good saving of the better grade. Work in this part of the mine is retarded by the bad air due to insufficient ventilation. Plans are in order for the sinking of an air shaft from surface.

Eureka.

The new Tintic Standard shaft is down 145 ft., the work having been done with a prospecting outfit, according to Manager Raddatz. About 5 ft. are being made a day but this will be increased soon when the new electric hoist is installed. The ore on the 1300 level is 100 ft. wide and as yet no permanent walls in sight. Arrangements have been made to put in sill floors preparatory to larger operations. The ventilating pipe was found to be inadequate for the new blower, and this will be replaced. The ventilating apparatus

has been found necessary to overcome the gas and heat, which clog the deeper levels on stormy days.

The shaft at the Eagle & Blue Bell is down 2010 ft. It is expected to carry it down to the water level which is about another 50 ft. The shaft sinking is given secondary consideration as there is no hurry now to reach its maximum depth. Important developments from the new station above the 2000 are being pushed. The tonnage is being increased gradually and the company is making good profits. While some of the ore occasionally runs high the mine is maintaining grades which average close to 15 to 30% lead and 15 to 30 ozs. silver.

Park City.

For the past few weeks New Quincy has been shipping at the rate of 2 cars a week. The two faces being worked are 60 ft. apart. The west face assays 0.8% lead, 44 ozs. silver, and 60 cts. in gold. The east face shows 0.97% copper, 6.8% lead, 40.2 ozs. silver, and 60 cts. gold. The body being developed is reached by a raise 280 ft. above the 900 level of the Daly-West. The ore is along the same ore zone as that in which the old Quincy developed a body of ore that yielded more than a million in 15 months.

Machinery for the Judge smelter is continually arriving and C. H. Hansen, head of research work for the General Electric Co., is on the ground with respect to electrical installations. It is expected that the plant will go into operation during January.

Serious caves have occurred in the Ontario shaft affecting the operations of the Federal Leasing Co. The trouble is above the 600 level. The pumps are still working, and from those in charge no fear of a shut down is expressed.

WASHINGTON.

Spokane.

The Silver Mountain Mining Co., capitalized for 1,500,000 shares at \$1 each, has been organized by Spokane men to take over and operate the holdings of the Daisy Mining & Milling Co. and the Wahiagiin Mining Co., near Daisy. W. E. Seelye, Spokane, is president and general manager; Dr. Don Hunt Shephard, Coeur d'Alene, Idaho, is vice-president; Boyd Hamilton, Spokane, is secretary-treasurer, and Charles H. Goodsell, Spokane, deputy U. S. Mineral Surveyor, is consulting engineer. The two groups adjoin, and to date there have been about 3500 ft. of underground run, opening the property to 450 ft. vertical depth. The ore is a low-grade silver. It is anticipated that shipments will begin next spring, a wagon road having been constructed to Addy, 16 miles distant, the nearest railway point. In recent weeks 2 cars of sorted ore have been shipped to the Northport smelter, and a third car now is being assembled. The group has been operated intermittently for the last 25 years; Seelye expended \$50,000 in development, and an equal amount was contributed by the late J. J. Browne. Seelye and the Browne estate are the principal stockholders, but a number of fairly large blocks of the issue are held in the east and middle west.

In the last few days two important strikes have been made in the Electric Point mine, near Boundary, according to Roy Young, president of the Electric Point Co., who arrived in Spokane from the property Thursday. "The existence of these bodies was known to the company, but they lacked development," said Young. "The point of last exposure is at the 200-ft. depth, where the bodies are up to the general average in dimensions and qualities of the other chimneys, of which five or six have been opened. One thousand tons of ore are on the dump, but it is not to remain, a carload of sleds having arrived for its transportation. Ore hoisting was halted for 10 days because of the volume in dump. This lot is composed of 300 tons of high grade and 700 tons of the 25% grade. We will haul 100 tons of ore a day when the roads are good. A tunnel is to be driven at the 300-ft. depth for the removal of muck, thus leaving the shaft free for the hoisting of ore only. A raise on the No. 3 chimney is 120 ft. above the 200 level. A 35-hp. compressor is being installed in place of a machine that was too light for our demands. We have a geological novelty in the form of an

igneous body in lime, an occurrence not considered possible by some authorities. It was struck recently at the 100-ft., depth in a body 4 ft. wide and is expected to lead us to other and interesting conditions."

WISCONSIN-ILLINOIS.

Highland.

New ore buying interest has appeared in this district, by the National Zinc Co. of Springfield, Ill. High grade zinc carbonate has found a market with this firm. Shipments were made last week by independent operators as well as to the Eagle-Picher Lead Co., Collinsville, Ill. Two cars came from the Saxe-Lampe mine; New Jersey Zinc Co. to Mineral Point, 1 car and Kreul Mining Co. to Linden Zinc Co., 1 car.

Whitson Junction.

Chas. Singer, General Manager of the Linden and Cuba zinc ore refineries, with A. P. Craft, an official of the Frontier Mining Co., are promoting the erection of a new custom refinery to cost \$25,000. Dings and Campbell types of magnetic separators are to be installed.

Mifflin.

Twenty-one cars of zinc ore were shipped last week, higher prices enabling independent operators to unload surplus and current production. The M. & A. Mining Co. operating the Big Tom, with new rig are now shipping regularly. The Vinegar Hill Zinc Co. have introduced another new zinc producer on the Yewdall lease with new equipment. Adjoining lands have been drilled and a heavy shipper is predicted. The Peni mine from which no reports have been made on shipments this year has entered in contract arrangements with the Grasselli Chemical Co. The Coker mines shipped 10 cars of zinc ore last week, 8 going to Mineral Point for separator treatment and 2 of high grade to the smelter at DePue.

Dodgeville.

The Guthrie Mining Co. shipped 2 cars of zinc ore last week to the refiners at Galena, 75 tons. The Berryman property recently drilled is offered for sale by the lessee, Henry Robberts. Heavy deposits of zinc ore have been located at a depth of 40 ft.

Montfort.

A slide in the east drifts of the O. P. David mine, following seepage of surface drainage has been overcome and shipments resumed, 1 car going to Wisconsin Zinc Roasters, 40 tons.

Platteville.

Deliveries of zinc ore for week of Nov. 25 totaled 31 cars, 5105 tons. The Mineral Point Zinc Co. offered a good market to independent low grade producers and sharp competition developed. Three cars of lead ore cleared, 2 coming from the Block-House mine and 1 from the Coker at Mifflin. Shipments of iron pyrites were light, in the face of advances in price only 624 tons reached the track. The gross recovery, mine run for all producers reporting, was 4057 tons. Net to smelters including 20 cars, 785 tons, to Grasselli Chemical Co. under contract, 2787 tons. Higher prices and steady advances have inspired ore refiners to hold their finished product. The Mineral Point Zinc Co. shipped 18 cars of refinery jack to the smelter at DePue, 636 tons. Shipments from local producers last week were light, 6 cars in all clearing 244 tons.

Prices on blende showed substantial gains, the base for 60% ore holding at the close of the week at \$98 per ton, with premium grades in advance of \$100. The range was narrowed on medium and second grade ores to \$95, stimulating all independent producers to unload and no reserve ore was found in the field at any point at the close of the week. Lead ore was sold at \$90 outside interests bidding strong. The feature of the pyrite market was a doubling in prices, offers going as high as \$10 per ton.

Benton.

Shipments of zinc ore last week were the lightest for any single week in months, 44 cars reaching track for a total

of 3,702,000 lbs. Frontier Mining Co. held the lead on shipments, 9 cars going to track, 362 tons; Vinegar Hill Zinc Co., 8 cars to Cuba, 356 tons; Fields Mining Co. to Grasselli, 5 cars, 181 tons; New Jersey Zinc Co., 6 cars to Mineral Point, 250 tons. The Skinner roaster sent 10 cars of 59% refinery to the several high grade buyers including the Eagle-Picher Co., 426 tons. New producers with new equipment have been introduced at the Hird and Grotkin mines for the Frontier Mining Co. On the Longhorn for the Wisconsin Zinc Co. A new mine and mill come into active commission early in December for the Vinegar Hill Zinc Co. on the Meloy land. A new mine is being developed on the Copeland for the Wisconsin Zinc Co. and a mill will be supplied early next spring. New Jersey Zinc Co. is developing a new range on lands adjoining and a part of the Meloy estate. Little Giant Mining Co. offer their mine and surface establishment for sale.

Shullsburg.

Shipments have been resumed at Oliver Mining Co.'s plant after installing new roasters, 2 cars high grade going to Edgar Zinc Co. last week, 74 tons. Winskill to Wisconsin Zinc Roasters, 3 cars, 127 tons. A new milling plant is being built for the Rodhams Mining Co.

Galena.

The quality of producer found at the Black-Jack mine, one of the New Jersey Zinc Co.'s, was shown last week, 8 cars going to refineries at Mineral Point, 300 tons. North Unity to National Works, at Cuba, 4 cars, 165 tons. Shipments of high grade refinery product were light the Wisconsin Zinc Co. sending 3 cars to American Zinc Co., 106 tons.

Returns from nearby districts were indifferent on reports handed in for week of Oct. 28. Hazel Green, usually heavy on raw ore shipped 3 cars from the Lawrence mine 120 tons. Shullsburg usually reporting to Winskill, showed no returns last week but instead came 3 cars ore from the Oliver Mining Co. operating the Mulcahy mine to Galena Refining Co. This shipment proves the Galena Refining Co. does not propose to lay down on operations although notice was served by the city of Galena to abate the nuisance of sulphur fumes. One car of high grade product was shipped to Lanyon Zinc Co. 40 tons. Black-Jack to Mineral Point 4 cars mine run, 159 tons. Birkbeck to Joplin Separating Works 3 cars, 132 tons. Graham mine, of Vinegar Hill string, to Cuba 4 cars, 152 tons. North Unity 2 cars, 878 tons. Wisconsin Zinc Co. finished product to M. & H. Zinc Co., LaSalle, 160 tons.

Potosi.

The Wilson Mining Co. reporting steadily shipped 1 car 59% wets last week to LaSalle, 40 tons. Forty-five men are engaged and 275 tons of rock handled daily. A new derrick and hopper at the Trego shaft is being built and when finished will enable a 24-hour run at the mine. A stope is to be taken up 600 ft. long, 150 ft. wide and 20 ft. high. Thirty acres of the leasehold have been fully proven. It is aimed to handle 400 tons daily at the mill. Miners' cottages are being constructed and plans have been drawn for a new boarding house to care for 30 men. The Tiffany Zinc Co. to the east of the Wilson mine is rushing building operations on a 300-ton plant from which service is expected within 15 days. The ore in this district is all high grade as it comes from the jigs and no separating facilities will be required. In addition a fair recovery of lead ore is made in concentrating at all the mines developed here the past year.

Your correspondent was in error in stating that A. B. Paterson was general manager of the Chicago Zinc Co. W. N. Tiffany occupies that position and also owns one-half interest in the company.

Wilson Mining Co. is outputting steady and well-maintained production, a car going in last week to LaSalle, assaying 59% and calling for top price, for mine run stuff.

A new derrick and hopper are going at the Trego mine for the Wilson Mining Co. When this is complete it is proposed to operate the mill 24 hours each day. A stope 20 ft. high, 600 ft. long and 150 ft. wide is waiting to be taken up; 30 acres of the lease have been fully explored and it is proposed to handle 400 tons of mill rock daily. A. L. Manass, formerly superintendent of the Fields mines at Shullsburg,

is now in charge of the Wilson mines. Another car of high-grade blende was shipped last week to LaSalle, 45 tons, and in addition one 25-ton car of lead ore cleared. The Wilson has been a good dividend payer, but its best profits are yet to come. Near the Wilson a new 300-ton mill is in course of construction for the Tiffany Zinc Co., recently incorporated. Much prospect work with drills is being followed in this section with good results.

WYOMING.

Conroy.

The mines of the defunct United States Coal Co. are to be reopened by the recently organized Wyopa Coal Co. P. J. Foley, Pittsburg, Pa., will have charge. The new company recently borrowed \$800,000 for the purpose of pushing the project. The setting in of winter, with the accompanying excessive demands for coal, has hastened the opening of the mine. While labor is unusually hard to secure at this place, it is said that Foley has made arrangements in the east to place more than 100 men at work immediately.

Casper.

The Merritt Oil & Gas Co. has brought in a well in the deeper strata on Section 10 ground. There is 1,000,000 cu. ft. of gas escaping from this oil well every 24 hours and steps are now being taken to construct a pipe line and save the gas. After the drill penetrated the sand to a depth of 10 ft. tremendous pressure was caused by the escaping gas. For an hour after the ten-foot point had been reached the oil continued to raise until more than 1000 ft. of oil raised in the well. This shows the producing capacity of which the sand is capable. Enthused by this showing Midwest expects to start for the deeper strata on ground of the Elkhorn Co.

CANADA.

BRITISH COLUMBIA.

Silverton.

To provide its equipment with more power, the Standard Silver-Lead Mining Co. is installing a new high-power crude oil engine in its mill at Silverton. During the cold period lack of energy has necessitated curtailing the output for a number of years, but with the additional power it is believed that capacity operations can be maintained steadily. Ice forming in the flume that furnishes the mill caused a shut down at the property a few days ago, but activity will be resumed as soon as the plant, in continuous operation for many months, is overhauled. Use of new machinery in connection with the flotation and concentrating plant, and the desirability of making provision against temporary cessation of hydro-power supply are reasons given for putting in the oil engine. Development of the recent strike in the lowest level of the Echo mine at Silverton has opened the ore body to a width of 11 ft. without reaching the limit, according to J. H. Thompson, manager. The property, which adjoins the Alpha claims of the Standard group, on which a 16-ft. ore body is being worked, is owned by Spokane men, including John Jordan and L. J. McAtee.

Nelson.

The Norman Mines Co. of Spokane, of which James A. Welch, railway construction contractor, is president and general manager, and Sidney Norman, mining broker, is secretary-treasurer, has taken a lease and bond on the Madison group, on Reco mountain, near Nelson. The bond is for 3 years at \$25,000, with \$5000 due payable June 1, 1917, \$10,000 March 1, 1918, and \$10,000 Dec. 1, 1918. Andrew G. Larsen of Spokane is consulting engineer for the company, and he already has a force at work cleaning out the workings preparatory to an extensive examination. This group consists of four claims, the Madison, Argenta, Great Eastern and Mardon, lying north and south on Reco mountain in line with the vein systems of the Noble Five, American Boy and Last Chance properties, which have produced large tonnage of

high-grade ore. W. F. Kennedy, Ralph Clarke and H. B. Nichols of Spokane, sold this property 20 years ago to W. C. Price of San Francisco, who transferred it to the Slocan Sovereign Mines, from which the Norman Co. gets it. Five tunnels, the lowest and longest being 1100 ft., have developed these properties and opened the vein to a depth of 300 ft. Picked samples have run as high as 2000 ozs. silver. Several streaks of high-grade ore in levels No. 4 and No. 5 will be developed.

ONTARIO.

Colbalt.

It is noted in the company report of Nipissing that the company mined ore valued at \$233,646 and made shipments including customs ores totaling \$410,233 during October. Important development was the continued good results obtained in four raises on vein 490 at the 5th level. The average is 50 ft. above the level. Usually there were two or three veins in each raise and during the month the average of all four was 6, assaying 1000 ozs. Some of the raises have shown as high as 10 ins. assaying 1800 ozs. In addition to high grade the raises are producing a good grade of mill ore. Indications are that a future stope on this vein will have an average width of 8 or 10 ft. At present, three of the raises have encountered a local fault, which from past experience throws the vein 6 ft. It is expected that the portions of the vein above the fault will be approximately the same as those found below.

The shaft at Lorrain Con. which will be sunk to the 400 level, is now down 300 ft. The company have planned extensive exploration which includes about 1400 ft. of drifting from the 400. The company resumed work in the summer and have added 200 ft. to the former depth of the shaft. The shaft was sunk on an 8-in. vein, carrying smaltite and some nickelite. The vein dipped out of the shaft at 65 ft. but will be again reached in a crosscut from the lower level. Engineers have recommended exploration work near the contact.

Gowganda.

Though no railroad as yet has been built or contemplated for this camp development continues with a small production. At the Miller Lake-Obrien it is said a find was made on the 325 level. Little can be learned of it since the ground is privately owned. The vein, which has already been drifted on for 150 ft., shows a width in some places of 39 ins. A fair average is put at 2 ft. The ore in this is said to average 5000 ozs.

Crews-McFarland installed a 5-drill compressor and are continuing the shaft from the 100 to the 200 level. The plans of development outlined call for crosscutting and drifting at the lower level. The company have some excellent surface showings.

On the Mapes-Johnson ore has been developed on three levels. A shipment is now being prepared, to be sent out over the snow. Drifting is under way on the 378 level and the face of the drift is in good ore, the same vein being on the 265. The company is equipped with a 3-drill compressor, a hoist, buildings, etc.

Kirkland Lake.

Installing new machinery at the Lake Shore Gold Mines Ltd. has been completed. The new compressor has a capacity of 740 cu. feet, and operates 7 drills. It can be operated either by steam or electric power. For the present it will be driven by steam until the Northern Ontario Light & Power Co. complete the power transmission line. The hoist is 10 by 12 ins. It is adequate for hoisting 1000 ft. Power is furnished at the present time by a steam plant of 160 hp. The shaft is down 300 ft. Considerable development work has been done on the 100 and 300 levels. About 400 ft. of drifting has been done at the 400 and 250 ft. of this in ore. At the 100 the shoot is shorter and about 120 ft. is in ore. All work has been done to the west of the shaft. An 800-ft. diamond drill hole was sent under the lake and several veins were located. Later crosscut will be run to these. At the 200 level it is proposed to do some work on a drift under the lake. A new mill has also been proposed and the site selected.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

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Ferguson, David.—*The Coal Fields of Scotland*. [A paper read before the Inst. of Mg. Eng., Scotland. The geology and nature of the deposits are described].—Coal Tr. Bull. Nov. 15 1916; p 47; pp 3½; 25c.

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Schrader, Frank C.—*The Ore Deposits of Mohave County, Ariz.* [Abstract of a paper read before the A. I. M. E. treating mostly on the gold deposits of the district].—M. & S. P. Nov. 19 1916; p 733; pp 5; 20c.

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silver and zinc are produced].—E. & M. J. Nov. 18 1916; p 889; pp 4½*; 25c.

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II. ORES AND METALS

(I) METALS AND ORES

Aluminum

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Davies, R. S. — *Hydraulic Packing at Ballarpur Colliery, Central Provinces*. [From the transactions of the Mg. and Geol. Inst. of India].—Coll'y Guard. Nov. 3 1916; p 856; pp 1*; 35c.

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Brinsmade, Robert B. — *Two Washington Mining Districts*. [The districts are known as Meteline Falls and Bald Mountain. Zinc, lead, copper and gold are found, with some silver. The various properties and their activities are spoken of briefly].—M. & S. P. Nov. 18 1916; p 743; pp 2½*; 20c.

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O'Neill, Haylett.—*Estimating Condensing Water.* [Reproduction of a chart is given].—Pract. Eng. Nov. 15 1916; p 951; pp 1½*; 20c.

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Ore and Metal Markets; Prices-Current

New York, Nov. 30, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Nov. 29 were as follows:

	New York. Cents.	London. Pence.
Nov. 23.....	73½	34 15/16
24.....	73½	34 15/16
25.....	73½	35 3/16
27.....	74	35 5/16
28.....	74	35 5/16
29.....	74	35 5/16

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London	
	1916	1915.	1916.	1915.	1915.
	High.	Low.	Avg.	Avg.	Avg.
January	57½	55½	56.775	48.890	26.875
February	57	56½	56.755	48.477	27.000
March	60½	56½	57.935	49.926	27.080
April	73½	60½	64.415	50.034	31.375
May	77½	68½	74.27	49.915	34.182
June	68½	62½	65.02	49.072	31.038
July	65	60	62.94	47.519	29.870
August	67	64	65.50	47.178	31.25
September	69½	67½	68.515	48.68	32.18
October	69½	67½	67.855	49.385	32.21
November .....	.....	.....	.....	51.713	.....
December .....	.....	.....	.....	55.038	.....
Year .....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Tenseness in the copper situation has been replaced by conservatism in the past week. Under the guiding hands of the prominent producers the copper situation has developed to such a point that nothing can take place that would have a repressive effect on the future prosperity of the red metal. Under their guidance the furious buying has terminated. They have held down on consumers who sought to cover needs over all of next year. They have talked conservatism and preached about the ill effects that a runaway market would have. They have cautioned consumers against overbuying. They have, finally, told their regular domestic customers that their future requirements would not be overlooked or would foreign purchases be given any preference. It has only been by these means that the producers have been able to restore confidence in the situation. Many consumers thought that the producers were after their pound of flesh and that the time had come to cast off business acumen and take copper for whatever delivery it could be had and at whatever price was demanded. Naturally the continuance of such a state of affairs would act to undermine any market, therefore the producers struggled to stave off this calamity. That they have succeeded is evidenced by the less active demand for copper.

Business since our last report taken by dealers and producers amounted to about 130,000,000 lbs. Of this aggregate less than 10,000,000 lbs. was for delivery after the first half. Producers have stopped selling for third or fourth quarter delivery. The dropping of the French inquiry for 225,000,000 lbs. for second half delivery reflects their attitude. While it was stated that this matter never reached the stage of formal negotiations it is known, however, that the buyers abandoned the plan on instructions of leading copper factors who realized just what condition such a sale would lead to. Domestic buying continued along lines that indicated the covering of nearby and second quarter requirements alike. Some consumers took December and January metal. Others ordered first quarter delivery, while a substantial business was done for the second quarter. Producers did not partake in the nearby business, confining their sales to second quarter and in a few instances disposing of metal for the third quarter. Prices have now reached a level at which they are likely to remain for several months, that is until

the next wild buying movement sets in, unless producers feel that present values are the top. Spot electrolytic sold at the new high record price of 36½ cts., but only a small tonnage was involved. Spot lake sold at 35 cts. Electrolytic for December delivery sold in carload lots at 34½ cts., while dealers took orders for the first quarter at 33½ cts. with business for the second quarter done at 32½ cts. For the third quarter some sales at 31½ cts. are known to have been made. Casting copper for March delivery sold at 32 cts., while one of the important eastern producers of this grade is declining to quote.

The course of the London market has been distinctly upwards. Spot electrolytic has climbed up to £168 and three months delivery of this grade up to £165. Standard copper has advanced to £147 for spot and £141 10s for futures.

Quotations for copper per pound at New York for the week ended Nov. 29 were as follows:

(For first quarter delivery.)

	Lake.	Electrolytic.	Casting.
Nov. 23.....	33 @ 33½	33 @ 33½	31 @ 31½
24.....	33½ @ 33½	33½ @ 33½	31½ @ 32
25.....	33½ @ 33½	33½ @ 33½	31½ @ 32
27.....	33½ @ 33½	33½ @ 33½	31½ @ 32
28.....	33½ @ 33½	33½ @ 33½	31½ @ 32
29.....	33½ @ 33½	33½ @ 33½	31½ @ 32

Quotations for copper per ton at London for the week ended Nov. 29 were as follows:

	Spot.	Standard Futures.	Electrolytic.
Nov. 23.....	£144	£139	£164
24.....	144 10s	140	165
25.....	144 10s	140	165
27.....	147	141	168
28.....	145	137	169
29.....	150	142	169

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.312
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	23.00	28.75	17.758
October	29½	29.00	29.18	17.925
November .....	.....	.....	.....	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	23.00	28.75	17.705
October	29½	29.00	29.18	17.869
November .....	.....	.....	.....	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	28.00	26.75	27.70	108.681	71.461
May	27.75	26.00	26.692	104.794	77.860

June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.60	24.75	24.90	111.100	87.350
September	27.00	25.50	26.40	116.10	68.560
October	28.50	27.00	27.31	117.25	72.577
November .....	.....	.....	.....	.....	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

September ..	7.10	6.70	6.88	4.627	31.25	22.953
October	7.10	7.00	7.05	4.612	30.20	23.932
November .....	.....	.....	.....	5.152	.....	26.240
December .....	.....	.....	.....	5.346	.....	28.884
Year .....	.....	.....	.....	4.675	.....	23.099

Tin.—The scarcity of spot tin has not been relieved in the past week and, while prices are about a half-cent off from the top this is due to profit-taking by small holders. Spot Straits sold at 45¼ cts., an advance of almost 4 cts. since the beginning of the month. Spot Banka sold up to 45¼ cts. Present prices are 45¼@45½ cts. for Straits and 44¼ cts. for Banka.

London and Singapore advanced last week, but during the current week the markets have shown irregularity. On Thursday Singapore touched £196 and Straits tin at London £191 10s.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Nov. 29 were as follows:

	New York		London		Singapore
	Spot.	December.	Straits spot.		shipments.
Nov. 23.....	45½c	45¼c	£191 10s		£196
24.....	45½c	45¼c	190 5s		195
25.....	45½c	45¼c	190 5s		195
27.....	45½c	45¼c	190 10s		195
28.....	45½c	45c	190		195
29.....	45c	44¾c	189		194

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.28
May	52.00	46.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.366
September	39.50	38.00	39.00	33.13
October	44.00	39.37½	41.17	33.077
November .....	.....	.....	.....	39.375
December .....	.....	.....	.....	38.765
Year .....	.....	.....	.....	38.664

Lead.—A very good business has been done in lead by leading independent producers at rising prices. Although outside interests took good orders it was noted that a tendency existed to hold down sales until the A. S. & R. Co. took some action on its price. Independents sold lead for December delivery at prices ranging from 7.25 to 7.30c. Naturally the quotation of 7.60c New York of the A. S. R. Co. is out of line. Some lead factors believe that an advance of \$10 a ton will be announced with the turn of the month and 8 cts. for lead is predicted by the end of December. Domestic consumers were the principal buyers. As yet the Canadian and Far Eastern interests have not entered the market. Lead for early December delivery is very scarce. Some producers are pretty well sold up, which is another factor in carrying prices to higher ground.

At London the situation has not undergone any change, the government maximums prevailing.

Quotations for lead per pound at New York and per ton at London for the week ended Nov. 29 were as follows:

	New York		London	
	Indpts.	A.S.&R.Co.	Spot.	Futures.
Nov. 23.....	7 20c	7 00c	£30 10s	£29 10s
24.....	7 25c	7 00c	30 10s	29 10s
25.....	7 25c	7 00c	30 10s	29 10s
27.....	7 25c	7 00c	30 10s	29 10s
28.....	7 30c	7 00c	30 10s	29 10s
29.....	7 40c	7 00c	30 10s	29 10s

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London		
	1916			1915.	1916.	
	High.	Low.	Avg.	Avg.	Avg.	
January	6.20	5.50	5.926	5.730	31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	22.010
April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	4.76	6.88	5.875	29.760	25.750
July	6.85	6.25	6.37	5.738	28.035	25.611
August	6.70	5.95	6.32	4.750	30.260	22.150

Lead Ore.—In the Missouri-Kansas-Oklahoma district during the week ended Nov. 25 prices for the best grades were up to \$90, while the poorer grades dropped \$3 to \$82. The shipments made during the week were up to 2,258,570 lbs. valued at \$98,532. The total for the year was placed at 93,007,522 lbs. and this amount was valued at \$3,858,974.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.375	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	48.25
October	87.00	70.50	79.875	51.80
November	90.00	82.00	85.5625	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—Prices were up again during the week ended Nov. 25 and the better grades sold at \$105 with the price for poorer grades ranging down to \$97.50. The week's shipments amounted to 16,405,350 lbs. valued at \$783,808, and the year's shipments to date were 635,341,737 lbs. valued at \$25,464,921.

Calamine.—This ore was also higher and sold at from \$62 to \$46. The week's shipments amounted to 2,046,210 lbs. valued at \$54,837, and the year's shipments to date amounted to 35,452,115 lbs. valued at \$1,057,959.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	53.90
February	130.00	86.00	119.75	64.437
March	115.00	80.00	100.50	62.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	83.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	60.00	58.75	60.25
September	65.00	45.00	56.00	76.75
October	75.50	50.00	63.375	82.40
November	105.00	70.00	86.25	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Demand for prime western spelter for first quarter delivery has been quite active, with further price advances. Buying has come mainly from domestic users. While some business has been done for the second quarter there appears to be no decided effort to cover needs over that period. Brass special has been in very good demand, spot moving up to 14@14¼ cts. St. Louis. Spot prime western advanced to 13½@13¾ cts. New York, and 12½@13 cts. St. Louis. A fair business for December delivery was done at prices ranging from 12½ to 13½ cts. For first quarter delivery sales were made from 12½ to 12½ cts. St. Louis. Second quarter delivery held around 11½ cts. Although prices are much higher than before the buying movement began, some producers of spelter remain out of the market, asserting that still higher prices are to be obtained. With zinc ore selling at \$105 a ton at Joplin, spelter below 11 cts. is cheap. It is apparent nevertheless that producers in their plan to secure higher prices are holding back metal and are depending on their past earnings to support their actions. On the other hand production of spelter has not reached the record-breaking figures that were indicated in the capacity report several months ago, as many of the retorts were not fired.

At London the situation has not shown any essential change, prices moving in narrow channels. Exports of spel-

ter are unusually heavy, shipments of 13,134 tons being reported since the first of November.

Quotations for spelter per pound at New York and per ton at London for the week ended Nov. 29 were as follows:

	New York.	Spot.	London.	Futures.
Nov. 23.....	13c	£58	£55	
24.....	13c	58	55	
25.....	13c	58	55	
27.....	13½c	58 10s	55 10s	
28.....	13.30c	59	57	
29.....	13.25c	59 10s	57 10s	

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916.	1915.	1916.	1916.	1915.	1915.
	High.	Low.	Avg.	High.	Low.	Avg.
January.....	19.42½	17.30	18.80½	6.519	89.840	30.819
February.....	21.17½	18.67½	20.094	8.866	97.840	39.437
March.....	20.60	16.60	18.40	10.125	100.720	44.278
April.....	19.37½	17.75	18.76	11.48	98.103	48.942
May.....	17.60	13.75	15.98	15.825	89.507	67.320
June.....	13.62½	11.25	12.72	22.625	67.410	100.320
July.....	10.75	8.75	9.80	20.803	53.00	98.150
August.....	9.75	8.37½	9.11½	16.110	66.00	68.250
September.....	9.70	8.12½	9.22	14.493	51.30	64.400
October.....	10.42½	9.42½	9.99	14.196	53.15	64.196
November.....				16.875		88.240
December.....				16.675		89.153
Year.....				13.914*		66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—A reduction of \$2.00 a flask has been made in spot virgin quicksilver, sellers stating that demand was inclined to be dull and with supplies arriving steadily it was impossible to maintain the price at \$80. Offerings are now being made at \$78 per flask, but even the lower price has failed to attract business.

Tungsten.—Demand for tungsten has been very active with sellers reporting a considerable business done for delivery over all of next year at prices ranging from \$17.50 per unit for ordinary grades to \$18 per unit for high grades. Eastern buyers have been especially anxious to take on tungsten for forward requirements. The situation in this metal is clouded. In the first place there are some interests who would like to see tungsten go up above \$50 a unit so that they can carry through stock selling schemes. Then again there are some speculators who bought tungsten when prices were high without thought that increased production would furnish a corrective. These individuals are holding metal for higher prices. On the other hand there are some producers who are finding that present market values yield a good profit and, being the principal outputters, are in a position to hold the market down. Brazilian ores are going direct to Europe while Japan has placed restrictions on shipments.

Sheet Zinc.—Further advances have been announced in sheet zinc, the price going to 22 cts. base with the usual 8% discount. Since the first of November five advances have been announced.

Antimony.—The situation has neither improved or weakened since our last report. Some Chinese and Japanese interests being well sold up are holding spot at 15 cts. Dealers on the other hand are willing to sell at 14 cts. duty paid. A fair sized Canadian purchase for nearby delivery has been put through, but otherwise business has been limited.

Pig Iron.—Basic iron has sold at \$30 valley and bessemer at \$35 valley, while foundry grades have advanced \$1 a ton and in some cases more. The demand for pig iron has been very heavy and sales in all districts last week amounted to over 175,000 tons.

Ferro Manganese.—Buying has been quite active lately with a number of good sized inquiries now in the market. Domestic producers have secured all of the business at \$164 delivered while English makers have been asking that price at the seaboard. It is intimated that English makers will soon lower their prices.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06¼	to	.06½
Nitric, 40 deg.....	.08¼	to	.07
Alcohol—U. S. P., gal., Grain, 190 proof.....	2.74	to	2.75
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.95	to	1.00
Denatured, bbl.....	.65	to	.70
Alum—Powdered, lb.....	.04½	to	.04¼
Lump, lb.....	.04	to	.04½
Ground, lbs.....	4.10	to	4.12½
Ammonia—			
Muriate, white grain, lb.....	.13½	to	.15
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06	to	.06¼
Red, lb.....	.62½	to	.65
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.16
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.16
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	6.50	to	6.75
Coke—Connellsville furnace.....	6.50	to	6.75
Foundry.....	9.00	to	9.25
Copperas—Spot, bbl.....	1.25	to	1.50
Ferrosilicon, 50%.....			100.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaubers Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			5.95
Bessemer, Mesabi.....			5.70
Non-Bessemer, old range.....			5.20
Non-Bessemer, Mesabi.....			5.05
Lead—Granulated, lb.....	.14½	to	.15¼
Brown sugar.....	.11½	to	.11¼
White crystals.....	.13	to	.13½
Broken, cakes.....	.12½	to	.13
Powdered.....	.13¾	to	.14
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.08	to	.08½
Single.....	.11	to	.11½
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Platinum—Oz. ref.....	105.00	to	111.00
Potash Fertilizer Salts—			
Kalnit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
Refined, bbl.....			.12
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	460.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.40	to	.42
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.80	to	1.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.95	to	1.00
Prussiate, red.....	2.50	to	2.75
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.31	to	.31½
Soda—Ash, 48% (43% basis), bbl.....	3.00	to	2.60
Strontia Nitrate, casks, lb.....	.28	to	.30
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.14¼	to	.14¾
Crystals, bbls., lb.....	.29	to	.29¾
Oxide, lb.....	.48	to	.50
Zinc Chloride.....	.10¼	to	.11¼

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid In 1916	Total to date	Latest Date	Amt.					Paid In 1916	Total to date	Latest Date	Amt.
Acacia, s. i. c.....	Colo.	1,438,989	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g.....	Colo.	480,915	\$1	\$.....	\$98,916	Sept. 1, '01	\$0.01
Adams, s. i. c.....	Colo.	80,000	10		773,000	Dec. 15, '09	.04	Golden Star, g.....	Ariz.	400,000	5		120,000	Mar. 15, '10	.05
Adventure, c.....	Mich.	100,000	25		50,000	July 20, '16	.50	Gold's Com. Fra. g.....	Nev.	922,000	1		92,111	Oct. 15, '09	.10
Alaska Goldfields.....	Alaska	250,000	25	2,000,000	6,050,000	Oct. 10, '16	.40	Goldfield Con.....	Nev.	3,659,148	100		23,999,831	Oct. 31, '16	.10
Alaska Mexican, g.....	Alaska	150,000	5		403,250	Jan. 10, '16	.15	Good Hope, g. s.....	Colo.	500	100		941,250	Jan. 1, '03	.25
Alaska Mines Sec.....	U. S.	500,000	5		3,507,381	Nov. 28, '15	.10	Good Sp. Anchor, z. s.	Nev.	550,000	1	33,000	119,755	June 15, '16	.01
Alaska Treadwell, g.....	Alaska	200,000	25	250,000	90,000	Nov. 1, '06		Grand Central, g.....	Utah	500,000	1	20,000	1,635,250	Oct. 25, '16	.04
Alaska United, g.....	Alaska	150,200	5	54,060	15,780,000	May 29, '16	.50	Grand Gulch, c. s.....	Nev.	239,845	2.50	17,790	19,187	Sept. 6, '16	.03
Altouze, c.....	Mich.	100,000	25	700,000	2,045,270	Feb. 28, '16	.30	Granite, g.....	Alaska	430,000	1	17,200	17,200	May 10, '16	.02
Amalgamated, c.....	Mont.	1,538,829	100		500,000	Oct. 4, '16	2.50	Gravel, g.....	Cal.	100,000	10		431,500	Feb. 1, '06	.25
Am. Sm. & R. com	U. S.	800,000	100	2,500,000	103,444,933	Aug. 30, '15	3.77	Hazel, g.....	Cal.	900,000	1		1,114,000	Jan. 5, '15	.01
Am. Sm. & R. pf.....	U. S.	800,000	100	2,500,000	31,833,333	Sept. 1, '16	1.59	Hecla, a. l.....	Idaho	1,000,000	0.25	1,400,000	5,155,000	Nov. 20, '16	.15
Am. Sm. Sec. A. pf.....	U. S.	170,000	100	1,020,000	57,421,336	Sept. 1, '16	1.75	Hercules.....	Idaho	1,000,000	1	2,450,000	13,200,000	Nov. 16, '16	.20
Am. Sm. Sec. B. pf.....	U. S.	300,000	100	1,400,000	11,720,000	Oct. 2, '16	1.50	Hidden Treasure, g.....	Cal.	30,000	10		457,452	Sept. 1, '00	.10
Am. Zinc, L. & Sm	Mo.	193,120	25	3,098,360	17,010,000	Oct. 2, '16	1.25	Holy Terror, g.....	S. D.	500,000	1		172,000	Jan. 1, '00	.01
Anaconda, c.....	Mont.	2,331,250	50	16,318,750	4,147,180	Nov. 1, '16	.50	Homestake, g.....	S. D.	251,160	100	1,795,798	37,501,502	Nov. 25, '16	.55
Annie Laurie, g.....	Utah	25,000	100		180,576,771	Nov. 28, '16	2.00	Hope Dev.....	Cal.	500,000	1		5,000	Dec. 31, '15	.01
Argonaut, g.....	Cal.	200,000	5	55,000	439,561	Apr. 22, '05	.50	Horn Silver, l. s. z.....	Utah	400,000	1	40,000	5,182,000	June 30, '16	.05
Arizona, c.....	Ariz.	250,000	5	576,982	1,695,000	Sept. 25, '16	.07%	Imperial, c.....	Ariz.	500,000	10		300,000	June 24, '07	.20
Arizona Com. c.....	Ariz.	250,000	5	130,000	20,279,362	Nov. 1, '16	.01	Inspiration Con.....	Ariz.	920,687	20	5,454,989	5,454,989	Oct. 31, '16	2.00
Arizona United, g.....	Ariz.	2,500,000	1	25,000	130,000	Oct. 30, '16	.50	Intermountain, c.....	Mont.	1,615,020	1	8,705	8,705	Oct. 20, '16	.00%
Atlantic, c.....	Mich.	100,000	25		25,000	Oct. 2, '18	.01	Interl Nickel, com.	U. S.	1,673,354	25	7,949,574	33,451,414	Sept. 1, '16	1.50
Baldad-Chase, g. pf.	Cal.	84,819	5		990,000	Feb. 21, '05	.30	Interl Nickel, pf.....	U. S.	89,126	100	534,756	5,832,202	Nov. 1, '16	1.50
Bald Butte, g. s.....	Cal.	250,000	1		202,394	Jan. 1, '09	.10	Intern'l Sm. & Ref.	U. S.	100,000	100		4,100,000	May 2, '14	2.00
Baldy, c.....	Mich.	100,000	25		1,354,648	Nov. 1, '07	.04	Interstate-Calahan	Idaho	464,990	10	2,092,455	4,649,990	Sept. 30, '16	1.50
Barnes-King, g.....	Mont.	40,000	5	60,000	7,950,000	Dec. 31, '13	2.00	Iowa, g. & l.....	Colo.	1,666,567	1		270,167	Dec. 31, '15	.00%
Beck Tunnel Con.....	Utah	1,000,000	0.10		60,000	June 1, '16	.07%	Iowa Tiger, g. s. l.....	Colo.	3,000	1		25,179	Jan. 15, '16	.50
Big Four Expl.....	Utah	400,000	1	100,000	940,000	Nov. 15, '07	.02	Iron Blossom, l. s. g.	Utah	1,000,000	1	360,000	2,850,000	Oct. 20, '16	.16
Board of Trade, z.....	Wis.	120,000	1		110,000	Sept. 4, '16	.05	Iron Cap pf. c.....	Ariz.	33,481	10	6,422	29,803	July 1, '16	.35
Bonanza Dev.....	Colo.	800,000	1		78,000	Jan. 15, '11	.05	Iron Clad, g.....	Colo.	1,000,000	1		50,000	Nov. 1, '06	.05
Booth (Reorganized)	Nev.	993,295	5	349,349	1,425,000	Oct. 28, '11	.20	Iron Silver.....	Colo.	800,000	20		5,050,000	Dec. 31, '16	.10
Boss, g.....	Nev.	405,500	1	8,170	349,349	June 25, '16	.05	Isabella, g.....	Colo.	2,250,000	1		742,500	Mar. 1, '01	.01
Boston & Colo. Sm.	Colo.	15,000	10		49,020	Nov. 1, '16	.05	Isle Royale, c.....	Mich.	150,000	25	450,000	600,000	Oct. 31, '16	2.00
Bot. & Mont. Com.	Mont.	100,000	25		402,350	Oct. 1, '02	.75	Jamison, g.....	Cal.	390,000	10		378,300	Jan. 1, '11	.02
Breese, l. s.....	Cal.	300,000	1		63,250,000	May 15, '11	4.00	Jerry Johnson, g.....	Colo.	2,500,000	10		187,500	Nov. 5, '14	.00%
Bullion-B & Champ	Utah	100,000	10		220,000	Dec. 15, '13	.10	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Bunker Hill Con. g.	Cal.	200,000	1	55,000	203,315	Sept. 15, '15	.05	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Bunker Hill & Sull.	Idaho	327,000	10	1,563,250	2,768,400	Jan. 11, '08	.10	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Butte Alex Scott.....	Mont.	75,000	10	84,662	676,000	Nov. 4, '16	.02%	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Butte-Balaklava, c.	Mont.	250,000	10		18,326,250	Nov. 4, '16	.40	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Butte Coalition, c.....	Mont.	1,000,000	15		1,054,119	Apr. 10, '16	10.50	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Butte & Superior, a.	Mont.	272,897	10	7,676,734	125,000	Aug. 1, '10	.50	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Caledonia, l. a. c.....	Idaho	2,000,000	1	859,560	4,700,000	Dec. 1, '11	.25	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Calumet & Ariz. c.....	Ar. z.	641,923	10	3,549,522	13,196,758	Sept. 30, '16	6.25	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Calumet & Hecla, c.	Cal.	100,000	25	5,000,000	1,742,381	Nov. 3, '16	.03	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Calumet & Hecla, c.	Colo.	1,750,000	25	113,564	26,997,847	Sept. 25, '16	2.00	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Cardiff, l. s.....	Utah	500,000	1	375,000	134,250,000	Sept. 22, '16	20.00	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Carlisle, g. & c.....	Utah	600,000	25		10,243,964	Jan. 1, '16	.17%	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Centennial, c.....	Mich.	1,000,000	1	100,000	500,000	Sept. 19, '16	.25	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Centennial Eureka.	Utah	100,000	25	100,000	60,000	Dec. 1, '06	.01	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Center Creek, l. z.....	Mo.	100,000	10	66,000	100,000	Sept. 1, '16	.00	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Central Eureka, g.....	Cal.	100,000	1		4,000,000	Apr. 25, '16	1.00	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Century, g. a. l.....	Utah	1,000,000	1	44,000	615,000	Dec. 1, '16	.10	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Cerro Gordo, l. s. z.....	Cal.	1,000,000	1	25,000	799,159	Mar. 6, '06	.05	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Champion, c.....	Mich.	100,000	25	6,920,000	392,087	Feb. 15, '16	.05	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Chief Con.....	Mich.	892,940	1	178,471	392,087	Feb. 15, '16	.05	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Chino Copper c.....	N. M.	892,940	5	5,002,385	25,000	Sept. 23, '16	.02%	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
C. K. & N. g.....	Colo.	1,431,900	1		17,920,000	Nov. 14, '16	6.40	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Cliff, g. a. l.....	Alaska	100,000	1		527,508	Nov. 14, '16	.05	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Clinton, g. a. l.....	Utah	800,000	10		11,700,377	Sept. 30, '16	2.25	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Clinton, g. a. l.....	Colo.	1,000	100		171,800	Nov. 4, '04	.01	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Colo. G. Dredging.....	Colo.	200,000	10	109,000	115,000	Jan. 6, '14	.05	Cal. Butler.....	1,718,000	1	343,604	515,406	Aug. 1, '16	.10	
Colorado, s. l.....	Utah	1,000,0													

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1918	Total to Date	Latest						Paid in 1918	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah	500,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04	Success	Ida.	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03	
Pharmacist, g.	Colo.	1,600,000	1	91,500	Feb. 1, '10	.00%	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Oct. 10, '16	1.00	
Phelps, Dodge & Co	U. S.	450,000	100	9,000,000	67,371,527	Sept. 30, '16	8.00	Superior & Pitts. c.	Ariz.	1,499,792	10	10,318,568	10,318,568	Dec. 21, '15	.35
Pioneer, g.	Al'ska	5,000,000	1	2,041,525	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	9,420,000	9,420,000	July 23, '07	4.00	
Pittsburg, I. z.	Mo.	1,000,000	1	20,000	July 15, '07	.02	Tamarack-Custer	Idaho	2,000,000	1	71,050	71,050	Aug. 30, '16	.02	
Pittsburg-Idaho, I.	Ida.	1,000,000	1	291,004	Oct. 2, '16	.04%	Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75	
Pitts Silver Peak	Nev.	2,790,000	1	840,800	Dec. 1, '14	.02	Tightner	Cal.	100	100	150,000	150,000	Jan. 3, '14	.75	
Platteville, I. z.	Wis.	500	60	179,500	June 15, '07	10.00	Tomboy, g. s.	Colo.	310,000	5	74,400	3,851,555	June 30, '15	.24	
Plumas Eureka, g.	Cal.	150,525	10	2,831,294	Apr. 5, '01	.06	Tom Reed, g. s.	Ariz.	909,555	1	2,555,934	2,555,934	Sept. 5, '15	.01	
Plymouth Con.	Cal.	240,000	5	293,300	Aug. 10, '16	.24	Ton. Belmont, g.	Nev.	1,600,000	1	750,000	8,393,027	Oct. 2, '16	.12%	
Portland, c.	Colo.	3,000,000	1	10,637,080	Oct. 20, '18	.03	Ton. Extension, g. s.	Nev.	1,272,901	1	604,580	1,591,776	Oct. 1, '16	.15	
Prince Con., s. l.	Nev.	1,000,000	2	325,000	Oct. 5, '15	.02%	Tonopah, g. s.	Nev.	1,000,000	1	600,000	13,600,000	Oct. 21, '15	.15	
Quartette, g. s.	Nev.	100,000	10	375,000	July 31, '07	.20	Tonopah Midway, g	Nev.	1,000,000	1	250,000	250,000	Jan. 1, '07	.05%	
Quicksilver, pf.	Cal.	43,000	100	1,931,411	Apr. 8, '03	.50	Tremmisi	Cal.	200,000	2.50	234,000	234,000	Apr. 28, '15	.02	
Quip, g.	Wash.	1,500,000	1	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	1,100,000	1,100,000	Oct. 30, '12	3.00	
Quincy, c.	Mich.	110,000	25	22,987,600	Sept. 25, '15	4.00	Tuolumne, c.	Mont.	800,000	1	495,525	495,525	Apr. 15, '13	.10	
Ray Con., c.	Ariz.	1,571,279	10	2,743,748	7,322,875	Sept. 30, '15	.75	Uncle Sam Con. s.	Utah	500,000	1	470,000	470,000	Sept. 20, '11	.06
Red Metal, c.	Mont.	100,000	10	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	167,070	167,070	Nov. 16, '15	.10	
Red Top, g.	Nev.	1,000,000	1	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	1,500,000	1,500,000	Apr. 15, '07	3.00	
Republic, g. s.	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	6,125,000	6,125,000	Aug. 6, '07	1.75	
Richmond, g. s. l.	Nev.	54,000	1	4,453,797	Dec. 23, '09	.01	United, z. l. pf.	Mo.	19,556	25	211,527	211,527	Oct. 15, '07	.50	
Rocco Home, I. s.	Nev.	300,000	1	152,500	Dec. 2, '06	.02	United Copper, c. s.	Wash.	1,000,000	1	40,000	40,000	Dec. 21, '12	.01	
Rochester Ld. & L.	Mo.	4,900	100	190,845	July 1, '12	.06	United (Crip. Ck.)	Calo.	4,009,100	1	440,435	440,435	Jan. 1, '10	.04	
Round Mountain, g.	Nev.	893,018	1	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	1,173,000	3,749,000	Sept. 30, '15	18.00	
Sacramento, g.	Utah	1,000,000	5	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	50,000	100	11,000,000	11,000,000	Sept. 23, '10	6.00	
St. Joseph, l.	Mo.	1,409,455	10	12,029,729	Sept. 20, '15	.76	United Verde, c.	Ariz.	300,000	10	3,500,000	39,397,000	Nov. 1, '15	.76	
St. Mary's M. L.	Mich.	160,000	25	7,840,000	Nov. 18, '16	2.20	United Verde Ext.	Ariz.	1,000,000	50	1,150,000	1,150,000	Nov. 1, '16	.60	
Schoenh'r-Wal'n.z.l	Mo.	10,000	10	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo.	59,188	100	414,078	414,078	Oct. 9, '03	1.00	
Scratch Gravel	Cal.	1,000,000	1	20,000	Feb. 1, '15	.02	U. S. Red & R. pf.	Colo.	39,458	100	1,775,935	1,775,935	Oct. 1, '07	1.50	
Seven Tro. Cn., g. s.	Nev.	1,443,077	1	262,532	Apr. 1, '15	.02%	U. S. R. & M. com.	USMx	351,115	60	1,316,681	7,941,860	Oct. 15, '16	1.00	
Shannon, c.	Ariz.	300,000	10	900,000	Nov. 15, '13	.50	U. S. R. & M. pf.	USMx	496,350	60	1,718,224	18,613,922	Oct. 15, '16	.57%	
Shattuck-Ariz., c.	Ariz.	350,000	10	4,637,000	Oct. 20, '18	1.25	Utah, c.	Utah	1,624,490	10	13,808,165	45,580,062	Sept. 30, '16	3.00	
Silver Hill, g. s.	Nev.	108,000	1	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	528,200	6	396,154	462,179	Sept. 30, '16	.25	
*Silver King Coal'n	Utah	1,250,000	5	14,334,955	Oct. 1, '15	.15	Utah Con., c.	Utah	300,000	6	675,000	9,825,000	Sept. 26, '16	.75	
Silver King Expl.	Utah	637,582	1	1,006,131	Oct. 22, '15	.10	Utah M. & T. l.	Utah	750,000	1	825,000	1,285,495	Aug. 15, '16	.50	
Silver Mines Expl.	N. Y.	10,000	100	250,000	June 15, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '15	.04	
Sioux Con., l. s. c.	Utah	745,389	1	872,106	July 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	207,500	207,500	Apr. 23, '10	.04	
Skidoo, g.	Cal.	1,000,000	5	365,000	Oct. 2, '14	.01	Vindicator Con., g.	Colo.	1,600,000	1	225,000	3,457,500	May 25, '16	.05	
Smuggler, s. l. z.	Colo.	1,000,000	1	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D.	500,000	1	100,000	649,466	May 15, '15	.02%	
Snowstorm, c.	Idaho	1,500,000	1	1,169,510	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,000,000	1	600,000	1,250,000	Oct. 2, '16	.02	
Socorro, c.	N. M.	377,342	6	195,070	Sept. 1, '15	.05	West End Con.	Nev.	1,738,486	1	89,424	625,969	Oct. 24, '16	.05	
South Eureka, g.	Cal.	299,981	1	1,409,754	Aug. 15, '16	.16	West Hill, c.	Wis.	20,000	1	8,000	40,000	June 29, '16	.20	
South Hecla, g.	Ida.	500,000	1	39,450	Aug. 10, '16	.16	White Knob, g. pf.	Cal.	200,000	10	60,000	190,000	Aug. 25, '16	.10	
Sw. Swansea, g. s. l.	Utah	300,000	1	287,500	Apr. 3, '04	.01%	Wilbert, c.	Ida.	1,000,000	1	40,000	50,000	Nov. 15, '16	.01	
Spearsfish, g.	S. D.	1,500,000	1	5,274,408	Jan. 7, '05	.25	Wolverine, c.	Mich.	60,000	25	720,600	9,120,000	Oct. 2, '16	6.00	
Standard Con., g. s.	Cal.	173,394	10	165,600	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,674	16	53,403	Dec. 15, '15	.25		
Standard, c.	Ariz.	425,000	1	69,500	Sept. 8, '06	.50%	Work, g.	Colo.	1,500,000	1	1,597,655	1,597,655	Apr. 31, '12	.02	
Stewart, l. z.	Idaho	1,238,362	1	2,043,297	Dec. 31, '15	.05	Yak.	Colo.	1,000,000	1	190,000	2,197,655	Sept. 30, '16	.07	
Stratton's Crp. Ck.	Colo.	2,000,000	1	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	167,500	167,500	Feb. 1, '13	.01	
Stratton's Ind.	Colo.	1,000,000	5	6,025,563	Dec. 23, '06	0.12	Yellow Aster, g.	Cal.	100,000	10	33,000	1,205,755	Nov. 6, '16	.06	
Str'n's Ind. (new)g.	Colo.	1,000,000	.30	591,250	Jan. 31, '15	.16	Yellow Pine, z. l. s.	Nev.	1,000,000	1	900,000	1,793,000	Nov. 25, '16	.10	
Strong, g.	Colo.	1,000,000	1	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	102,583	102,583	July 15, '14	.10	

Corrected to December 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1918	Total to Date	Latest						Paid in 1916	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Ajuchitlan	Mex.	50,000	\$ 6	\$ 237,500	July 1, '13	\$0.25	Las Cabrilas	Mex.	1,040	\$10	\$591,400	June 3, '12	10.00		
Amistad y Concordia g.s	Mex.	9,600	50	429,358	July 16, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25	1,527,320	Dec. 15, '16	\$0.24		
Amparo, s. g.	Mex.	2,000,000	1	2,292,176	Nov. 10, '16	.05	Lucky Tiger	Mex.	715,337	10	440,061	3,714,053	Nov. 20, '16	.10	
Barlo de Medina Mill	Mex.	2,000	25	103,691	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,692	1	289,724	4,877,492	Oct. 2, '16	.03	
Batopilas, s.	Mex.	446,268	20	55,870	Dec. 31, '07	.12%	Mexican, l. pf.	Mex.	12,500	100	1,015,750	May 1, '12	3.50		
Beaver Con., s.	Ont.	2,000,000	1	710,000	Apr. 29, '15	.03	Mexico Con.	Mex.	240,000	10	660,000	Mar. 10, '05	.25		
Boleo, g.	Mex.	120,000	20	721,871	May 8, '11	6.00	Mexico Mines of El Oro	Mex.	150,000	5	4,475,500	June 25, '14	.96		
British Columbia, c.	B. C.	591,709	6	615,399	Jan. 5, '13	.16	Minas Pedrazzini	Mex.	1,000,000	1	497,500	Jan. 23, '11	.06%		
Buena Tierra, g.	Mex.	330,000	6	160,380	Jan. 30, '15	.24	Mines Co. of Am.	Mex.	900,000	10	4,955,600	July 25, '13	.12%		
Buffalo, Ont.	Ont.	1,000,000	1	2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can.	2,075,000	1	570,525	1,348,750	Sept. 30, '16	.15	
Canadian Goldfields	Can.	600,000	0.10	237,099	July 15, '14	.01%	Montezuma, l. pf.	Mex.	5,000	100	402,600	Nov. 15, '12	3.60		
Cananea Central, c.	Mex.	600,000	10	360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex.	500,000	1	100,000	July 20, '09	.04		
Cariboo-Cobalt	Ont.	1,000,000	1	295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11	
Cariboo-McKinney, g.	B. C.	1,250,000	1	65,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex.	100,300	1	3,190,000	Oct. 11, '09	\$2.53		
City of Cobalt	Ont.	500,000	1	138,375	May 15, '09	.01	N. Y. & Hond. Rosario.	C. A.	200,000	10	300,000	4,050,000	Oct. 28, '16	.50	
Cobalt Central, s.	Ont.	4,751,500	1	192,845	Aug. 24, '09	.01	Nipissing, s.	Ont.	1,200,000	5	1,600,000	14,940,000	Oct. 20, '16	.50	
Cobalt Lake, s.	Ont.	3,000,000	1	455,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1	533,000	Feb. 1, '10	.02		
Cobalt Silver Queen	Ont.	1,500,000	1	315,000	Dec. 1, '08	.03	Paloma, g.	Mex.	3,000	1	99,600	Dec. 1, '12	6.00		
Cobalt Townsite, s.	Ont.	199,282	5	1,042,259	Aug. 20, '14	.24	Panuco	Mex.	10,000	1	7,465,000	Nov. 4, '09	6.00		
Cornwall, s.	Ont.	800,000	5	400,000	Aug. 5, '18	.25	Peneoles, s. g.	Mex.	120,000	20	5,451,687	Sept. 30, '13	1.25		
Corn. Mfg. & Sm., g. & c.	B. C.	53,050	100	631,204	1,951,341	Oct. 1, '16	2.60	Peregrina, pf.	Mex.	10,000	100	328,856	Sept. 1, '10	3.60	
Crown Reserve, s.	Ont.	1,999,957	1	6,112,408	July 15, '15	.03	Peterson Lake	Ont.	2,401,820	1	126,096	323,219	Oct. 2, '16	.01%	
Dolores	Mex.	400,000	5	1,374,865	July 24, '11	.22%	Pinguico, pf.	Mex.	20,000	100	720,000	Apr. 15, '13	3.00		
Dome Mines, s.	Ont.	400,000	10	1,000,000	Sept. 1, '16	.50	Porcupine Crown	Ont.	2,000,000	1	240,000	660,000	Oct. 2, '16	.03	
Dos Estrellas, (El Oro)	Mex.	300,000	0.50	15,405,000	Sept. 30, '13	1.60	Providencia, (S. J.)	Mex.	6,000	15	963,360	Apr. 1, '08	1.00		
El Favor	Mex.	3,500,000	1	210,000	Apr. 30, '14	.01	Rambler-Cariboo	B. C.	17,500	100	87,800	607,500	Nov. 15, '16	.01	
El Oro, g. s.	Mex.	1,147,500	5	9,136,842	July 11, '13	.24	Rea Mines, Leasing	Ont.	200,000	1	12,750	Feb. 20, '15	.00%		
El Rayo, g. s.	Mex.	260,020	2	140,410	Apr. 24, '11	.16	Right of Way	Ont.	1,685,500	1	25,291	669,690	Sept. 15, '16	.00%	
El Triunfo, c.	Mex.	2,000,000	1	20,000	Aug. 25, '11	.01	Rio Plote	Mex.	374,518	5	345,744	Feb. 1, '13	.06		
Esperanza, s. g.	Mex.	400,000	10	12,521,250	Dec. 31, '15	1.00	San Francisco Mill	Mex.	6,000	25	446,085	Oct. 15, '08	1.00		
Greene Cananea, c.	B. C.	149,985	100	6,650,251	Nov. 1, '16	2.00	San Rafael	Mex.	2,400	25	6,798,260	Jan. 11, '12	20.00		
Granby Con. c. g. s.	Mex.	474,411	100	3,403,463	Nov. 23, '16	2.00	San Toy, s. l.	Mex.	6,000,000	1.00	540,000	July 24, '13	.01		
Greene Cananea, c.	Mex.	1,000,000	10	3,500,000	Oct. 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex.	1,500,000	5	2,819,772	June 16, '16	.24		
Greene Gold-Silver, pf.	Mex.	300,000	10	194,871	Mar. 28, '07	.40	Sta. Gerty's Guadalupe, g. s.	Mex.	60,000	100	3,960,000	Mar. 27, '09	1.00		
Guanaquato Con.	Mex.	540,000	5	600,000	Oct. 8, '06	.07%	Sta. Maria del Paz	Mex.	9,600	12%	5,006,900	Jan. 2, '13	2.60		
Guanaquato Dev., pf.	Mex.	10,000	100	274,356	Jan. 1, '11	.50	Seneca-Superior	Ont.	478,844	1	1,878,902	Nov. 14, '16	.20		
Gugkenheim Explor.	Mex.	833,732	25	10,713,458	Apr. 3, '16	11.85	Soledad, s. l.	Mex.	960	20	4,439,540	Oct. 17, '11	8.00		
Haleybury, s.	Ont.	50,000	1	80,000	Apr. 5, '11	.50	Sorpres, g. s.	Mex.	19,200	20	3,979,240	Jan. 11, '11	74.00		
Hedley	B. C.	120,000	10	2,003,520	Sept. 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	550,000	2,550,000	Nov. 10, '16	.02%	
Hinds Con., g. s. l.	Mex.	6,000,000	5	89,000	Feb. 27, '02	.62	Temiscamg' & Hud. Bay	Ont.	1,940,761	1	1,940,250	Nov. 10, '12	3.00		
Hollinger	Ont.	4,000,000	5	6,090,000	Nov. 8, '16	.06	Temiskaming, s.	Ont.	2,500,000	1	150,000	6,609,156	Oct. 22, '16	.05	
Hollinger, c.	Mex.	10,000	100	67,000	Feb. 27, '10	1.00	Tezuitlan, c.	Mex.	1,800,000	100	1,955,000	Jan. 1, '09	1.50		
Korr Lake	Ont.	600,000	5	5,670,000	Sept. 15, '16	.25	Tough-Oakes	Ont.	631,600	5	255,748	332,187	Oct. 3, '16	.12	
La Blanca	Mex.	140,000	20	2,775,700	Mar. 31, '13	90	Tretbeway, s.	Ont.	1,000,000	1	1,061,958	July 16, '14	.05%		
La Republica, s.	Mex.	400,000	5	110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	656,386	Oct. 20, '13	.05		
La Rose Con., s.	Ont.	1,498,627	5	299,724	6,886,844	Oct. 20, '16	.05	Yukon, g.	Y. T.	3,500,000	5	787,860	8,370,610	Sept. 30, '16	.07%

Methods of Softening and Filtering Mine Water

M. F. NEWMAN.

One-sixteenth of an inch of scale in boiler tubes will cause a waste of 5% or more in fuel burned. As the scale increases, the loss in fuel increases. Frequent cleaning of the tubes is necessary with consequent shutting down of the boiler. Labor is required, which costs money. The tubes are injured by the scale, meaning increased maintenance.

These things are not new to those who operate boilers in hard water districts. In fact, so far from being a subject on which new things can be said, the

do it, and the item of fuel cost is as important with him, dollar for dollar, as in any other industry.

Water is hard because it carries in solution certain mineral substances, and through heating in the boiler tubes, the latter are made the dumping ground of these impurities. The substances in solution are principally the carbonates of lime, magnesia and iron, and the sulphates, chlorides and nitrates of lime, magnesia and iron.

Without going into the chemistry of the subject,



SOFTENER INSTALLATION, U. S. COAL & OIL CO., HOLDEN, W. VA. (BOILER FEED AND MUNICIPAL).



SECTION OF TUBE FROM A BADLY SCALED BOILER.

boiler scale nuisance is so old as to be rather a habit with some—a supposedly necessary evil which has to be tolerated, and about which the less said the better.

But neglecting to remove from the water those impurities which cause scale, with attendant fuel loss and deterioration, is in reality largely a matter of inertia on the part of the average power plant operator. He is not alone in his proneness to do things the way he has always done them. But with evidence on every hand, in industrial power plants, that water can be treated easily and cheaply so as to remove scale-forming impurities before it gets to the boilers, there is every reason why mine owners should look into this subject. His profits depend not alone upon how much he can take out of the ground, but how cheaply he can

it is sufficient to say that these impurities, which are not visible to the eye, can be removed by adding to the water chemical reagents, such as lime and soda ash, which will cause the impurities to become insoluble and be precipitated. This treatment may be given in a simple automatic machine called a water softener. The precipitated impurities settle harmlessly to the bottom of the softener tank, and the softened water is then filtered and delivered to the heater and boiler.

A safe rule to follow in purifying boiler feed water is to remove the hardness and suspended matter by means of an efficient water softening and filtering system, whereby all suspended matter originally in the water, as well as the precipitate resulting from the

softening reaction, are removed, so that the water is both clear and soft.

The mechanical details of water softening devices vary with the different manufacturers, but for the purpose of illustration, some of the apparatus made by Wm. B. Scaife & Sons Co., of Pittsburgh, Pa., has been selected.

Water softeners are made both intermittent and continuous in their operation.

The intermittent system consists essentially of two or more treating and settling tanks, equipped with mechanical stirring devices, operated by power, a reagent or chemical mixing tank with mechanical stirring device, with means for introducing the chemicals into the treating tanks, and one or more filters of either gravity or pressure type. The settling tanks are filled alternately with water. While a tank is being filled the chemicals are introduced and thoroughly mixed with the water. The softened and settled water is taken out of the settling tank by means of a hinged



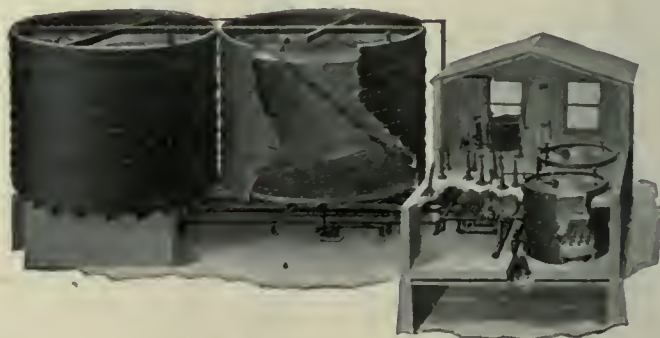
SOFTENER, CONTINUOUS SYPHON SYSTEM, THE FUCHS & LANG MFG. CO., RUTHERFORD, N. J.

floating outlet pipe arranged to rise and fall with the level of the water. While one tank is being filled, treated and settled, the other tank is supplying the softened water through the filter. When this tank is empty, the first tank is ready for use. Thus, a constant supply of clear, soft water is obtainable, although the treatment is made intermittently. In this system measured quantities of water are treated; therefore, accuracy of treatment can be maintained, and uniform, clear, soft water obtained regardless of the variation in the impurities in the water, or the rate at which the purified water is used, as the use of the water has no particular influence on the treating operation. The settling tanks act as storage, in which a considerable volume of water is carried and is available for irregular demands.

A typical arrangement of an intermittent system is shown herewith.

The continuous system consists essentially of a treating and settling tank, with mechanical feeding

device to proportion the chemicals to the flow of water through the apparatus. After treating and settling, the water is delivered through a filter for clarification. In the softening process, the reagents, such as lime and soda ash, are prepared in the reagent tank at ground level. This is a manual task, and is done at least once every 12 hours in most cases, and one man can do it



WE-FU-GO INTERMITTENT SYSTEM WITH GRAVITY FILTERS.

in a short time. This reagent solution is then pumped up into a solution tank in the upper part of the softener. By means of the syphon arrangement of this particular softener, the reagent solution is introduced in direct proportion to the volume of water flowing into the apparatus. This syphon introduction and



SYPHON CONTINUOUS SYSTEM WITH GRAVITY FILTER.

mixing is automatic in its operation, the proportion of reagents added to the incoming water being at all times constant; so that the proper quantity is added to soften the water. The water with the chemical added is mixed in the top of the vertical tank, and the reagent causes the soluble mineral matter in the water to

be precipitated in fine crystalline or powder form. These precipitates settle to the bottom of the tank where they can be readily blown off. The passage of the water through the treating and settling tank is slow enough so that ample time is allowed for precipitation and settling. The softened water is drawn from the tank and piped to the filter, or in some cases is delivered to a filter built in the top of the settling tank. The usual type of filter consists of sand or quartz of different degrees of fineness, with the coarsest at the bottom. The suspended matter is removed in passing through the sand filter, which is so arranged that by manipulation of valves, water can be forced in the reverse direction through the sand, periodically, to wash it.

Two arrangements of a continuous softener are illustrated. In one, the softened water passes through a gravity filter and is pumped into a closed type heater before entering the boilers. In the other, the water passes through a pressure filter and then into an open-type heater, the boiler feed pump being located between the latter and the boilers.

The two types of softeners, intermittent and continuous, have their respective advantages for various conditions encountered as to water supply, method of use, etc.

Review of Conditions in the Joplin Zinc and Lead District in November.

All previous records of this district both in point of tonnage and values for zinc and lead ore will again be broken by the 1916 output, which now looks as though the gross increase over 1915 will be as large or larger than last year's great gain over all previous high records.

For the 11 months of the current year, according to the Lyon Investment Co. review, the production of zinc ore (including calamine) amounts to 670,793,852 lbs., which sold for \$26,522,880. During the corresponding period of 1915 the production was 555,323,525 lbs., which sold for \$20,694,186.

The output of lead ore during the 11 months just ended has been 93,007,592 lbs., which sold for \$3,858,974, as compared with a production of 81,507,115 lbs., that sold for \$2,145,982, during the corresponding period of last year.

The foregoing figures show the value of both ores for the first 11 months of 1916 to be \$30,381,845, as against a value of \$22,840,168 for the corresponding period of 1915, and a total value of \$26,050,350 for the entire year.

Last March it was estimated that the output would reach \$35,000,000. If the average rate of production during the past 11 months is maintained throughout December, this year's output will go slightly above \$34,000,000, but there is more than \$1,000,000 worth of ore now in bins at the mines throughout the district, most of which we believe

will be marketed during the coming month in addition to the regular production, thus bringing the total value close up to our early estimate.

November closed with the price for top grades of zinc strong around \$105 per ton, which was an advance of about \$30 per ton during the month, and \$40 higher than the price in October. The market seems to be following very much the same course as it did in 1915, when a top price of \$130 was attained early in June, from which the market gradually receded to \$70 per ton in August, and then remained practically stationary at \$70 to \$80 until the latter part of October, when a steady advance set in that carried it to \$115 by the end of November, and then fluctuated between \$90 and \$110 until February, 1916, when it reached \$120, then went off to around \$100 until the middle of April, when it sold up to \$125, the top price for the year. During May and June prices were fairly steady at from \$90 to \$110, after which a gradual decline set in that carried the market down to \$65 for top grades during September and October of the current year.

With the certainty that winter weather will curtail production and with every evidence of an increasing demand for spelter, both for munitions and in commercial channels, it would seem as though a strong and high market for zinc ore may be anticipated during the next 6 months.

Extracting Pyrite from Zinc.

In many western ores the presence of large amounts of iron in the zinc concentrate has been a curse to the milling industry, because when iron was above 10% the concentrate might contain as much as \$30 worth of zinc to every ton and yet be unsalable. The method as worked out by the department of metallurgical research, University of Utah, consists of treatment of the mixed sulphides in a reducing atmosphere at about 600° C. The pyrite loses 1 atom of sulphur under these conditions and is reduced to a form which will react with dilute sulphuric acid, while the zinc sulphide is resistant to the acid. In this way the iron can be removed, making a marketable zinc product. The success of the method depends upon the use of cheap sulphuric acid, but at the same time the large smelting interests are at a loss to know what to do with their sulphur fume from the smelting furnaces. The conversion of this sulphur into sulphuric acid is quite cheaply done, but heretofore the trouble has been that there was an insufficient market for the acid. This process of removing iron from the zinc concentrate should prove to be an important consumer of acid, and is only one illustration of how one branch of the Bureau's work may fit in with another, as one section of the bureau has been studying smelter fume problems while up to the present time the Salt Lake station has been devoted entirely to the metallurgy of zinc and lead.

Mascot Copper Co.'s Aerial Tramway.

In transporting its ores from the mine to the Mascot & Western railroad for shipment, the Mascot Copper Co., at Dos Cabezas, Ariz., uses a 10,000-ft. Broderick & Bascom aerial tramway, using patented improved screw type friction grips.

Illustrations show the buckets and loading station. The capacity of the line is 50 tons per hour.

The track cables are $1\frac{1}{8}$ and $1\frac{1}{2}$ -in. B. & B. wire ropes. The B. & B. pulling wire rope is $\frac{9}{16}$ in. in diameter. This tramway operates by gravity. The

chutes, with pivotal extensions for loading the freight cars.

From this receiving station the ore-laden freight cars are hauled to the smelter at Douglas. The Mascot & Western is about 16 miles long and connects with the Southern Pacific system at Willcox. The Mascot & Western has been in operation since June, 1915.

Mineral Deposits in Eastern Nevada.

Twenty-nine mining districts in eastern Nevada are described in a report recently issued by the U. S. Geological Survey as Bulletin 648, "Notes on Some Mining Districts in Eastern Nevada," by J. M. Hill. These districts are widely scattered through an area extending from the northern part of the state to the extreme southern part, in southeastern Clark county. Not much has heretofore been known about the geologic features of the ore deposits in these districts, because they are relatively inaccessible or undeveloped. Silver, lead copper and gold are the principal valuable metals found, but tungsten and bismuth also are known to occur. Many of the deposits were found in the early sixties, when the rich oxidized ores were worked, but others have since been discovered from time to time, valuable ore bodies having been found as recently as 1911. Most of the ore deposits occur in sedimentary rocks that border intrusions of granite or porphyries. Gold and silver are found in Tertiary volcanic rocks of other parts of Nevada, but only one deposit of precious metal—a free-milling gold ore—has so far been found in such rocks in this region. The report is chiefly a record of facts, most of which are of local and practical interest. It is intended as a guide to those who wish to know something of the geologic occurrence, character, and stage of mining development of the ore deposits in the districts examined.

Reinforced Spiral Pipe Smokestack.

A novel use for reinforced spiral pipe such as that employed by mining companies for water supply, dredging and drainage operations has been found in the manufacture of a stack consisting of pipe 50 ft. long in one piece, which comes from the works of the Standard Spiral Pipe Works, Chicago. It is more rigid and appears to be stronger than any other stack of considerable heavier metal would be. The same company has also recently made up two 20-in. stacks, each 55 ft. long in one piece, with only one set of guy wires. These are now in service and were given a severe test recently when a windstorm passed over the section in which they were erected. All other stacks in the vicinity having two to four sets of guys of the same length, together with telegraph poles, trolley wires, etc., were blown down, while these stacks were not affected in the least.



TRAM LEADING FROM MINE TO RAILROAD.

longest span in the tramway is 1300 ft. The highest tower is 52 ft.

The copper ore is brought out of the mine tunnel in small ore cars, pushed by hand. These cars are dumped into a small chute leading to the "picking belt," which discharges the ore into the ore bins at the loading station. The loading station has four steel chutes for loading the tramway buckets. These chutes are of the undercut type and are operated by hand.

The ore is then carried by gravity to the Mascot & Western railroad at the recently established town-site of Mascot. The receiving station at the railway is equipped with a discharge bin having five steel

Leading Gold Mining Operations in Korea

E. W. MILLS.*

Gold mining is of very ancient origin in Korea, going back probably before the Christian era. This branch of mining, however, was entirely alluvial, and it has been overshadowed of late by the development of lode mining under modern conditions. The first concession to foreign engineers was the Morse concession in 1895. Subsequently, concessions were granted to British, German, French, Russian, Japanese, and Italian representatives.

The development of production in recent years has been rapid. In 1895 the output first passed the \$5,000,000 mark, while in 1913 it was valued at \$5,175,000, in 1914, \$5,115,000, and last year it attained the record yield of \$6,145,000.

The following is a short account of the leading mines now operating:

Un-san Concession.—The Un-san mines are situated in North Pyeng-an, about forty kilometres south of the Yalu river. This concession is being worked by the Oriental Consolidated Mining Co., an American company, which has been highly successful in its operations in this district from the beginning.

Operation were first started at Chittaballie, and a 20-stamp mill was placed in operation in 1897. This mill was the pioneer of the modern stamp mills in Korea. Before the mine was abandoned, in 1905, it had produced 152,632 tons of ore, valued at 3,036,952 yen. In 1899 a 40-stamp mill was erected at Tabowie, and in 1907 was enlarged to 80 stamps. To June 30, 1915, this mine has produced 1,226,859 tons of ore, valued at 15,918,755 yen.¹ A 20-stamp mill was erected at Kuk-han-dong in 1900. It was increased to 40 stamps in 1905. This mine was closed down on January 15, 1915, after having produced 551,892 tons of ore, valued at 4,788,182 yen. In 1902 a 40-stamp mill was placed in operation at Maibong. To June 30, 1915, 412,071 tons of ore, valued at 5,967,274 yen have been produced. In 1903 an 80-stamp mill was erected at Taracol. To June 30, 1915, this mine has produced 1,173,208 tons of ore, valued at 13,749,526 yen. There are 16 batteries of five stamps each, and 32 vanners of the Frue type. The daily capacity of this mill is about 350 tons in twenty-four hours. In 1908 a 10-stamp mill was placed in operation at Candlestick. From this mine 43,998 tons of ore, valued at 999,591 yen, have been produced up to June 30, 1915.

As may be seen from the foregoing, the growth and development of this concession has been exceedingly satisfactory. On July 1, 1915, a total of 210 stamps was in operation at the following mines: Tabowie, 80 stamps, Taracol, 80 stamps; Maibong, 40 stamps; E. Candlestick, 10 stamps. The tonnage of ore crushed for the year ending December 31, 1915, was 295,379

tons, valued at 3,758,135 yen. From this ore, gold in bullion and concentrates was recovered to the value of 3,228,941 yen. The total tonnage of ore produced from the various mines since 1897 to December 31, 1915, has been 3,986,772 tons, valued at 49,568,632 yen. The first dividend of 5% was paid in 1903. Since that time to July 1, 1915, the total dividends have amounted to 150%, of a total of 12,871,550 yen.

Su-an Concession.—The Su-an mines are situated some 100 kilometres farther south, about the middle of South Pyeng-an, some kilometres from Chin-nam-po, while the Chik-san mines are situated about the same distance south again in the Province of Kyong-Ki, adjacent to Nam-yang Bay. This British concession is held by the Korea Syndicate, Limited, of London, but is being operated by the Seoul Mining Co. This concession is being developed with highly successful results. Although not as old as the Un-san concession, its tonnage and output are increasing yearly. It shows promise of eventually becoming the largest producer in Korea. The first stamp mill of 20 stamps was placed in operation in the latter part of 1909 at the Su-an mine. This mine developed satisfactorily, and the mill was increased to 40 stamps in the autumn of 1911. During the past three years a larger mine than the Su-an mine has been developed at Tul-mi-chung, about six miles south of Hol-kol. A reduction plant, the pioneer of its kind in Korea, was placed in operation late in September, 1915. This plant has a rated capacity of 350 tons in 24 hours, and is the first one in Korea to use Hardinge conical ball and pebble mills, in place of gravity stamps, for crushing and grinding the ore. Both plants also employ the oil flotation process for the recovery of concentrate. It is expected that the production of gold from the Su-an concession for 1916 will approximate a total of 2,500,000 yen. For the year ended December 31, 1915, the Su-an concession produced 108,078 tons of ore, valued at 1,789,224 yen. The gold production for the same period amounted to 1,435,041 yen. Since the date of the commencement of milling operations in 1909 to January 1, 1916, the Su-an concession has produced 433,361 tons of ore, valued at 7,945,328 yen, with a total gold production of 6,566,244 yen. The dividends for the same period have amounted to a total of 2,180,087.50 yen, or a total of 275%.

Chik-san Concession.—This concession was operated intermittently by the concessionaires, Shibusawa-Asano Mining Partnership on a small scale until 1906. In this year American partners were admitted, and in 1907 a small stamp mill was placed in operation. In 1911 a reorganization took place, whereby the control of the concession rights was taken over by an American company, the Chiksan Mining Co. During the Japanese régime considerable work was done on the

*Excerpts from a paper read before the Korean Branch of the Royal Asiatic Society.

placer deposits, and a small profit was made. Although no exact figures are available, it is probable that the alluvial gold production during this time amounted to over 300,000 yen. For the year ended December 31, 1915, the production of gold from this concession was 933,261 yen. It is estimated that the Chik-san concession has produced 3,199,073 yen in gold, and has treated 192,144 tons of ore during the period from February, 1908, to January 1, 1916. This concession has now reached the dividend-paying stage, and is being operated successfully.

The present company has proved the existence of a large acreage of ground containing sufficient gold to warrant the installation of a gold dredge at Sei-go-ri, which was worked earlier under the supervision of the Japanese concessionaires. The order has been placed for this dredge, and it is expected that it will be in operation before the end of 1916. Chik-san will, therefore, have the distinction of starting the first gold dredge in Korea. The operation of this gold dredge, in conjunction with the present mill of 40 stamps, should result in showing a considerable increase in the gold production for 1916 and for several succeeding years.

Japanese Enterprises.—Under government encouragement an important combination was formed in recent years known as the Furukawa Partnership Co., which holds some 15,000 acres in the Koo-Sung district, North Pyeng-an. The chief interests comprised are those of Messrs. Furukawa, Asona, and Kuhara. In co-operation with this company; the Kuhara Mining Co., of Osaka, lately completed a smelter at Chin-nam-po designed primarily to treat gold-copper ores, more especially the concentrates, from the Su-an mines.

Government Mines.—The Japanese Government has itself retained a number of gold prospects for experimental working in different districts.

In all something like 50,000 Koreans and several thousand Chinese and Japanese are now dependent upon the foreign companies for their livelihood. The author states Japanese authorities are willing to assist foreign mining companies in every possible way. After the occupation of Korea mining regulations were issued in 1906, with further amendments in 1907 and 1908, and a further revision is expected to be published shortly. Henceforth it is provided that "none can enjoy mining rights other than subjects of the Empire or juridical persons organized in accordance with the laws and ordinances of the Empire." It is stated, however, that foreigners who already possess mining rights will not be affected by the revision either now or in the future.

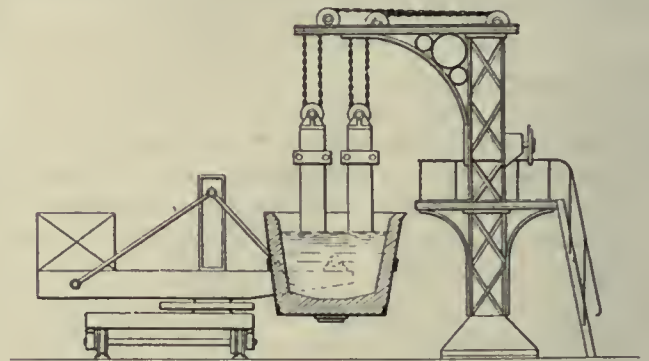
An unprotected bare wire is more or less dangerous regardless of potential, if proper precautions are not observed with regard to distance from rails and location as to chutes and switching stations.

¹Yen = 49.8 cts.

Keeping Metals Hot in the Ladle.

When several furnaces are tapped into one ladle, where it is desirable to refine one material or mixture with others at the same time, or where metallic waste is to be melted, it is of advantage to do these things right in the ladle itself in many instances. In tapping from several furnaces before pouring, especially, the contents of the ladle is apt to become too cool for pouring properly. The contents can be kept hot very conveniently by using an apparatus shown in the illustration.

The ladle is mounted on its car in such a manner that it can be run under two electrodes which can be raised and lowered as shown. Current passing from one electrode to the other through the contents of the ladle generates enough heat to bring the contents back



METHOD OF KEEPING METALS HOT IN LADLE.

to the proper pouring temperature or to melt or refine scrap and other materials thrown into the ladle.

To refine or make additions to the metal collected in the ladle it is introduced into the electric circuit, and the removal of slag proceeded with if required. The current is then regulated so as to considerably reheat the metal to be refined, and the necessary additions are then made to obtain the required quality. For example, steel can be manufactured with cast iron from ordinary cupolas by refining this cast iron by the addition of oxide and, just as in the Martin furnace, one can desulphurize, dephosphorize and deoxidize. This process therefore permits of transforming an ordinary foundry into a steel foundry. C. A. Keller of Paris, France, is the inventor.

Japan's Boom in Metals.—The boom in Japan's metal industry in 1915 appears from the statement of the director of the Mining Bureau of the Department of Agriculture and Commerce that the total value of the mineral output in 1915 was \$87,711,075, exclusive of the production of the Government iron works. This was a gain of \$10,428,620 over 1914. The total value of metals produced amounted to \$17,811,405, or 57% above the previous year's figures. The increase in copper output was 7%, and in value more than 37% over 1914. Antimony output increased 200%, while the gain in value was 8750%. Zinc showed an advance of 206% in output and 804% in value.

The Electric-Point Mine in Washington

ARTHUR LAKES.

During the past summer, the writer paid a brief visit to the Electric-Point mine in Washington, a young mine that has forged rapidly into notice as a promising lead producer. The region in which the property lies is characterized by uptilted and more or less altered sedimentary rocks of Paleozoic age, such as limestones, quartzites, slates or schists, with few evidences of eruptive rocks or outcrops of granite or other igneous rocks, although the region lies on a great batholith of igneous and once molten granite. The region is hilly rather than mountainous, although ranges of mountains form prominent elements of the distant scenery. Streams flow through valleys and canyons, with here and there small lakes in deep basins. The region is heavily wooded, making prospecting somewhat diffi-

the smallest of the three upon the surface, has since developed into a very important body, being much larger at the 200-ft. level where it is partially defined. The north chimney, which appears larger on the surface than the original discovery, had not at the time of my visit yet been entered by the 200-ft. level. A so-called talc seam of iron-oxide gangue matter followed for over 100 ft. led the workings to a point east of the chimney, from which a crosscut was being run toward the ore body. Shipments have been from 75 to 100 tons daily, consisting of some 25% galena and 75% carbonate of lead.

The most striking features, such as would have attracted the early prospector, are the bright red colors of the surface of the mineralized zone extending north-



THE ELECTRIC-POINT MINE.

cult. Small farms occupy meadows and cleared land along the streams and valleys.

The Electric-Point mine is located on the top of a mountain, which is part of the chain dividing the Columbia and Pend O' Reille valleys at an altitude of between 4000 and 5000 ft. above the Columbia river.

The main surface showings consist of three chimneys of ore, that first discovered being in the center. The discovery has been opened by a "glory hole" or open quarry as shown in sketch, exposing a body of ore somewhat circular in form, about 25 ft. in diameter. On this ore body a shaft has been sunk 210 ft. with drifts and crosscuts on the 100 and 200-ft. levels, proving the shoot or chimney to maintain its size and grade at least to that depth. On the lower level drifts were being run to tap the two other chimneys outcropping at the surface, No. 2 shoot being 40 ft. to the south and No. 3 180 ft. to the north on the strike of the ore-bearing zone. The south chimney,

east and southwest between the uptilted ridges and outcrops of limestone. It would have suggested to them the probabilities of heavy mineralization below the surface, confirmed perhaps, by picking up here and there small nodules of galena, or by digging down a little below the red "gossan" uncovering a boulder of lead weighing many pounds, such as were discovered in excavating a road through the village to the mine as shown in sketch, in which the nearness of these lead boulders to the surface is represented by one of them lying beneath the roots of a fir tree. On analyzing the surrounding red material you find that a large proportion of it consists of lead carbonate stained with iron oxide. The boulders of galena show on their exterior the transition of lead-sulphide or steel-gray-galena to a dull, greenish gray substance, which is lead-sulphate or anglesite, and that to white or iron-stained crystals resembling some forms of gypsum, which are lead-carbonates. From their loose position in the oxi-

dized mass and the chemical transitional signs observed on their surface they evidently represent parts or relics of once large, continuous bodies of galena or unaltered lead-sulphide, to be doubtless hereafter encountered in depth and in place, which partially resisted the oxidizing agencies which reduced the ore near the surface to carbonates and oxides. To what depth these oxidizing effects may extend is unknown,



THE GLORY HOLE.

but the limit is not reached as yet by the lowest or 300-ft. level.

Looking down from above into the glory hole we notice its sides to consist of two varieties of limestone of different colors. One of light yellowish drab color is a true dolomite or magnesian limestone; the other at contact with it of a dark gray, banded with numerous white crystalline veinlets of dolomite, is probably a dolomized limestone. A so-called talc seam of



BOULDERS OF GALENA.

gangue and iron-oxide locally separates the two varieties. Both limestones are involved in the zone of mineralization and mineral replacement. Two small dikes of dark eruptive or igneous rock have been encountered in the workings crossing the limestones, but not at direct contact with or relation to the ore bodies. The latter appear to be a replacement by mineral of dolomitic limestone along a zone of least resistance, accentuated locally by the crossing of bedding planes

or weak places by joint-planes favoring the forming of chimneys or ore shoots at such points. Ascending heated waters charged with mineral solutions acting on the limestone more or less decomposed it and replaced its substance with sulphide ore or galena, subsequently reduced almost wholly to carbonates and oxides by oxidizing waters.

As to the ultimate source or genesis of the ores, we may look to the batholith of once molten granite and other igneous rocks underlying this region, though rarely giving evidence of their existence by outcropping masses or dikes on the surface. That igneous forces were not wanting in the vicinity is shown by the discovery of the small igneous dikes in the workings. We noticed also on our way to the mine large masses of igneous rock thrown out of the way in making the road.

Apart from these few occurrences the batholith of granite may be considered as fully competent to have supplied the heated mineral solutions, and by upheaval to have opened fissures and crevices in the overlying sedimentary rocks such as the local soluble limestones, which by their composition and structure are particularly favorable to mineral replacement.

Belgian Kiddies, Ltd.

At a recent meeting of the New York section of the American Institute of Mining Engineers, Belgian conditions were discussed and the part taken in the relief work for that stricken country by American engineers, and particularly the work of Herbert C. Hoover.

As a result of this meeting there was formed the Belgian Kiddies, Ltd., the objects of which are summarized as follows:

- I. The object of this stock issue is to provide one meal per day for ten thousand Belgian children for the year 1917. Each share sold means 365 square meals for one child.
- II. Our business is constantly growing and no estimate can be made of the requirements for 1918.
- III. Security of the principal is absolutely assured by the personal management of H. C. Hoover and associates.
- IV. That no cash dividends will ever be paid is absolutely guaranteed.
- V. The stock is probably only part paid and is fully assessable.
- VI. The stock is preferred as to holders, the subscribers being preferably taken from the members of the mining and metallurgical professions, and their wives and sisters.
- VII. The demand value of the shares shall be \$12, preferably payable in advance, but installments will be welcome if more convenient to the subscriber.

A letter is being sent out by an informal committee of mining engineers pleading for the support of this worthy cause. The letter reads as follows:

An informal committee of mining engineers, from all over the United States, have decided to give our friend Herbert C. Hoover a Christmas present by taking off his shoulders part of the burden which he and his associates have been carrying for the last 2½ years.

During this time the United States has received a great deal of gratitude from the Belgian people which it has not deserved. To the Commission for Relief in Belgium all praise is due for their work. The C. R. B.—as it is known—has distributed in Belgium goods costing about \$227,000,000, of which the United States has contributed \$10,000,000, or about 4.3% of the total; and much of this has come from a few large foundations. The commission has purchased in the United States goods to the amount of \$125,000,000. We have not even paid a fair commission thereon. Reduced to

a per capita basis, we have given 8 cts. apiece. Canada has given 18 cts. per capita, New Zealand \$2.34 and little Tasmania \$6.25 a head. Yet the United States gets most of the credit. We have been obtaining gratitude under false pretenses.

This is naturally discouraging to us who know and appreciate the work of American engineers in Belgium. These men have been keeping alive a population of 9,000,000 on one meal a day. This is not enough for children. (Would you like it for yours?) At present 1,000,000 children are failing in health, and the C. R. B. has asked us Americans to assume the proper feeding of these children as our little share of the big job.

To do this right, the C. R. B. has started to give the children a nourishing noon-day meal, and they have not the money to carry it on. This costs only \$1 per month per child (3 cts. a day). This seems incredible, but as the overhead expenses of the C. R. B. are only $\frac{3}{4}$ of 1% of the gross cost you will understand that this is real engineering efficiency.

As engineers we want to show our appreciation and so we have organized an informal syndicate to float a new venture. We would like to cable Hoover before Christmas that we will take a block of "Belgian Kiddies" off his hands.

Don't you want to come in with us on this?

W. H. Bassett
F. Bradshaw
D. W. Brunton
D. H. Browne
R. B. Carnahan, Jr.
R. M. Catlin
A. C. Clark
J. P. Channing
F. H. Clymer
J. V. N. Dorr
W. Douglas
H. S. Drinker
T. C. Dupont
S. A. Easton
C. W. Goodale
J. C. Greenway
H. G. Hixon
C. H. Hollis
R. J. Holden
R. W. Hunt
G. P. Hulst
H. Jennings
D. C. Jackling
W. R. Ingalls
W. Kelly
E. P. Kirby
C. B. Lakenan
D. A. Lyon
J. F. McCarthy
C. H. MacDowell

G. Macfarlane
James MacNaughton
H. G. Memmlinger
C. W. Merrill
C. E. Mills
P. N. Moore
S. W. Mudd
R. V. Norris
H. C. Parmelee
C. F. Rand
F. B. Richards
R. H. Richards
L. D. Ricketts
Milnor Roberts
J. C. Ralston
D. M. Riordan
T. Robins
T. A. Rickard
W. L. Saunders
E. A. C. Smith
F. M. Smith
J. M. Sully
T. B. Stearns
C. R. Van Hise
W. R. Webster
H. V. Winchell
C. W. Whitley
I. C. White
Pope Yeatman

The Freezing Point of Mercury.

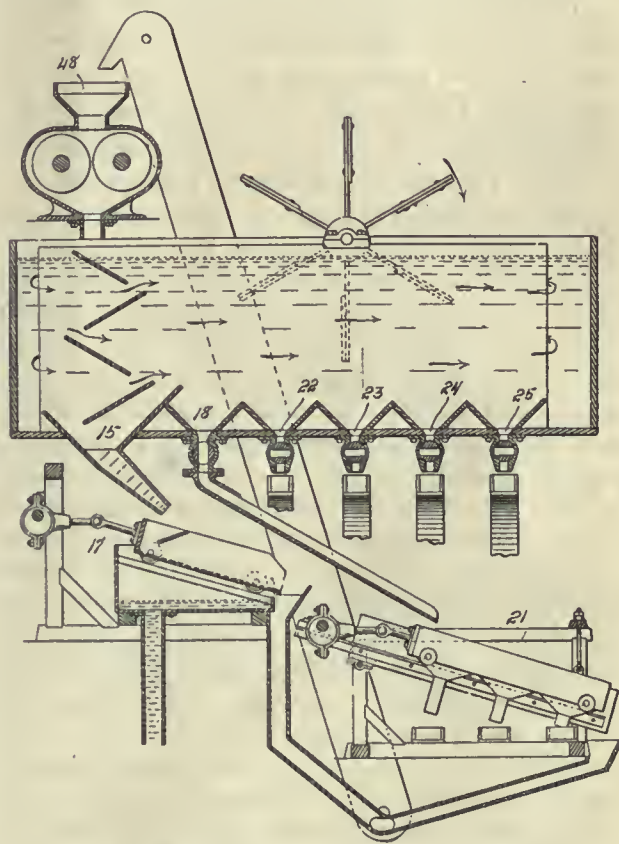
The Bureau of Standards has just completed a very careful determination of the freezing point of mercury using platinum resistance thermometers to measure the temperature. The result of this work gives -38.87°C . (-37.97°F .) for this temperature. It is interesting to note that as far back as 1862 the English government, recognizing the importance of an accurate knowledge of this point, appropriated £150 to have it determined. The value then obtained, -38.85°C . (-37.93°F .), is in good agreement with that obtained at the bureau. However, other determinations made previous to and after this early work cast some doubt as to its accuracy. It can be seen that a knowledge of the freezing point of mercury is of great importance to thermometer makers as it marks the lower limit to which a mercurial thermometer may be used and furnishes a method for calibrating or pointing the scale below 0°C . (32°F .).

Often trimming ore cars underground before they leave the chutes or working faces will save considerable loss of ore in transit to the shaft. It will also save part of the wages expended in cleaning tracks, ditches, etc.

Dewatering and Screening Apparatus.

Where ore is sorted into different sizes entirely by water classifying, it has been found impossible to recrush the oversize effectively, owing to the presence of the large amount of water which has to be drawn from the classifier along with the over-size material. In order to remove this excess of water a shaking screen has been invented which makes it possible to remove all of this excess of water at a minimum cost. James B. Ballantine, who has designed this apparatus, says that he has been able to pass 50 tons of broken ore per hour over a screen of this type 2 ft. square, and obtained an ideal product for recrushing.

In the operation of the classifier, the rotation of



DEWATERING AND SCREENING APPARATUS.

the paddle wheel produces a circulation of the water in the tank, which begins to travel toward the left on one side of the partition, passing around the end and through the baffles.

The action of this current of water upon the crushed or pulverized material performs the classifying function, and the material settles in the tank according to its size, the largest particles being the heaviest. Consequently the coarsest portion of the product is first deposited and falls into the hopper (15) and passes to the dewatering apparatus (17). The next coarser product settles in the hopper (18) and passes to the dewatering and screening member (21). The other grades which do not require to be crushed, pass through the openings 22, 23, 24, 25, etc. The product from the dewatering apparatus (17) and the coarse products which do not pass through the screen (21) are returned by an elevator to the crusher (48).

Metallurgical Treatment of Molybdenum Ores

HERMAN FLECK.*

Nearly everything has been tried of an ore-dressing nature on the molybdenum ores—no two of which are alike—and, on the whole, with surprisingly interesting results. Molybdenite is different from most minerals. It is heavy like a metallic sulphide and behaves in part like these, and then it is flexible, and not brittle, with strong basal cleavage and a tendency to flake like graphite or mica. Ordinary methods of concentration are hardly applicable.

However, combinations of heat, newer principles, such as flotation, magnetic and electrostatic separation, have done much to win good concentrates from ores which were looked upon quite unfavorably a few years ago. Only rarely does the mineral occur so coarsely divided that it may be hand-picked.

Molybdenum is brought on the market in two forms, powder and ferroalloy.

The first of these is invariably made by heating some form of oxide with a reducing agent. Carbon in form of charcoal is usually employed. The first stage of reduction is the dioxide which forms readily, and, unlike the trioxide, is not readily volatile. Prolonged heat and high temperature effect further reduction of this to metal.

The second form, ferromolybdenum, with varying molybdenum contents, is made by the use of the electric resistance furnace, either direct from the sulphide or from the roasted high-grade sulphide. The advantage here is that impurities may be slagged off, whereas in case of powdered metal, unless the impurities are subject to extraction with a solvent, they remain with the metal.

Before the increased present demand manufacturers were exacting. Standard requirements for concentrates were 85 to 90% MoS_2 and, except in very small amounts, copper, bismuth, arsenic and tungsten, when present, were penalized. Because of increased demand the requirements are made more easy to meet.

The reasons are obvious. The purer the molybdenite, the less treatment required for the final operation of reduction. When the demand is greater than production, as at present, the increase in price takes good care of additional preliminary refining treatment of lower grade material. The preparation of the oxide in commercially pure form is not an easy matter.

This may be done by roasting the sulphide first to oxide and then leaching the mass with ammonium hydroxide, which dissolves the oxide to form ammonium molybdate. Copper oxide forms an objec-

tionable constituent because it also dissolves and reappears in the subsequent evaporation of the ammoniacal solution. Evaporated to crystallization, preferably under reduced pressure, so-called ammonium molybdate crystallizes out from the filtered solution. This contains 81.55% of molybdic oxide, 8.27% ammonia and 10.19% of water. On ignition ammonia is driven off and molybdic oxide results. A previously mentioned process whereby the oxide is won by volatilization directly from the ore may be referred to here.

When the oxide is heated in a wind furnace with carbon in graphite crucibles a dark powder results which is commercial molybdenum. An analysis of such a product showed 95% of molybdenum and 2 to 3% carbon combined by cementation. The metal forms carbide readily. With care a product may be made 99% pure.

Among the early manufacturers Sternberg and Deutch in 1892 made a metal which contained 3% carbon by igniting precipitated calcium molybdate, in similar fashion, with carbon. Their factory was situated near Berlin and the capacity was 200 kg. metal a day. The admixed calcium oxide was leached out of the metal with hydrochloric acid. The metal at that time brought 86½ cts. a pound. It contained 3% carbon.

Moissan first introduced the use of the electric furnace. By heating ammonium molybdate he made the dioxide, which he treated with 10% pure carbon. The resulting metal contained carbide.

Guichard produced a metal of high carbon contents directly from the sulphide in the electric furnace. The ore, nearly pure molybdenite, gave a metal of 91.5% molybdenum contents. Current used, 300 amp., 50 volts.

Robert Keeney of the Colorado School of Mines found that either the raw or roasted ore can be used in making ferromolybdenum in the electric furnace. Lime is used as a fluxing and desulphurizing agent. Ferric oxide is subsequently added for decarbonizing purposes. In the case of direct use of molybdenite the sulphur slags off in form of calcium sulphide, with a current of 900 amp., 50 volts, sulphur is found to be entirely expelled from molybdenite. However, about 7% of carbon is absorbed, partly graphite. This can be reduced by the decarbonizing action of freshly added oxide. Wulfenite when fluxed with sodium carbonate gives oxide of lead and sodium molybdate. The latter is soluble in water the former is not. From the solution the oxide can be gotten and worked into metal. Such mention seems necessary now, since wulfenite in 1914 found a good mar-

*Excerpts from article in Colorado School of Mines Quarterly.

ket at 60 cts. per pound of MoO_3 contained in good grade concentrate.

The thermit or alumino-thermic process, which depends upon the greater heat of formation of aluminum oxide for reduction, produces a high-grade metal free from carbon. Ninety-eight to 99% of molybdenum and the remainder iron is the composition of the product.

Producers of Crude Barytes.

In the last 2 years the Geological Survey has had so many inquiries from both producers and consumers of barytes concerning possible markets and sources of supply that it became advisable to indicate in a general way the present conditions of handling barytes.

In Missouri most of the barytes passes through two and sometimes three hands before it reaches the consumer. The miner sells to a local buyer, most often a storekeeper, in exchange for goods. This buyer sells to a large buyer having access to the railroad, who in turn sells to one of the larger selling companies or to the consumer. It is next to impossible to deal with the miners or even the first buyers. Often the second buyers are agents for some of the larger purchasing companies and do not deal directly with the consumer. In the eastern field conditions are not quite the same. Much of the mining is done by the owners or lessees of the property and the product is sold to large buyers or direct to the consumer. In fact, many deposits in the eastern states are worked by the consumers themselves, though some of these operators have barytes to sell.

In the following list will be found the names and addresses of the principal people able to supply crude barytes. The addresses given are those of the office of the companies, which are not in all cases at the mines:

J. N. Adams, Del Rio, Tenn.
Anson G. Betts & Co., Box 792, Asheville, N. C.
Big Tom Barytes Co., Cartersville, Ga.
Cahaba Mineral Co., Leeds, Ala.
H. C. Carter & Co., Halifax, Mo.
Carolina Barytes Co., Stackhouse, N. C.
A. H. Carr, Potosi, Mo.
Casey & McGregor, Potosi, Mo.
Cherokee Chemical Co., 109 Hollingsworth street, Baltimore, Md.
L. E. Cole & Co., Blackwell, Mo.
J. F. Doherty, Sweetwater, Tenn.
Durex Chemical Co., 320 Fifth avenue, New York, N. Y.
J. C. Finck Mineral & Milling Co., 101 Barton street, St. Louis, Mo.
B. W. Gahagan, Stackhouse, N. C.
Georgia Peruvian Ocher Co., Cartersville, Ga.
Johnson Bros., Fletcher, Mo.
Krebs Pigment & Chemical Co., Newport, Del.
R. H. Langhorne, Evinston, Va.
Chas. L. Lawton, Bessemer City, N. C.
A. Long & Son, Cadet, Mo.
James Long, Potosi, Mo.
McCready & Cole, Blackwell, Mo.
H. J. Moore, Sweetwater, Tenn.
New Riverside Ocher Co., Cartersville, Ga.
Nilsen, Klein & Krause Manufacturing Co., Levee and Sidney streets, St. Louis, Mo.
Paga Mining Co., Cartersville, Ga.

Pittsburgh-Potosi Lead Co., 5527 Ellsworth avenue, Pittsburgh, Pa.
Point Milling & Manufacturing Co., Mineral Point, Mo.
Potosi Lead, Barytes & Mercantile Co., 721 Locust street, St. Louis, Mo.
W. T. Reavis & Sons, Henley, Mo.
South East Missouri Lead Co., Potosi, Mo.
Southern Leasing Co., Cartersville, Ga.
A. & C. Stackhouse, Stackhouse, N. C.
C. A. Stocking & Son, De Soto, Mo.
C. A. Sulzer, Sulzer, Alaska.
A. L. Taylor, Canon City, Colo.
Thompson-Weinman & Co., 100 William street, New York, N. Y.
U. S. Barytes Co., Tiff, Mo.
Washington Land & Mining Co., 307 Washington street, St. Louis, Mo.
White & Bro., Cadet, Mo.

Columbia Section, American Institute of Mining Engineers.

L. K. ARMSTRONG.*

The sixth annual meeting of the Columbia Section, A. I. M. E., was held in Spokane hotel, Spokane, Nov. 25.

With Stanly A. Easton, manager of the Bunker Hill & Sullivan Mining & Concentrating Co., in the chair about 25 members and guests sat down to a six-course dinner, after which Mr. Easton addressed the meeting as retiring chairman citing the activities of the Columbia Section during the year past, called attention of the members to the present close relation of the local sections and the parent organization, gave some detailed information on the Arizona meeting which was held in September last, dwelt at some length on the value of professional ethics without which no engineer can attain high standing among his peers and with the public, warned his hearers that the present period of inflated prices will prove the "acid test" in mining, stated that in his opinion the present European war will be determined largely by the availability of the metals, and finally referred to an article in a recent issue of Atlantic Monthly by Dr. Eliot, formerly president of Harvard University, in which he referred to "miners and other adventurers," as being based upon ignorance of the men engaged in the industry and to be deplored because of the high standing of the author.

The secretary-treasurer followed with his report which showed the membership to have increased during the year from 129 to 158. He also read several letters from members who were not able to attend and one from E. Jacobs, secretary Western Branch, C. M. I., who found it impossible to attend although it was an unusual circumstance.

Election of officers then followed resulting as follows: Chairman, W. H. Linney, mining engineer, Spokane; vice-chairman, Oscar Lachmund, general manager B. C. Copper Co., Greenwood, B. C.; secretary-treasurer, L. K. Armstrong, mining engineer, Spokane. These with Stanly A. Easton, past chairman, and S. Shedd, Professor of Geology, Washing-

*Secretary-Treasurer Columbia Section, A. I. M. E.

ton State College, Pullman, Wash., are the executive committee.

W. H. Linney emphasized the good work which the Columbia section has done and stated that by the aid of the other officials and the members he hoped the section would keep its high standing and gain something in membership and value to the community.

Prof. C. G. Warfel, Assistant Professor of Mining at the State College, Pullman, Wash., read an interesting paper on the "Electric Reduction of the Iron Ores of Eastern Washington," the material of the paper having been gathered by request of the Spokane Chamber of Commerce and being preliminary throughout, and the figures submitted being tentative, yet approximately correct. Assuming a cost of materials delivered in Spokane about as follows:

Iron ore	\$2.50 per ton
Coke	\$5 to 7.00 per ton
Limestone	2.00 per ton
Labor	2.00 per diem

It would be necessary to procure electric current at a cost of about \$2 per horsepower year (\$16 per kilowatt year) to meet competition.

The paper covered iron analyses, construction costs, markets, depreciation and amortization, and other details.

R. S. Ord, manager of the Corbin Coal & Coke Co. believed the use of the lower grades of coke would not be possible as manufacturers were not partial to the low-grade or "black butts" coke on account of the narrow margin of profit and the better demand for high-grade coke at reasonable margins of profit. He also believed electric current costs could be cut below present rated market prices.

W. Earl Greenough, former manager of the Marsh mines in the Coeur d'Alene district, stated that competitive rates indicate a reduction on rates quoted, i. e., \$25 to \$30 per horsepower year.

Prof. F. A. Thomson, Professor of the Mining Department, Washington State College, Pullman, believed the question would be solved by adequacy of ore supply and power costs.

S. L. Boyer made reference to power costs at points of generation and at points more or less remote therefrom.

Prof. D. C. Livingston, Professor of Geology, University of Idaho, cited power costs in the irrigated areas of Southern Idaho where power is sold during non-use periods at a very low price, approximating \$16 per horsepower year, or thereabouts.

Flotation was discussed by D. F. Haley, consulting engineer for the Consolidated Interstate-Callahan Mining Co., who gave some interesting figures on differences in grinding at certain milling plants. S. A. Easton cited the present Latouche operation in Alaska where all sliming is securing a satisfactory result and of the character of the Alhambra ore in the Coeur d'Alene which is very finely disseminated throughout the gangue, the silver-lead contents of which will probably be recovered by an all-sliming process yet to

be worked out, in which flotation will play an important part. Richard Marsh discussed the question in reference to selective and preferential terms and Prof. Thomson reported an interesting laboratory test on an ore carrying the copper, lead and zinc sulphides in the separation of which he was successful by the aid of flotation and which he believed could be made of commercial value.

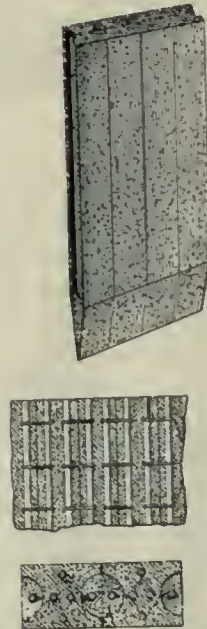
Co-operation in geological survey work, between the state and national surveys was discussed by some of the members who were willing to leave the question open for discussion at a later date.

More frequent meetings of local members are to be tried out through an early call upon all local members.

The following named members were selected as a committee on papers: J. C. Haas, S. A. Easton, L. K. Armstrong.

Method for Concrete Piling.

Sheet piling, walls, curbing, casings, caissons and similar structures of concrete can be erected without the use of molds by employing the sectional piling illustrated in the drawings. The sections are designed to be set or driven edge to edge, as in the case of the ordinary interlocking sheet piling. There are grooves in both edges of each section, the part which corresponds to the tongue being concrete, which is poured



METHOD FOR CONCRETE PILING.

into the holes formed by the abutting grooves after the sections are set. Each section is reinforced by four vertical rods, as shown in the cross-section, and these are tied together at intervals by looped wires, and also to two other rods which stand vertically, one in each groove. When the concrete is poured it not only binds the sections together mechanically, but at the same time effectually seals the joints. Lyman B. Langworthy of Chicago, Ill., is the inventor.

What the Mining Companies are Doing

The Porphyries' October Production.

The four leading porphyry copper producers showed substantial gains in production during October last as compared with October, 1915. Utah Copper showed a slight falling off as compared with September production, as did also Chino. Both Nevada Con. and Ray Con. outproduced more copper in October than they did in September.

The following table (in pounds) gives the production by months in 1916 as compared with the same months in 1915, 1914 and 1913:

UTAH COPPER.

	1916.	1915.	1914.	1913.
January	11,999,910	8,009,646	10,649,036	7,560,521
February	11,849,972	8,202,467	9,492,898	7,819,900
March	12,711,651	10,203,882	12,704,220	8,504,040
April	14,557,282	12,015,148	13,133,779	9,834,894
May	15,950,215	14,053,765	13,616,993	10,312,695
June	17,877,432	14,720,912	13,268,106	11,637,949
July	20,302,228	14,641,009	13,768,958	9,849,043
August	20,315,440	15,966,543	8,245,520	10,620,981
September	20,462,256	14,159,289	6,672,194	11,817,428
October	20,325,520	16,004,607	7,765,396	10,236,575
November		13,722,723	6,665,049	11,121,078
December		14,497,485	6,795,567	10,762,490

NEVADA CON.

	1916.	1915.	1914.	1913.
January	6,157,862	3,069,919	5,791,122	5,169,708
February	6,533,412	3,210,569	4,598,243	4,798,537
March	6,565,559	4,535,192	5,218,227	5,555,320
April	7,716,101	4,710,684	4,880,043	5,650,608
May	7,723,148	5,271,756	4,959,589	5,932,275
June	8,651,772	5,124,480	4,483,175	6,344,863
July	8,537,231	6,292,413	5,477,313	5,403,919
August	7,688,014	6,201,858	3,062,637	5,989,973
September	8,360,180	6,021,850	2,718,471	4,441,671
October	8,676,327	5,880,083	2,801,507	5,898,046
November		5,495,487	2,612,071	5,443,047
December		6,201,247	2,651,658	5,343,862

CHINO COPPER.

	1916.	1915.	1914.	1913.
January	5,316,975	3,563,618	6,131,840	3,440,274
February	4,617,220	3,722,893	5,769,948	4,018,789
March	6,333,255	4,446,087	5,566,819	4,602,809
April	4,496,270	5,027,548	6,109,888	4,046,813
May	5,359,294	6,442,977	5,666,881	4,067,486
June	7,241,618	6,984,977	5,656,102	3,876,533
July	6,883,403	6,660,429	5,087,750	4,893,325
August	6,326,116	6,640,923	3,165,501	6,650,867
September	7,397,204	5,254,286	2,957,704	4,435,873
October	6,921,081	6,319,194	3,060,000	4,914,944
November		6,939,006	3,047,694	4,402,909
December		6,202,045	2,827,891	4,525,792

RAY CON.

	1916.	1915.	1914.	1913.
January	4,263,440	4,053,147	5,705,000	3,869,006
February	5,797,087	4,830,553	5,600,000	4,007,918
March	6,379,681	5,579,513	6,223,617	4,422,872
April	6,294,032	5,303,213	6,277,693	4,514,565
May	6,278,611	5,016,048	6,495,719	4,405,217
June	6,598,694	4,205,119	6,226,536	4,392,612
July	6,834,492	4,352,571	2,962,000	2,526,000
August	6,597,032	5,581,734	3,300,000	4,401,566
September	6,250,937	4,997,083	3,180,000	4,470,551
October	7,590,028	5,894,441	3,278,348	4,871,566
November		5,576,083	3,196,457	4,900,994
December		5,725,009	3,126,638	5,232,167

Utah Copper Co.

Without the aid of its 50% interest in Nevada Con. Utah Copper Co. is now in the Anaconda class with earnings of \$1,000,000 a week. In fact, on a basis of 240,000,000 lbs. annual production, a 6½-ct. cost and 30-ct. price, Utah stands to earn \$56,400,000, equal to \$34 a share.

By the inclusion of one-half Nevada Con. earnings on current rate of production and costs, the Utah profits jump to \$76,000,000, or to \$46 per share. This brings Utah's earnings up to \$1,500,000 a week.

It costs Anaconda at least 4½ cts. and possibly 5 cts. more per pound to produce its copper than the average at Utah. To offset the higher cost to some extent, however, Anaconda has a larger production, now at the rate of 360,000,000 lbs. a year, against Utah's total of 240,000,000 lbs. It also has a large miscellaneous revenue from smelting, refining and from its new zinc business.

Assuming an 11-ct. cost at Anaconda, a 30-ct. copper price and 360,000,000-lb. production, this company's earnings

must now be at the rate of \$1,300,000 weekly. Including miscellaneous revenues the figures probably exceed \$1,600,000.

No other copper mining companies in the world from direct operations of their own properties can lay claim to earnings of \$1,000,000 a week.

Davis-Daly Copper Co.

The report of the company for the quarter ended Sept. 30, shows as follows:

Receipts—	
Ore returns	\$105,059
Miscellaneous revenues	2,550
Total	\$107,610
Disbursements—	
Development	\$ 40,268
Mining cost	64,228
Equipment	1,566
Butte general expense	3,989
Boston expense	2,148
Total	\$112,199

In his report Secretary Schirmer says:

During the period development work totaled 961 ft., comprising 324 ft. of drifts and 637 ft. of crosscuts.

The mining claims of the company, located as they are, along the border of the copper zone, are between the copper and zinc areas and covering portions of both, have long been known to contain zinc ore bodies of substantial size. Until recently, the development of zinc veins in Butte has been avoided, with the exception of the Butte & Superior and the W. A. Clark properties, which are exclusively zinc. In addition to the development of copper ore bodies the Davis-Daly Copper Co. has now turned its attention to the development of zinc and an arrangement for the milling of zinc ore has been made with the Butte-Detroit Copper & Zinc Co., the owner of a modern zinc mill located in Butte. Your mine is ready to deliver a limited tonnage of zinc ore and the mill is ready to receive it, and from now on zinc ore as well as copper ore will be developed and mined.

The new hoisting engine is ready for shipment. It is expected that the new hoist will be in operation about the first of the year, and when this is completed, mining costs should become normal.

Because of this adequate hoisting machinery reducing operating costs and greater tonnage available, a more staple and steadily increasing net earning should occur.

Shipments for the 3 months amounted to 198 cars, aggregating 10,808 tons, producing 679,008 lbs. of copper and 57,069 ozs. of silver.

International Nickel Exonerated.

A statement has recently been made by Arthur Meighan, Canadian solicitor general, absolving the International Nickel Co. from all charges of selling nickel to Germany. This statement is backed by the Canadian government and the British admiralty, which says:

"To allied and neutral countries not the pound and not one shipment of nickel has gone from International Nickel Co. except with approval of British government through the committee on enemy supplies."

The Canadian government has placed an embargo on exportation of nickel matte from Canada, and regarding exports to United States the solicitor general says in his report:

"We keep the closest eye on all that goes across the border. We know the purpose for which it goes and unless we approve, none goes."

Mason Valley Mines Co.

A new lease of life has been taken on by the Mason Valley Mines Co. with its purchase of the Grey Eagle mine in northern California. The property was purchased for 144,250 shares of stock of the former company. Of the total capital stock of \$2,500,000 divided into 500,000 shares,

par value \$5 each, there are now issued and outstanding 155,750 shares; the 144,250 shares authorized for the Grey Eagle purchase and 200,000 shares which have been sold at \$5 a share for working capital and construction purposes.

The merger of the two properties gives the combined company the Grey Eagle mine, which consists of 14 patented claims covering about 256 acres, and the Nevada properties, including the Thompson smelters, and the Mason Valley mines.

Mason Valley will begin business with \$1,300,000 cash in the treasury.

H. C. Krumb made an examination of the Grey Eagle mine several years ago and estimated 450,000 tons of ore containing 4.64% copper and \$1 gold per ton as well as large quantities of lower grade ore. O. R. Whitaker, of Denver, also made an examination and his report was similar to that of Henry Krumb, although he added 600,000 tons of ore containing a little over 1% copper, a total of 1,100,000 tons containing an average of 2.75% copper and 70 cts. gold per ton. Both Engineers Krumb and Whitaker said that prospects of developing a much larger tonnage were good.

Active development work will be started this winter and at the same time a decision as to the best methods of treating the ore will be reached. Preliminary treatment by the oil flotation process indicates that good results can be obtained.

It is not unlikely that at least during development stages shipments may be made to the Thompson smelter at Mason Valley on completion of the railroad to the Grey Eagle mine which is about 60 miles distant from rail connection.

Arrangements have already been made by the Mason Valley Mines Co. for a coke supply and as soon as the railroads can supply sufficient cars, operations will be resumed at the Thompson smelter. Arrangements have already been made for treatment of large tonnages of Bluestone ore where it is estimated that over 1,000,000 tons have already been developed. Work has already been started at both Mason Valley and Bluestone mines. In addition, the company is also doing development work on other properties under option.

Goldfield Con. Mines Co.

Production and earnings of the Goldfield Con. Co. for October compare with previous months as follows:

	Oct.	Sept.	Aug.	July.	June.	May.
Tons ore mined.	30,000	.....	17,300	26,700	29,000	32,400
Net	\$17,045	\$16,072	\$18,211	\$30,016	\$40,453	\$52,500

Miscellaneous Company Notes.

Tonopah-Belmont net profits for October were \$90,872. The company milled 12,367 tons of ore from which there was recovered 1,974.985 ozs. gold bullion and 185,167.75 ozs. silver.

The Tonopah Extension Mining Co. reports for October as follows: No. dry tons milled, 10,038; ozs. gold bullion recovered, 1,488.12; ozs. silver bullion, 153,317; net profit, \$50,902.

It cost Miami Copper Co. 8.978 cts. a pound to turn out its record yield of 5,054,153 lbs. of copper in October. The September cost was 9.266 cts. The general improvements in cost has been attained in the face of constantly increased wages and higher costs for materials and supplies of all kinds.

Wolverine's October production amounted to 504,499 lbs. of copper. Production in previous months of 1916 follows: January, 460,967; February, 516,607; March, 577,684; April, 588,092; May, 495,743; June, 493,378; July, 545,156; August, 517,851; September, 470,190; October, 504,499.

The Mohawk Mining Co. will earn about \$22 a share in 1916, thanks to a very favorable production cost. It has paid dividends this year amounting to \$1,700,000 and will have a surplus at the end of the year approximating \$500,000. In October, Mohawk produced 828 tons of mineral from the

milling of 61,757 tons of rock. This yielded an average of 19.97 lbs. of copper per ton, or a total of 1,233,463 lbs. of copper.

Shannon Copper Co. has sold copper to the end of June, 1917, at 32 cts. a pound. Only a small portion of its output was disposed of at this price, as the management believes that it is better to sell only a portion of its output so far ahead, with copper prices still maintaining an upward tendency.

After paying a dividend of \$450,000 on Oct. 31, the Arizona Commercial Copper Co. had on hand \$450,000 in cash. At the present time the company is shipping about 150 tons per day and on this is earning \$60,000 a month on 30-ct. copper. According to President Charles S. Smith, the company will soon be in shape to ship 300 tons per day and make anywhere from 750,000 to 1,000,000 lbs. of copper per month.

The report of production and development operations of the McIntyre Co., Ontario, for the quarter ended Sept. 30, 1916, is as follows: McIntyre ore—Tons milled, 28,933; value per ton, \$9.08; gross value, \$262,863.49; recovery, \$250,744.69; operating costs, \$142,900.00; per ton, \$4.93; operating profit, \$107,844.69. Custom ore—Tons milled, 6877; profit from milling custom ore and from subsidiary company operations, \$28,239.09. Total tons milled, 35,810; total operating profits, \$136,083.78.

About \$10,000 is to the credit of the Lucky Jim mine for payment toward the balance of \$12,000 remaining due on the first mortgage, according to the monthly report of the receiver, A. G. Larson, which has been filed at Nelson. The total amount due for ore is \$16,166. Accounts payable amount to \$5432, leaving a credit balance of \$10,733. Against this is a mineral tax of about \$700, leaving a trifle over \$10,000 to the good. Last month's net profit was approximately \$5000.

The output of copper by the Magma Copper Co. by the close of November will have been practically doubled. The company heretofore has been producing at the rate of between 6,000,000 and 8,000,000 lbs. annually. Net profits on that amount of copper have been running at the rate of more than \$5 a share annually. With present facilities capacity can be doubled without any additional expense to speak of. Arrangements have been made to greatly enlarge the output beyond what it will be with present facilities.

The Utah Apex Mining Co. stockholders at annual meeting held last week authorized a reduction of the company's capitalization of 600,000 shares, par value \$5 to 120,000 shares of \$25 par value. Number of directors was reduced from nine to five. The following were elected: John J. Murphy, Dr. Nicholas du Vally, Wm. F. Coffin, R. F. Haffenreffer, Jr., and Charles G. Schirmer. This leaves Frank A. Schirmer (recently resigned), Hiram M. Burton, Clifford A. Brewer, William L. Creden and J. W. Saladine, who were directors last year, out of the present line-up.

There is no doubt that at the end of the year Miami Copper Co. will show earnings for the year of close to \$12 a share. Dividends have been paid during the year totaling but \$5.75 or \$4,295,905. This compares with dividends of \$2.25 per share in 1915, \$1.50 in 1914, \$2 in 1913 and \$1.50 in 1912. With costs at 10 cts. per pound and copper selling at 28 cts. per pound, Miami is capable of earning at the rate of \$14 a share on its 747,114 shares. On a 75,000,000 (now 60,000,000 lbs.) production, and the same selling price and same costs the company could earn close to \$18 per share.

It is understood that the North Butte Mining Co. will ship its zinc ores to the Anaconda plant to the extent of 300 tons daily. The company is reported to have at least 2 years' supply of zinc ore in sight in the present workings that are opened up for the extraction of copper. Throughout its productive career North Butte, as in various mines of the Anaconda Co., ran through ground highly shot with zinc values. Whenever found they were left in the stopes as prior to the new era for zinc, commencing with the European war, it was not profitable to try for commercial production.



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*Illustrated.

“A Trespass Both Stupid and Indecent.”

Our temperamental and somewhat quixotic co-worker on the Pacific Coast has charged another wind-mill. It is not the King's English that he is defending this time, nor an obvious question of common honesty that he is elucidating under the euphonious title of “Professor of Ethics.” This time it is the stupendous question of the right of pre-emption by first usage of any general descriptive term as a title to a book. Because he saw fit to call a compilation of articles upon flotation “The Flotation Process,” he claims that it was a “trespass both stupid and indecent” for Mr. Stander and Mr. Megraw to call their books upon the flotation process by the same title. This is as though the shade of Macaulay should arise and peevishly complain because others after him had written upon the history of England and entitled their books “A History of England.” We wonder how many books upon algebra have been called simply “Algebra”; how many books on the cyanide process have been called the “Cyanide Process”; how many books upon descriptive geometry have been called simply “Descriptive Geometry”; how many books upon qualitative analysis have been called simply “Qualitative Analysis,” or upon psychology simply “Psychology.”

If one desires individuality of title for a book he must display individuality in the selection of its title, just as any family by the name of Smith must display individuality in the selection of the children's names if they want to differentiate them by their first names from other Smiths.

The stupidity in this whole affair is for anyone to think that a title gives individuality to a book. It is the author that does that if there be any to the book. Hundreds of books may be written upon the history of England and called such, and yet Macaulay's “History of England” will ever stand out from them. Why? Because of what he put into his history, not because of its title.

Butte & Superior Co. Wins Right to Continue Dividend Payments.

From our Butte correspondent we learn that in the decision handed down by Judge George M. Bourquin of the Federal District Court the petition of the Minerals Separation, which asked for an injunction to restrain the Butte & Superior Co. from declaring dividends and distributing its profits to stockholders in this manner, has been denied. The court also discharged the Butte & Superior Co. from the order issued Nov. 13, 1913, requiring it to post a bond in the sum of \$75,000 to secure a possible judgment for infringement of patent on the oil flotation process, and requiring monthly reports of the results of the process at its mill.

The decision is a sweeping victory for the Butte

& Superior Co., so far as the phase of its controversy with the Minerals Separation Co. is concerned. The question of the infringement of patent involved is now before the United States Supreme Court and a decision is expected within a few days.

The decision of Judge Bourquin means that the Butte & Superior Co. may go ahead immediately with its plan for the enlargement of its mill and increasing its capacity. Within a few minutes after the decision was rendered Manager J. L. Bruce had a force of men at work and the improvement will be rushed to completion.

The decision of Judge Bourquin ends the possibility of interference of the usual quarterly dividend of \$1.25 per share in addition to the extra dividends which have been declared each quarter now for over 2 years.

The Butte & Superior's new shaft will soon be equipped and ready for operating and this, with the increased mill capacity, will add greatly to the capacity and output of the entire plant. The figures for the November production of Butte & Superior are not yet available, but an estimate on production to date indicates that November will be one of the best months of the year 1916.

Attorneys for the Minerals Separation Co. have filed the necessary notices of appeal, but it is probable that the decision of the United States Supreme Court that is expected shortly will dispose of all the points involved in this and other similar suits against other companies over this same patent question.

Over-estimating the Value of Mine Machinery.

We have a communication from one of our readers in Arizona, which is interesting for what it suggests. He says:

I have for the past 3 years been devoting my time to improvements in rock drills. My attention has been devoted mostly to improvements of the wet-drilling system. On one of my improvements a patent has already been issued, and on two others the patents are still pending. I have applied these improvements to one of the standard machines now on the market, and can safely say that it increased the efficiency of this machine 50%. My idea of the proposition is to make, or have made, my own machine complete, with the improvements built in. This would make a machine that would be by far superior to anything on the market to-day. This I will be glad to demonstrate as soon as the patents pending are issued.

What companies would you recommend to take this proposition up with, and what departments?

Our correspondent's judgment of the worth of his invention may be justified. We hope it is; and we shall be glad to put him in touch with any of our clientele who may have a practical interest in the matter.

Enthusiasm on the subject of rock-drill improvements is, however, perennial; and many have been the disappointments therefrom. What, for example, became of the famous D 21 stopers (or was it D A 21's?),

which were so widely heralded in the Cripple Creek district a number of years ago? Probably the scrap heap can best answer. Such fiascos, which are not uncommon, lead mine operators to be rather cautious about taking up "improved devices"; and it is only after numerous local tests, successfully conducted, that a new drill, backed by first-class manufacturing and sales effort, gets a real foothold in the mining or contracting industries.

The whole subject of water purification is one of great importance in connection with any mine property, not only for boiler feed purposes, but for general supply where any considerable community exists in the vicinity of the mines. It would take too much space to go minutely into the chemical theory of the subject, or taking up the mechanical details and specifications of a water purifying system, but it is hoped that readers who have serious water problems to face will read the article in this issue by Mr. Newman. Not only will it suggest and lead to steps for immediate betterment, but communications will bring up individual problems for publication, with the answer, in the future issues.

Aside from its monopolistic effect, the new conservation rulings of the government covering coal mining in the west is having the effect of putting a damper on opening up new coal fields. Practically all the operating coal mines purchased their property under the old laws at \$10 or \$20 per acre. Under the new rulings these lands are worth all the way from \$100 to \$400 per acre. The average at which coal lands may now be leased is 10 cts. per ton, irrespective of the quality or grade of the coal. Under the increased valuation of the government a new coal company stands but little chance with the old companies when it comes to competition. The new rulings have reversed the theories of the conservationists—the small operator hasn't a ghost of a chance.

In times of copper prosperity there has always been rumors of mergers and the year 1916 has been no exception. This time it is a big consolidation with the Kennecott corporation as the "big squeeze." The plans, according to the rumors in circulation, are that the Kennecott (now owning 25% of Utah Copper) is to acquire 75% of the Utah Copper Co.'s stock, not now owned by the former, and then through the Braden Co., which Kennecott owns, absorb the Chile Copper Co. Then there is the Cerro de Pasco Copper Co. and the Andes Copper Co. of South America, owned by Anaconda, that might be brought into the fold.

Many a good mining property has been abandoned for lack of funds occasioned by the individual stockholders declining to recognize their responsibility or co-operate with the management.

Copper exports from Atlantic ports for the week ending Nov. 30 were 6448 tons: Since Nov. 1 they were 21,433 tons; same time last year 19,396.

PERSONAL.

R. W. Schultz, representative of the Minerals Separation Co., Ltd., is at Houghton, Mich.

E. C. Brain, general manager of the United Gold mines, Sumpter, Ore., is in Spokane, Wash.

George Ross, Wallace, Idaho, is back from a trip to Portland, Ore., and other coast cities.

D. C. Jackling will return to Salt Lake City about Dec. 15 after an extended trip to New York.

Alexander P. Rogers, mining engineer, New York, has returned from a trip to Dutch Guiana.

Charles A. Peet, consulting engineer, Salt Lake City, Utah, has returned from a trip to Ely, Nev.

Howard D. Smith, mining engineer, San Francisco, has recently returned from a trip to New York.

E. H. Hamilton is now consulting metallurgist for the Consolidated Mining & Smelting Co., Trail, B. C.

E. G. Spilsbury, consulting mining and metallurgical engineer, New York, is on professional work in Cuba.

Richard A. Parker, consulting mining engineer, Denver, Colo., has returned from a trip to various parts of Oregon.

F. B. Caldwell, superintendent of the Mexican Candelaria Co., San Dimas, Mexico, is now located in Woodland, Calif.

C. H. Hayes, in charge of development at the Stonewall Jackson mine, Globe, Ariz., has made a trip to El Paso, Texas.

Arthur Allen, formerly with the Calumet & Hecla Co., Calumet, Mich., is now with the Highland Mining Co., Ashcroft, B. C.

Mark R. Sherman, Chicago, and associates have been in Lordsburg, N. M., inspecting the property of the National Gold & Silver Mining Co.

C. L. Herrick, former mill superintendent of the Gold Hunter mill, has recently been appointed general manager for the company at Mullan, Idaho.

Edwin Higgins, formerly with the California Industrial Accident Commission, has opened offices as a safety and efficiency engineer in San Francisco.

G. P. Holmes, recently with the St. John's Mining Co. at Montezuma, Colo., has joined the engineering staff of the Aetna Chemical Co., at Drummondville, Quebec.

John Jacke, mining engineer, who has been in the operating department of the Calumet & Hecla Co., has been appointed mining captain of White Pine Extension.

F. K. Brunton is now at Humboldt, Ariz., with the Consolidated Arizona Smelting Co. He was formerly with the American Smelting & Refining Co., Garfield, Utah.

George C. Moore, chemist, and H. E. Bierce, mining engineer, both of Los Angeles, Calif., have been examining properties around Phoenix, Ariz., and are now in Globe, Ariz., on a similar mission.

C. T. Griswold of the Associated Geological Engineers has transferred his activities from Wyoming to Oklahoma. M. L. Fuller, managing engineer of the Engineering Division of the same organization, visited the New York office recently.

F. K. McIntosh, former superintendent, Gold Road Mines Co., Gold Road, Ariz., has been in Higuera, Mexico, with the Compania Minera Paloma y Cabrillas and will go from there to Laredo, Texas, for the Compania Minerales y Metales.

In recognition of his inventing the Dorr thickener and other metallurgical apparatus, J. V. Dorr has been awarded a John Scott Legacy Medal by the city of Philadelphia on the recommendation of the Franklin Institute.

F. N. Flynn, smelter superintendent of the Arizona Copper Co., has resigned to become affiliated with the Chile Exploration Co., Chuquicamata, Chile. The vacancy will be filled by former Assistant Superintendent R. H. Hatchett.

OBITUARY.

Frederic Stanwood, for many years treasurer of the Copper Range Co., died at Brookline, Mass., aged 65 years, after a brief illness.

Frederick J. H. Merrill, one of the best-known consulting geologists and mining engineers in the west, died at his home in Los Angeles on Dec. 1 from an apoplectic stroke. He was born in New York in 1861 and was graduated from Columbia School of Mines in 1885. Among the various appointments held by him was that of assistant on geological survey of New Jersey, 1885-1889; assistant state geologist of New York, 1890-1903, assistant director New York State Museum, 1894-1904, and state geologist of New York, 1899-1904. He carried on private practice since 1904, and served as director of various American exhibits. He was a frequent contributor to mining literature and scientific publications.

SCHOOLS AND SOCIETIES.

Southwestern Engineering Society.—An endeavor is being made by A. F. Barnes, Dean of Engineering at the New Mexico College of Agriculture and Mechanical Arts, to organize an engineering society to include the states of New Mexico, Arizona and Texas. He has the support of many noted men in the district already. Until the time for the assembling of the society can be decided on communication should be addressed to Prof. Barnes.

Missouri School of Mines.—An organization to be known as the Metallurgical Society of the Missouri School of Mines has been perfected. The attention of the society is to be devoted to matters pertaining to metallurgy, ore dressing and chemistry. Officers were elected as follows: T. P. F. Walsh, president; H. A. Horner, vice-president; C. L. Epperson, secretary-treasurer. An executive committee was appointed to draft a constitution. Meetings are to be held twice a month.

American Institute of Mining Engineers.—The annual election of officers of the Columbia section occurred at a meeting in Spokane, Wash., Nov. 25. Topics under discussion at this meeting included the United States Mining Laws, Flotation, Land Classification and State and National Co-operation in the Establishment of Bureaus of Mines. C. G. Warsel also talked on the possibilities of reducing iron ore by electricity in the Spokane district. The field of Prof. Warsel's investigations were deposits in Stevens county, which, it is declared, can become the basis of manufacture here if electric power can be obtained within certain limitations.

Mackay School of Mines.—The Short Course for Prospectors at the Mackay School of Mines, University of Nevada, Reno, Nev., which was held with so much success during the past 2 years, will be repeated again this season. This course, which will begin on Jan. 8 and last until Feb. 2, is designed primarily to aid the prospectors of Nevada, but it is open to those engaged in other professions and to the residents of other states. The work of the course includes both lectures and laboratory exercises, and the subjects taken up consist of prospecting, assaying, sale of ores, milling, mineralogy, geology, prime movers, chemistry, hygiene, first-

aid to the injured, and mining law. Those who desire to take advantage of the instruction offered in this course should present themselves at the office of the Registrar at the University on the opening morning, Monday, Jan. 8. No charges will be made for instruction, but a fee of \$5 will be collected to cover, in part, the cost of supplies used during the course. Text books are not required, but certain books will be recommended in each subject.

TRADE PUBLICATIONS.

Duplex Steam Driven Compressors. Ingersoll-Rand Co., New York. Form 3033; pp. 28; illustrated.

The construction of the compressor is described in detail. It is stated that the compressor was designed to operate equally as well with either high-pressure superheated steam or steam under ordinary conditions. In the steam end of the compressor, which is known as type XPV, piston valves are used, and in the air end the usual type of Imperial-Corliss valves are used.

Flexible Roller Bearings for Mine Cars. Hyatt Roller Bearing Co., Newark, N. J. Application Bulletin No. 307; pp. 23; illustrated.

The four methods of housing the Hyatt bearing are classified as Wheel Hub Application; Inside Box Application; Outside Box Application and Anaconda Type. In the pages that follow detailed accounts of these four applications are given with reproductions of blueprints showing plans and sections of the construction. The advantages and limitations of each application are given. In the concluding pages separate reviews are given of the way in which different mine car manufacturers use Hyatt bearings in the construction of their particular cars.

Flexible Shaft and Equipment and Tools Used in Connection With It. Stow Mfg. Co., Binghamton, N. Y. Bulletin No. 102; pp. 107; illustrated.

Emery wheels, drills and similar tools to which the piece of work to be treated is usually applied may often be more conveniently arranged for the work in hand, especially when the piece to be handled is of a large size, and cannot easily be brought to the machine. To accomplish this, this company here describes portable motors which can be brought to the piece of equipment to be worked on. It is connected with the tool desired to do the work, such as emery wheel, drill, etc., by means of a flexible shaft, and thus the tool is applied to the part to be treated instead of that part having to be dismantled and applied to the tool.

INDUSTRIAL AND TRADE NOTES.

The Chicago Pneumatic Tool Co., through its San Francisco agency, sold a 50-hp. oil engine to the Cerise Gold Mining Co., Wilbur Springs, Cal., and a 750-cu. ft. air compressor to the Holt Mfg. Co., Stockton, Cal., for shop uses. J. H. Rylands is the company's San Francisco representative.

P. W. Sothman & Co., New York, announce the formation of the Sothman Corporation, which will specialize in power development and transmission, also in water works. The policy of the parent company of giving its clients the personal attention of Mr. Sothman or Mr. Glaubitz in all engineering problems which it may handle will be continued.

A series of three industrial motion picture films, illustrating the manufacture of "National" pipe, from ore to finished product, will be shown before the National Association of Stationary Engineers at Coplay, Pa., Tuesday evening, Dec. 12. These pictures were taken under the direction of National Tube Co., Pittsburgh, Pa., after 8 months'

work and at an expenditure of thousands of dollars. They are educational, and so realistic that even a novice, after seeing these pictures, may feel that he has started at the Mesabi ore ranges in Minnesota and followed the ore, step by step, until it is shipped out as finished "National" pipe. These pictures will no doubt be of interest to engineers, architects, plumbers and others interested in the manufacture of pipe.

Abr. Levine sailed on Nov. 23 for Brazil for the purpose of buying a supply of carbon. There has been an extraordinary demand for the black diamonds in this country for the last 6 months, owing to the increased activities among mines. Fine carbons are becoming very scarce and there is an outlook for higher prices in the future. In Mr. Levine's opinion there are indications that good carbon is going to bring \$100 a carat.

NEW PUBLICATIONS.

Underground Wastes in Oil and Gas Fields and Methods of Prevention. By William F. McMurray and James O. Lewis. Washington, D. C., U. S. Bureau of Mines Technical Paper 130; pp. 28; illustrated.

By the term underground waste as used in this paper is meant the unnecessary destruction or lessening of the value of underground supplies of oil, gas and water. Points tending to make production inefficient are discussed and remedies for the same given, such as waste caused by bad methods of producing from the well, allowing waters to contaminate the oil or gas strata, etc.

The Mining Industry of Idaho for 1915. By Robert N. Bell. Boise, Idaho, State Inspector of Mines. Seventeenth Annual Report; pp. 134; illustrated.

The report gives a general talk on the mining industry in the state during the year, accidents and their causes, and a review of new installation at mines, mills and smelters in the state during 1915. The geology of the Coeur d'Alene district is gone over quite thoroughly. A review of operations at mines and plants is made by counties and where of sufficient importance the operating company of the mine or plant is given a separate review as regards operations and production.

Geographic Tables and Formulas. By Samuel Gannett, Washington, D. C., U. S. Geological Survey. Bulletin 650; pp. 388.

This bulletin will be found of most value to those interested in surveying and more particularly that branch of the art known as geodesy. For the greater part the bulletin consists of tables though some space is given to the description and practical use of geometric and trigonometric formulas and derivations as applied to geodesy and plane surveying. There are 40 tables in all including tables of logarithms; those for the conversion of time, linear measure, latitude and longitude, those giving data for Polaris computations and the projection of latitudes to plane surfaces, etc.

Handbook of Rock Excavation Methods and Costs. By Halbert Powers Gillette. Clarke Book Co., New York. Book; pp. 825; illustrated. For sale by Mining World Co., \$5.

In no way has the author strayed from the book's designated title, and information on tunneling and shaft work, earth excavation, etc., is entirely omitted. The book deals entirely with things related to the excavation of large bodies of rock, such as methods, machinery and supplies used; classified costs of complete jobs and more detailed operations included in the work. The nature of rocks is briefly described in Chapter I. In the next 10 chapters drilling machines, methods and costs are dealt with and the concluding chapters go into the details of operation as practiced in various kinds of excavation such as quarrying, canal, trench and subaqueous excavation of rock.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Iditarod.

The Tolstoi camp has again come to light and pay has been encountered on Boob creek. This creek together with Mastadon creek was the center of much excitement during the early spring. Later it was given out that the camp was not so good, but now those who stuck are receiving their rewards.

Kennecott.

At a recent meeting in Seattle of the Mother Lode Copper Mines Co. \$1,000,000 was voted for developments and improvements next year. The improvements provided for include the building of a 12-mile wagon road from the mines to the railway. A concentrating plant is also provided for, and this will mean the employment of an additional force of men. The capital stock has been increased to \$7,500,000, and authority was also given for the issue of \$1,000,000 in bonds.

Fairbanks.

G. A. Arons, manager of the Fairbanks Gold Mining Co., has stopped dredging operations for the season and will leave for England, where he will spend the winter.

ARIZONA.

Miami.

North Inspiration has been organized by mining and business men of the Michigan copper country to take over 20 claims owned by P. P. Sullivan, who has done the assessment work on them for 9 years. The claims adjoin the Inspiration and Black Warrior properties and a shaft will be started immediately under the direction of H. V. Snell, a mining engineer of Globe, formerly of Hancock, Mich., and one of the lessees of the Black Warrior. The officers are: Williard J. Smith of Houghton, president; J. J. Sullivan of Calumet, vice-president; Bat Quello of Calumet, secretary-treasurer; A. E. Petermann of Calumet; M. W. Goldsworthy, Hancock; Maurice Bandetinni of Calumet and H. V. Snell, the remaining directors.

Jerome.

Two unusually wide and well-mineralized outcrops are to be developed by the Verde Copper Development Co. under supervision of J. E. Leeper. One of these outcrops—a broad belt of iron-stained quartz—follows the course of the great north fault. It samples high in iron and carries traces of copper, gold and silver. The erosion that has taken place here and at other points has disclosed favorable geological conditions. By reason of the greater erosion it is probable the area of commercial ore lies much closer to surface here than it did in the United Verde mine, where the overburden was heavier. The work now being done is purely preliminary, but it will serve as a guide to future operations and as a base for the development of the ground at depth. The deepest shaft is down 85 ft. It shows considerable copper mineralization, and while it is in the sedimentary formation, carries the mineralogical earmarks of making into commercial ore at depth. The slope of the hill adjacent to this shaft, and the gulch below it, are covered with float that has eroded from the outcrop. A permanent camp has been established nearby and in its vicinity will be located the 3-compartment working shaft the company plans to sink. This is to be equipped with powerful and modern mine machinery. The

latter will be freighted to the site via the old ore road to Ash Fork, formerly used by the United Verde Co., and a road the Verde Copper Development Co. will build to connect therewith about 3 miles from Jerome.

A number of recently organized companies are busy south of the United Verde and United Verde Extension mines. The section is one which holds much encouragement and is viewed with favor by the mining men of the camp. The Michigan-Verde Copper Co. is outlining plans for development at depth and expects to have work well advanced before the close of the year. The company holds 310 acres, being located in proximity to the United Verde. It carries the iron gossan and copper-stained quartz characteristic of the country in the vicinity of the United Verde and United Verde Extension. Near the Michigan-Verde the Boston & Jerome Co. is preparing development. A camp has been established and a force of miners engaged. Like the Michigan-Verde, the Boston & Jerome holds promise. It is one of the oldest corporations doing business in the Verde district, but until recently was inoperative. Now, however, it is to at once be developed. Funds for that purpose have been assured and will be available within 60 days. Reorganization was recently brought about with the result that Boston & Jerome has now on its board of directors some of the most capable mining, business and professional men in Yavapai county. Among them is Richard Kingdon, of the United Verde Extension mine. Others on the board are E. S. Clark, attorney of Prescott; J. S. Acker, mining and business man of Prescott; L. E. Hesla, mining and business man of Prescott, and E. C. Farrell, mining and business man of Clarkdale.

Seventy-five thousand shares of the United Verde Con. Copper Co. were sold at \$1 per share on Nov. 23rd, the day the stock was called for the first time on the New York curb. The company's United Verde, Junior group is located in the vicinity of the producing mines of the Verde district. Diamond drill operations are being prosecuted and at a later date will be in force on the company's Mahurin group also. These operations are preliminary to development at depth.

The conviction is becoming general in this section that the Jerome Victor Extension Copper Co.'s property will be a producer within a few months. The drive toward the United Verde workings on the 1200 level continues to show favorable copper indications, and the chances are strongly favorable to the picking up of the extension of the United Verde ore body during the next few weeks. The face of the drive shows chalcopryite and iron pyrites and appears to be nearing the point where a body of copper ore will be encountered. The company has the backing of a number of prominent copper mine operators of the Lake Superior country and has an ample treasury fund. An overburden of water for a time hampered mining operations considerably. Of late, however, the water has been handled without difficulty and the work has been prosecuted expeditiously and to good purpose.

Paradise.

The California mining district situated on the east slope of the Chiricahua mountains is fast taking on activity again after being quiet for a number of years. The district during the 80's was a producer of silver, and it again took on new life from 1905 to 1907. During the panic and the slump in copper in 1907 developments all over the country were curtailed and it is just recently that new life is taking headway and we have at least one property in the district now that will take its place among the producers. It has been under development for more than 2 years now by the Fife

syndicate of Kansas City and Chicago, and their developments up to date have been very satisfactory. They are now expecting their new plant and it will be all installed by early spring, at which time they expect to commence marketing ore. The company is now engaged in building a road to the nearest railroad station at Rodeo, New Mexico, where they will ship to both the El Paso smelter and the copper reduction works at Douglas, Ariz.

The Hall property is also being worked under new management and it is believed that they have a good property and will soon commence to ship ore. This property is part of the old Texas mine that was worked in the 80's.

The Doran and Galligar property is also under bond and leased to Denver parties, and while they are at present shut down, it has been announced that they are in the east financing, and that they will resume work by the first of the present year on a very large scale. This mine has good values in copper and zinc and some in silver and gold, and the engineer who spent several months on the property pronounced it a very attractive prospect. •

The Crys Grauer property has recently been sold and two shifts have been put to work taking out shipping ore from some of the old workings. It is said that work on a large scale will start as soon as machinery has been installed. The property joins the Hill Top on the west and north.

G. T. Colvin has sold his property. The Colvin is a copper property and joins the Hill Top on the east.

The Virtue Mining & Development Co. has recently been organized. The Virtue property which has been under development in a small way for a number of years, has proven satisfactory in every way, and as soon as machinery and supplies can be arranged for and installed development on a larger scale will be undertaken.

The Cochise Con., a very attractive property now owned by C. E. Welch, has recently been examined by eastern capitalists. The development work which has been done in the past has been satisfactory, and more depth will be the next undertaking by parties working the property. The greatest depth that has been attained on the property is a vertical shaft 115 ft. which shows ore from the surface to its present depth. There are several other workings on the property of less depth that show equally as good for the depth attained.

Oatman.

The United Eastern mill will be running at part capacity by the first of January, according to official prediction, and at full capacity of 200 to 250 tons within 30 days thereafter.

New plants are projected by the Tom Reed, Big Jim and Gold Ore companies, and by a syndicate which is heavily interested in Carter and a couple of other properties. The Gold Dust plant, which is trying out a new high-speed crushing apparatus and the Zimmer centrifugal amalgamation process, is undergoing some changes, but will soon be handling 25 tons daily.

The Tom Reed is drawing plans for a new 500-ton mill to handle the ores from its new Aztec mine, which embraces the Aztec, Black Eagle, Grey Eagle and Bald Eagle workings. Supt. Edwin Rabb is designing it, and says that he believes he will be able to mine and mill \$4.50 ore at a profit.

The Big Jim is planning a 400-ton mill, and plans are practically completed. Supt. Keating hopes to equal Engineer Rabb's record as to low mining and milling costs.

The Gold Ore, left without milling facilities when the Gold Road suspended milling operations temporarily, will commence construction of a 50-ton plant not later than Jan. 1.

The Carter interests are planning a 200-ton mill, but plans have not yet advanced to the point where definite information can be given out.

The new Aztec mine of the Tom Reed is being steadily developed and is showing up better every day.

The Big Jim is drifting to the east on three levels, and is daily adding to its ore reserves. Drifts have been carried to within 125 ft. of the eastern end line, showing solid ore

20 to 25 ft. in width, and as the Tom Reed has developed a body of ore more than 25 ft. in width up to within a few feet of the eastern end line of the Big Jim on the same vein, it appears reasonable to assume that the Big Jim ore shoot extends to its extreme eastern end line—a distance of some 700 ft. from the shaft.

The Lucky Boy Co. has resumed operations, but has not as yet put a full crew of men at work, as some preliminary work was necessary after its shut-down of several months. The working force will soon be increased.

Under the impetus of power drills the Oatman United's big 3-compartment shaft is being steadily driven downward, and has now reached a depth of about 200 ft.

The Nellie, after having cut through more than 40 ft. of vein matter by crosscutting on the 350 level, has resumed sinking and will go to the 500 level. The crosscut opened about 17 ft. of pay ore.

The Iowa is drifting on the vein on the 400 level, and values are slowly increasing. The ground was considerably broken where the crosscut was driven into the vein, but is now becoming more solid.

The Ivanhoe has almost completed unwatering its property, and mining operations have been resumed on the 500 level.

Drifting is in progress on the United Northern on the 400 level, with values ranging from \$2 to \$12. The vein is about 50 ft. in width, and a point has not as yet been reached where the values seem to centralize.

The Gold Ore has been refinanced by Hot Springs capitalists, and work is being resumed. The refinancing includes \$100,000 for the construction of the new milling plant. The company shipped several thousand tons of \$20 ore to the Gold Road mill.

The Gold Road company has resumed mining operations, and is exploring virgin ground to the east of its old workings.

The old Moss mine is now being prospected by diamond drills. It is reported to have been taken over by the San Gertrudis Co. of London.

The east drift on the Carter is now in 850 ft. on the 350 level, and a considerable tonnage of ore reported to range between \$18 and \$25 is being developed. The company has been refinanced and work will be done on deeper levels in the near future.

Bisbee.

The Louisiana-Arizona Copper Co. has recently been formed and acquired 31 claims in this district. The officers of the company are D. A. Pressly, president; J. B. Tompkins, vice-president, and R. A. Clampitt, secretary-treasurer. Recently a strike of silver, gold, lead and copper was made. Since, careful investigation has revealed deposits of ore, running as high as \$117.05 copper, \$32.70 silver and \$9.00 gold. Stock will be placed on the market for 30 days in Bisbee before going after outside capital.

Miami.

At Old Dominion work has been commenced on sinking the Kingdon shaft below the 16th level.

Most of the 1200 tons hoisted per day are coming from the "A" shaft. Here on surface, foundations are being put in for the new Diesel engine, delivery of which has been delayed several times. Three shifts are working stringing pump columns in the new concreted pump shaft. The two ends of the west footwall drift on the 18th were recently holed through. Having this connection between the "A" shaft and the farthest west workings improves the ventilation on the lower levels and expedites the handling of ore, etc. The footwall drift going east is making headway. Most of the ore is being produced on the 12th, 14th and 16th levels, while active exploration work is proceeding from the 12th down. On the east side of the mine a raise is being put up from the 14th level under the Grey shaft for ventilation. When this is completed the drift west will be extended toward the Arizona Commercial in order to prospect the vein. A small tonnage of ore is coming from the Grey mine, on the 5th, 6th and 7th levels, No. 3 vein. At the concentrator about 800 tons are being handled daily. The flotation plant is handling a daily tonnage of 400 tons. At the

Oliver filter plant a new thickener has been installed which will give better settling capacity. Plans are being made to install a new flotation plant on the lower floor of the old unit of the concentrator. At the same time a blacksmith shop and carpenter shop will be put in on the same floor.

CALIFORNIA.

Jenny Lind.

J. W. Plant, Insurance Exchange building, San Francisco, has taken a 3-year lease on Plymouth Rock mine. A gasoline hoist has been put in and some gold and silver ore is being shipped. The ore carries lead and zinc also, and it is probable that a mill will be built for concentration by oil flotation.

Angels Camp.

Angels Camp Deep Mining Co. has been organized to take over, explore and develop the old Pioneer mine, which adjoins the Gold Cliff of Utica Mining Co. An electric hoist and air compressor have been put in position, and sinking a new shaft is in progress. No lateral development will be done till a depth of 500 ft. is reached. In old workings, at 130 ft., shoots of ore were found, and a 12-ft. vein was opened containing rich stringers of gold ore. The inclined shaft on Gold Cliff is down 2200 ft. and the Angels Camp Deep have plans to reach similar depth. Officers of the new company are: E. P. Brinegar, president; Elgin Stoddard of Chas. C. Moore & Co., vice-president; J. H. Hopps, engineer; Kenneth McDonald, and Mr. McCarty of Sherman, Clay & Co., are interested. All are San Francisco men.

Ingot.

Reports received from the east are that the Afterthought Copper Mining Co. has been financed and that new equipment is to be purchased and installed for a plant to recover copper, zinc, gold and silver in the ores of that mine. The methods to be adopted, while practically decided upon, are not given out.

Portola.

Operations have been started at the Bonita copper mine, about 24 miles from Portola, by the Walker Brothers Con. Co., of Salt Lake. A compressor and other equipment has been installed, also three machine drills. It is planned to press developments during the winter, and ore shipments to Salt Lake will begin in the spring. Electric power will also be brought to the mine as soon as the dry season sets in. The Bonita lies a mile from the Walker copper property and has been undergoing development for 4 years. A good camp has been established. H. L. Allread is superintendent.

The Boca & Loyaltan railroad is to be extended 5 miles into the Grizzly Creek country, facilitating easy communication with the Walker mine. Construction is to commence at once. The road is controlled by the Western Pacific Co. and its building will stimulate the working of numerous copper and gold prospects. The Walker property is being worked by the International Smelting Co. The 100-ton flotation plant is reported to be making a high metal recovery, and its capacity will probably be greatly increased early in the coming year.

Crescent Mills.

The Crescent gold mine is being rehabilitated by the Philadelphia Exploration Co. Considerable mine equipment is to be installed, and the old mill replaced by a modern reduction plant. The Crescent has been developed to a depth of 400 ft. and formerly ranked among the richest gold producers in the state. Albert Burch, formerly of the Goldfield Con., is manager, and A. Buckbee superintendent.

Alleghany.

The new 5-stamp mill has been placed in commission at the Mariposa and is effecting a satisfactory gold recovery. The company is prosecuting work in the Mariposa and Ophir claims, and has a large tonnage of good ore ready for the stamps.

The Osceola mine has been acquired by R. C. Gillespie and associates of Pittsburgh, and is being equipped with the

plant formerly operating at the Spoon property. By Dec. 15th Manager Dan McGonigal expects to have everything in shape for extensive work. Rich ore has been extracted from the Osceola at intervals, and ore indications are considered favorable for the making of a good mine.

Amador City.

The output of the Original Amador mine has been increased from 150 to 250 tons per day, following installation of two Hardinge mills in the plant. A higher gold extraction is also announced. On the 850 level several good shoots have been opened, and a large tonnage of profitable ore has been blocked out in this section of the mine. The mine lies between the Bunker Hill and Keystone properties.

Sutter Creek.

The hoist formerly operating in the winze on the 2900 level of the Central Eureka has been moved to the 3100 level, and sinking of the main shaft an additional 200 ft. has begun. New levels will be opened at the 3300 and 3400 points, and drifts extended east and west with a view to the intersection of two ledges that are thought to parallel the main ore body. Ore of fair grade is being mined on the 2800, 3000 and 3200 levels, and the management expects to keep 20 of the 40 stamps in operation while shaft sinking proceeds.

Jamestown.

The Harvard mine has been taken under option by an eastern syndicate headed by W. J. Loring, and a thorough examination is being made. For more than a decade the Harvard has been one of the largest and most consistent of Mother Lode producers, and late work in the deeper levels is reported to have been encouraging. The mine is equipped with a 60-stamp mill and large mine plant.

Sonora.

A small flotation unit has been placed in commission at the Dutch-App group, operated by W. J. Loring and associates. It is the first flotation plant of commercial character to be operated on the Mother Lode, and the results are being followed with keen interest, as many Mother Lode properties are hampered by the lack of suitable equipment for economical treatment of low-grade sulphide ores. Splendid ore has been opened at several points in the Dutch, App and Sweeney mine since Loring and associates acquired control, including a particularly fine vein in the 130-ft. winze from the 1800 level.

The California Gold Mining & Development Co. has bonded from F. A. Wenzel of Sonora the Chaparral mine, southeast of Tuolumne. Several adjacent properties have also been taken under bond and will be thoroughly explored. The Chaparral has a good record. A compressor and drills have been ordered, and development of a wide area of promising ground will be pressed.

The Bonanza mine, in the heart of Sonora, has been taken under bond by J. B. Curtin and George Weston. It has produced upward of \$2,000,000 in pocket gold, and large areas of promising territory remain to be exploited.

Callahan.

New mine equipment has been installed at the Oro Grande, formerly known as the McKeen, and arrangements are being made to provide an entirely new milling plant, employing a process for treatment of the somewhat refractory ore. Twenty men are employed and development of good territory is being carried on from the lower tunnel workings. W. L. Fraser is superintendent.

Porterville.

More than 700 men are engaged in mining of magnesite and its allied branches in the Porterville district. Three calcining plants are now in operation, the \$50,000 plant of the American Magnesite Co. starting up last week. The plant has a rated capacity of 65 tons per day, making a total of 125 tons daily for the district. Mining developments are very active, and several important discoveries have been lately announced.

Mokelumne Hill.

At a depth of 50 ft. a 6-ft. vein, said to assay \$200 in gold, has been uncovered in the Garibaldi mine, located in the Jesus Maria district, 8 miles from Mokelumne Hill. The

property is owned by the Gardells brothers, and is being worked under bond by W. P. Young and William Stovers. Considerable fine gold is present, and much decomposed quartz occurs.

Grass Valley.

The Grass Valley Con. Co. has announced that unwatering of the Allison Ranch mine will be completed within 2 weeks. Construction of the mill is proceeding rapidly and the management expects to have the stamps dropping on good ore early in the coming year.

COLORADO.

Lake City.

The Colorado-Utah Operating Co. is doing extensive new work in connection with its mill at the Golden Fleece mine. Within 90 days the recently ordered Hardinge ball mill, 100 tons capacity, will be installed. In the meantime the flotation process for the treatment of milling ore, which carries gold and silver with substantial values in copper and lead, will be completed. The new plant will have a capacity of at least 100 tons. Pending its installation, development will be prosecuted.

Palisade.

A company has recently been formed to work shale beds here which contain oil. Richards and Flinn originally owned the claims which are on Dry Fork creek. The company estimated that it can separate the crude oil from one ton of rock for about \$1 and that the crude oil will be worth about \$10. With a small retort which it has constructed it has averaged 81 gals. of oil to the ton. The oil contains a large per cent of kerosene, gasoline, etc., and the remainder has been classed by a Denver chemist as good oil for flotation. What is known as the first unit of the Scott system of separating the oil from the rock, which consists of 6 retorts, will be installed. This system when completely installed will cost \$10,000.

Leadville.

At the Leadville Unit several veins of zinc carbonate have been cut in the Jamie Lee which will start producing by Jan. 1. A steady production of carbonate is being made from the Tip Top. The Jamie Lee shaft is to be sunk further. It has been drained to its present depth and work is now under way cutting a station at the bottom. As soon as this is finished a plant of pumping equipment will be installed and sinking started again. Because of the favorable indications uncovered in the upper workings the plan to lease out certain parts of the Jamie Lee has been abandoned. It is now determined to prospect the property on company account. The Harvard, Tip Top and Jamie Lee shafts have been equipped with a system of air lines from the Harvard to all the important workings of the company. Development will be taken up in several of the most promising places of the Tip Top and Jamie Lee.

Operating with a Layne-Bowler electric sinking pump, the water in the Greenback has been lowered from the 900 to the 1200 level. At this latter level, however, an unusual amount of water is now coming in which is puzzling because nothing similar occurred when the property was previously unwatered.

About 450 tons are now being shipped daily from the Garbutt and Ibex mines, which is considerable larger than has prevailed for several years. A good body of low grade gold has been opened on the C. & G. lease of the Ibex. Development on this shoot continues to the south and new ground opened. The tonnage of copper ore is becoming an important factor in the Ibex. Several leasing companies have opened strong veins of copper averaging 8%. Under the present price for copper, this product is rivaling the gold output. High grade carbonate of zinc is also being mined.

Ouray.

The Barstow mine has been let under lease and bond to C. R. Wilfley and Chicago associates. W. A. Sheldon will be superintendent. The new lessees will continue development on the bottom levels during the winter on a fairly large

scale, with the intention of greatly extending their operations next spring. Several old filled stopes will be investigated. If promising the 40-stamp mill will be overhauled and a fine grinding machine and flotation process installed.

Breckenridge.

The mill of the Pioneer Con. Mines Co. has been completed and is now operating. At the Wellington, while sinking the shaft to encounter the Oro vein a new vein of fair promise was encountered. By a new roaster, making two in the roasting plant, the capacity for increased shipping was provided. A new addition has been built for the accommodation of the flotation plant, which is to be enlarged. New ore bins have been completed recently which provide ample storage room. The new boarding house is among the latest surface improvements.

Tonopah is drifting from the bottom of the Miller shaft across the gulch from the Wellington. The work is inspired by the probability of cutting either the Oro vein or another vein the existence of which is assured by exposure of the vein during dredge operations in the past.

Rico.

The Gold Anchor has made its first shipment and it is understood that plans are being laid for extensive work for next year to cut the ore body at a much greater depth by a tunnel 500 or more feet in length.

The plant of the Rico Argentine is now running smoothly. Two drifts are being run from the main tunnel. Strong mineralization indicates that the copper shoot must be close. This shoot was developed in the old workings. Both drifts are about 600 feet in and are in limestone. At each face 8 ft. a day is being made with the new power drills. The work is 180 ft. vertically underground and 300 ft. on the dip. Some samples were taken from the faces of workings Nos. 406, 405 and 404. The first group showed copper and the second lead and zinc.

IDAHO.

Mullan.

Plans are being perfected by the Gold Hunter Mining Co. to increase the capacity of its concentrator and install separate treatment systems for ore now being produced. It is said that the new unit will be devoted to treating the lead ores and that the old plant will be remodeled to handle the high-grade silver product.

George R. Trask, of Wallace, has been busy the last week at the Carbonate Hill mine, near here, making surveys and laying out work for the contemplated long lower tunnel, starting at the railroad to tap at greater depth the ore bodies disclosed in the upper tunnel. This new tunnel will be about 1900 ft. long and give a vertical depth at the ore body of 850 ft. below the surface, 240 ft. below the present workings, and a stoping back on the vein, below the present workings of 275 ft. Judging from the fine showing of galena-zinc ore in the present workings, when this new tunnel reaches the ore, the mine should be among the prominent shippers. Estimates are also made for a new compressor, installing of electric power, and other improvements.

Burke.

Resumption of development is planned by both the Ajax and Ambergris mining companies, adjoining the Hercules. The Ambergris mine, owned by the Ambergris Mines Co., whose capitalization recently was reduced from 3,000,000 shares at \$1 each to 1,000,000 shares, is regarded as a promising non-productive property. The Ajax also is to be opened at depth, according to H. W. Woodward of Lynn, Mass., vice-president of the Ajax Co.

Kellogg.

Construction of the Bunker Hill & Sullivan Mining Co.'s new \$1,000,000 smelter at Kellogg is progressing rapidly, according to Stanley A. Easton, general manager, and the plant probably will be completed and operating on schedule. The superstructures for the furnace and refinery buildings are being raised, the main stack is rising fast, and construction

in other departments is being rushed. An average of 275 men are employed in the work, and the force probably will be increased as installation of the equipment progresses.

Adair.

More than a car of ore a day is being shipped from the Richmond mine, fifteen 4-horse teams being employed transporting the product to the railway at Saltese, Mont., and it is believed that operations can be maintained throughout the winter, with a possible exception of a short time when the ground begins to thaw next spring. Extraction now is being made through the main shaft. Short tunnels already have been extended from both the Montana and Idaho sides of the mountain on which the property is situated. Officials state that 35 cars of ore have been shipped since September, the settlement ranging from \$1300 to \$2200 net to the car.

Black Bear.

Resumption of operations at the Black Bear property is contemplated. The company recently took a lease on the Western Union Mining Co. mill, west of Wallace, for a year, commencing Jan. 1, with the privilege of adding new buildings and machinery to the plant necessary to handle the Black Bear ores, which are a lead-zinc product. It is estimated that from \$15,000 to \$20,000 will be required to place the mill in a condition with a capacity of 125 to 150 tons. It is also contemplated to expend approximately \$20,000 in new equipment, which will include a larger air compressor, drills, steel-sharpener, cars, bins, air pipe, fans, crushers and railroad siding.

Hope.

The Hope Mining & Milling Co. has recently been incorporated to continue the development of the Morning Star group. Considerable work has already been done with excellent showings having been encountered. The property is located about 3500 ft. from the main line of the Northern Pacific railroad, and from the lines of the Northern Idaho and Montana Power Co., which gives splendid transportation facilities and cheap power. A small stream passes near the workings and there is an abundance of timber for all mining purposes. There are five nearly parallel veins of mineral bearing quartz on this group of claims cutting the formation at a sharp angle and on a clean contact. The Big Ledge is from 4 to 6 ft. wide at the outcrop, and stands nearly perpendicular. The general character of the formation shows a marked similarity both in texture and color to the main Coeur d'Alene region. There are no indications of local disturbances or faults.

The veins have been tested by 23 open cuts all of which show mineral-bearing quartz in places. The present development consists of 313 ft. of tunnel, by means of which the veins have been cut at depths ranging from 70 to 124 ft., exposing in these workings two veins of copper sulphide ore of a shipping grade, while at Big Ledge about 30 ins. is of a good grade of milling ore. The largest of the veins of shipping ore has been explored by a drift for a distance of 50 ft. disclosing its continuity for at least that distance, with a width of from 5 to 12 ins., and giving every indication of the lens increasing in size as depth is obtained. The ore from this lens averages \$60.

A good road has been constructed from the railroad to the tunnel site. The development now being undertaken consists of a 1200-ft. crosscut which will encounter all of the veins at depths ranging from 350 to 500 ft. The company is capitalized with 1,500,000 shares of a par value of \$1 each, of which over 900,000 remain in the treasury. The officers are: Hon. G. H. Martin, Sandpoint, Idaho, president; A. W. Bowen, cashier 1st Nat'l Bank, Sandpoint, treasurer; John Parson, Hope, secretary. The directors are all well-known local business men.

LAKE SUPERIOR.

COPPER.

Houghton.

Isle Royale has raised its daily tonnage up to 3200, or at the rate of 80,000 tons a month, but the actual figures will

be nearer 77,500, which though the daily rate is high, about 3100, is somewhat low, as there are only 25 working days, since election day was a holiday. The profit for the month should be about \$141,000, or at the annual rate of over \$10 a share. The wooden rockhouse at No. 5 shaft will probably be completed in February, and the crew will be transferred to building a similar wooden rockhouse for No. 6. A large amount of development work is in progress, as the mine located within a mile of Houghton, gets and holds its men better than the more remote properties. Nos. 4 and 5 are the best of the shafts, and as they have been opened quite extensively, there is every reason to believe their good quality will continue with length and depth.

Copper Range is steadily hoisting its 5800 tons daily, which is its normal, the mines having all the men that are needed. It has purchased recently from the Denver Rock Drill Co. 25 Dreadnaught drills, and 50 of the Clipper pattern. It has now three diamond drills at work at the tract of land taken under option from the St. Mary's Co. and lying south of the Globe.

Wyandot will in a short time make a mill test of the rock it has accumulated. It is drifting both ways on the 10th level in excellent ground, and is getting good rock from its two stopes on the 9th level. Its rock will probably be milled in a mill that regrinds the tailings, as it needs this treatment to get the fullest possible recovery.

Osceola Con. will have about 110,000 tons for November, or about 4400 daily, and this a very good figure considering that the Osceola and North Kearsarge are quite a distance from the larger towns. Ahmeek is making just about the same figure as the Osceola counting the La Salle rock, which is about 7000 tons monthly.

Michigan has made three cuts on the Evergreen lode with great success, there having been taken out of the last one about 700 lbs. of mass copper, one piece weighing over 200 lbs., with the face of the drift still in the same average quality, and also a good amount of stamp rock. On the Ogimah lode the ground in the drifts was poorer than the average for the week ending Nov. 25th, but beginning with the 27th it has been better. On the raise in the longitudinal vein lying above the Butler lode, but which may be the hanging-wall of the latter, there has been copper in good quantities all the way up from the 6th to the 5th levels, where the work is stopped waiting for the drift to be opened 35 ft. in from the shaft. In the west drift the diamond drill searching for the lode beyond the fault encountered 2 or 3 weeks back, is being kept up.

Centennial has reached the 18th level with its No. 2, and one skip way of its No. 1 shaft the latter being used only for men and timber; and has drifted from No. 1 past No. 2 north into rich ground. As was indicated on the 17th level the mineralization has extended south across No. 2 shaft southerly, making the property of much greater extent than it appeared to be. The copper is quite evenly distributed through this northern part of the mine as far as it has been exposed by drifts, and its eight or more "forties" will make a good sized mine, when the proper time arrives for it to be worked to its greatest advantage.

Keweenaw Copper shipped on Dec. 1 about 40 to 50 barrels of mineral, and about 2 carloads of mass, to the Quincy smelter.

Quincy has run its daily output to between 4300 and 4400 tons; great care is taken to keep the reserves up to the proper figure all the time.

Lake, on the Knowlton lode, will soon have a new Ingersoll-Rand compressor with a 10-drill capacity. At the older part of the mine there has been a slight increase of tonnage for November, which will be approximately 8000 tons.

Mohawk will make in November a slight increase of its tonnage over that of October which was about 63,000 tons, or 1,239,500 lbs. of refined copper; and Wolverine's figure for November will be just about the same as that for October, which was 27,174 tons, or about 405,500 lbs.

Calumet & Hecla is keeping up a very good rate of tonnage, as its figures for the past few days have been about

10,520 tons, which is a decrease of about 300 tons from the figures given about 3 weeks ago.

Indiana is now down about 100 ft. with its shaft on the Butler lode and is finding some copper all the time.

Houghton Copper has discontinued its northern drift on the 12th level since the continued extension is so expensive as the "dirt" has to be trammed over 100 ft. to the winze, drawn up in a bucket to the 6th level, trammed to the shaft 250 ft. away, and finally hoisted up to the surface. It is, however, cutting into some of the ground already opened there with high grade disclosures. It is probable that the directors will soon decide whether they will extend the shaft down crosscut over to the lode and mine it.

White Pine Extension will sink from the 100 level to the 200 and open up the drifts. The party of directors, who were here recently, were very much pleased with the high grades of rock that were being met with at the drift on the 100 level, as they fully justified, the expectations that followed the getting of such good drill cores.

Mass will increase its output for November somewhat over that of October, which was about 27,000 tons, a little more than 1000 tons a day. Conditions underground were never better and more men could be at once put to work stoping to bring the tonnage figure to its maximum, if they were to be had.

South Lake is taking out about 125 tons a day and hopes to soon increase the production.

IRON.

Marquette.

A saw mill for the handling of wood for the charcoal retorts of the Pioneer Iron Co. will be in operation by March, 1917, and the 20 new retorts have been put in operation. At the new mill logs will be shipped in as felled instead of being cut into 4-ft. lengths in the woods. The equipment of the mill will be three 6-ft. band saws and a 4-saw Prescott slasher, equipped with 72-in. circular saws. The logs will be rolled from the banking ground into a conveyor that will carry them to the slasher, which will cut them into 4-ft. lengths. The smaller wood, of retort size, will be diverted from the conveyor, and the larger sizes will be carried to the band saws, where they will be cut up for retorts.

Iron Mountain.

The Peninsular Power Co. will soon commence a transmission line to the Indiana mine from Twin Falls. The mine will require about 350 electrical horsepower for operating pumps, crusher and hoist. An electric haulage system also is to be installed underground.

MISSOURI-KANSAS.

Joplin, Mo.

So far as could be learned last week \$105 was the top basis price being paid for zinc blende. Sales at this price were reported 'few, many producers declaring they would not sell for this figure, but hold for a higher price. Lead ore remains unchanged, as well as silicate.

The power plant of the Empire District Electric Co. at Riverton, was further crippled at 12:35 o'clock Saturday morning, when a short circuit developed in one of the turbine generators, causing a complete burn-out and rendering it practically useless. Another large generator near the burned one was damaged to such an extent that it is out of service. It will be a week before these turbines can be replaced, and all mines using electric power will be forced to shut down, further curtailing the output of ore, and for this reason higher prices are expected by producers.

The Fighting Wolfe Mine at Zincite, which went into the hands of J. A. McConnell as trustee, has become a prolific producer, zinc concentrates being made now at the rate of 3 carloads in 2 weeks. At present there are a total of 12 drifts in ore being worked at the property. These drifts are on two levels, six of them being at 65 ft., the upper level,

and 6 at 84 ft. The company is said to be planning a new concentrating plant a short distance to the southwest of the present mill. Drill holes in this vicinity were exceptionally good and the fine run of ore that has been shown recently leads the company to believe that there is plenty of need for another mill.

The first barrowful of concentrates to be mined at the new mill of the Latoka Lead & Zinc Co. was thrown into the bins Saturday. The mill was started in the morning. This property is owned by Jess Short, who says they have a 17-ft. face of ore at the 200-ft. level which runs 15% blende. The mill is 150-ton capacity.

Construction of a new concentrating plant has been started by the U. S. Paymaster Mining Co. on the Lewellyn land north of Bell Center. It will be a steam plant of 150-tons capacity per shift, is being built under contract by Goettel & Carrow Brothers, and it is to be completed in 55 days. This property was opened up about a year ago by the Wassermann Mining Co. as a lead prospect.

Another shaft has been put down by the Independent Mining Co. at Bell Center. Excellent dirt is being taken from a 98-ft. depth.

Miami, Okla.

A company composed of Webb City and Carthage men have taken over a large lease between Quapaw and Commerce, which is being drilled and developed. The tract consists of approximately 745 acres. If the land proves up the company will erect a new \$600,000 mill. The following are interested: George W. Moore, J. F. Wingfield, S. C. Bird, Thomas Hill and James Richards of Webb City, and Richard Holden, John Bailey and L. Gerald of Carthage; Holden is fee owner of the land.

Rich ore has been encountered in a shaft on what is known as the Blue Jacket mine near Cardin. This mine is on a 40-acre lease, on which nine drill holes have been put down. At the bottom of the shaft, as far as it has been sunk, ore, lead and zinc could be picked up by the handful.

The Lucky Jew Mining Co. is drilling extensively on its newly acquired 80-acre tract in the Cardin district. Three drills now are in operation and have already revealed good runs of ore at about the 280-ft. level. The following are interested: A. B. McCormick, W. W. Hubbard, Herman Strauss, J. H. West, Chas. Veteto, Ira Smith, Hal Mitchellson, A. J. Goldberry, J. W. Watson, Roy Redman, Frederick Wilson and F. M. Thompson.

The Admiralty Zinc Co. in the Century field has erected three new mills since it took over a 100-acre tract of land in the vicinity of the Big Welsh properties in the last year. Two of the mills are of 200-ton capacity, while the third is capable of handling 125 tons. The tract procured by the company was developed by Church & Mahon. Extensive drilling activities were made by the fee holders before subleasing the tract to the Admiralty zinc. At the present time the company has six shafts in ore, all of which are producing big. The ore is of exceptionally high grade, assaying from 60 to 84% metallic zinc content. A carload of ore recently sold assayed an average of 63.80%.

Announcement has been made of the sale of a 20-acre lease adjoining the Croesus property at Cardin, by the Dewey Howard Mining Co. of Miami to a Kansas City company. The consideration is reported to be in the neighborhood of \$35,000. Drilling operations have been under way for some time and a shaft was started some weeks ago and now is almost down to ore. A total of 11 drill holes have been put down and all show an ore face of approximately 30 ft. in height at a depth of about 205 ft. It is understood the new owners of the property will push the work on the shaft and as soon as the ground is fairly well opened up will erect a 250-ton concentrating plant. This deal is one of the most important reported in the Oklahoma field for several weeks.

The U. S. Mining & Smelting Co. has completed a 300-ton mill on a 65-acre tract of land near Cardin, adjoining the Blue Goose mine on the northwest. The ore faces vary in size from 15 to 23 ft. at the 250 ft. level. The plant is one of the best equipped in the district, coal being used for fuel, four large 150 hp. high-pressure boilers supplying steam.

MONTANA.

Butte.

The Anaconda Co. has posted the following notice: "Notice to Employees: Without altering or changing any existing contracts or obligations, the Anaconda Copper Mining Co. will, as long as the average monthly price of copper remains 27½ cts. per pound, or more, increase the wages of all employees paid on a daily wage rate, at the mines at Butte and the reduction works at Anaconda and Great Falls, 25 cts. per day. This increase is made effective, beginning Dec. 1, 1916, and shall apply to settlements made for services rendered from and after Dec. 1, 1916." The increase means that miners will receive \$4.75 a day while the price of copper remains at 27½ cts. or better, and that salaried employees who receive \$300 or less per month will receive an additional raise of 5%. The wage increase applies to the employees of the Anaconda Copper Mining Co. at Anaconda and Great Falls.

Federal Judge George M. Bourquin, in a decision handed down, has denied the petition of the Minerals Separation Co. for an injunction restraining the Butte & Superior Co. from distributing its enormous profits to stockholders, disposing of its assets and enlarging the plant with which it reduces its zinc ores by the oil flotation process. The court also discharged the Butte & Superior Co. from the order issued Nov. 14, 1913, requiring it to post a bond in the sum of \$75,000 to secure a possible judgment for infringement of patent on the oil flotation process, and requiring monthly reports of the results of this process at its mill.

The decision is a sweeping victory for the Butte & Superior Co. so far as this phase of its controversy with the Minerals Separation Co. is concerned, although the question of infringement of patent itself is now with the United States Supreme Court, where it was taken on a writ of certiorari immediately after the circuit court of appeals reversed Judge Bourquin's findings and declared the Minerals Separation patent void because of lack of novelty.

Refusal of the Minerals Separation Company's petition for injunction and granting of the Butte & Superior Co.'s motion for discharge of the restricting order of Nov. 14, 1913, means that the Butte & Superior Co. may now go ahead with its plans for enlargement of its mill with a view of greatly increasing the capacity. These plans have been held in abeyance because of the court's restriction on use of the patent process to the extent to which it was being used at the time the order was made. When news of the decision reached the offices of the Butte & Superior Co.'s attorneys, Sanders, Kremer & Sanders, word was telephoned to General Manager J. L. Bruce and work was immediately started on the deferred plans for enlargement.

This latest decision brings the present status of the Minerals Separation-Butte and Superior litigation down to the point where it is up to the supreme court to decide whether or not use of oil flotation for reduction of ores is an infringement of the Minerals Separation patent. Judge Bourquin held 3 years ago that it is. The circuit court of appeals held that it is not.

The suit against the Butte and Superior is based in large part upon the contentions in the Hyde case, an immediate parallel. After the Minerals Separation Co. had appealed from the circuit court's decision to the supreme court of the United States, it filed a motion a few weeks ago in the federal court here to increase the Butte & Superior bond so that a possible judgment might be secured. The Minerals Separation Co. contended that profits of the Butte & Superior from use of the oil flotation process had mounted up to a figure approximating \$15,000,000, and that \$13,000,000 of these had already been distributed to stockholders. They contended that the Butte & Superior was disposing of its assets to such an extent that possibility of collecting a judgment in the amount which might be expected was jeopardized.

Dillon.

There is considerable excitement in Argenta over the uncovering of a vein of high-grade copper ore which was struck

in the Jack Rabbit mine. The news was brought to Dillon by B. C. Crowley, who states that the vein is 14 ins. wide and runs 15% in native copper, from 20 to 30 ozs. silver and from \$1.50 to \$4 in gold. Under the supervision of Jack Conda of Butte, a small crew of men have been employed at the mine for several months. Extra men have been put on already, and Conda was in Argenta Saturday to get lumber for the construction of an ore bin. The company that is operating the mine contemplates putting a larger crew of men to work immediately and will begin shipping ore to the concentrator within a few weeks.

Great Falls.

The third unit of the new zinc smelter is in operation, which gives an output of 100 tons of zinc per day. The fourth unit, manager Frederick Laist says, will be ready by the 15th, and the fifth and last unit will be completed and in operation by Jan. 1. The five units will give an output of 9,000,000 lbs. of zinc per month and will in addition to caring for all of the concentrates of the Anaconda Co., enable it to handle concentrates from other districts. The Anaconda is now purchasing concentrates from Idaho, in addition to a much larger output from its own mines, and expects to keep the new plant working to full capacity. With the completion of this third unit the temporary plant at Anaconda, which was evolved from the original experimental plant, will be abandoned and the men employed there will be transferred to the Great Falls plant.

NEVADA.

Goldfield.

It is officially announced by the Goldfield Con. management that operations with flotation will be resumed about Jan. 1. At least one 500-ton unit will go into commission on that date, and the second operated as soon as possible. A 50-ton unit has been in steady operation on gold-copper ore from the Laguna mine with satisfactory results, and reports that the process has not been successful are refuted. The additional equipment for the flotation plant has arrived and is being installed. Underground developments are being prosecuted, with good results. Arrangements have been made to run about 700 tons of tailings and ore through the cyanide plant daily, as soon as the flotation mill goes into service.

Two crosscuts are advancing into virgin ground from the 1100 level of the Silver Pick shaft. The east crosscut has intersected several parallel seams of good quartz, and the management believes indications favorable for development of a strong ledge in this area. The west crosscut is being driven to intersect the numerous ore shoots indicated by the Calyx drill, and within a few weeks important disclosures are anticipated.

The Florence mine has been placed in the hands of a receiver. It is understood the principal owners are contemplating a reorganization of the company and the raising of finances for work below the 650 level where large deposits of copper-gold ore are indicated.

The east crosscut from the 320 level of the Cracker Jack is advancing rapidly, and is expected to intersect the Columbia Mountain fault vein within 10 days. This vein has yielded much good ore and hopes are entertained for discovery of profitable quartz. Considerable work is going on in the upper levels, and the shaft has been thoroughly repaired.

Battle Mountain.

Copper Canyon Mining Co., operating the old Glasgow and Western mine, is shipping 3 to 4 cars of ore per week, which runs about 12% copper. F. Sommer Schmidt is manager.

Yerrington.

Everything is commencing to take on new life in the Yerrington field, embracing the Luning, Mason, Reservation and adjacent districts. Work has been resumed in the Mason Valley mine, and at the smelter a force of mechanics is busily engaged in placing everything in shape for early

activity. It is understood the plant will be blown in as soon as sufficient coke and other supplies are on the ground, some delay resulting from the car shortage. The Delamar interests have started operations at the Bluestone group, with C. A. Weck in charge. It is understood this company has contracted to ship a heavy tonnage to the Thompson plant. The Western Nevada, Malachite, Walker River, Montana-Yerrington and several other properties are being placed in shape for early production. It is rumored the smelter will handle a large tonnage from the Balaklala mine, located near Coram, California.

Pioneer.

The Pioneer Con. is arranging to operate its property along broader lines and has engaged A. J. Canava, formerly with the Goldfield Con. Mines Co., to superintend operations. In addition to company work, four sets of leasers are active, and several new leasing applications are being considered. It is planned to install additional mill equipment, including apparatus for treatment of the slimes.

Jarbridge.

The Long Hike Co. has installed a gasoline power plant on the Jarbridge river and is erecting an electric hoist at the mine. This will be used to sink a 500-ft. winze from the lower adit. An incline tramway has been erected to facilitate shipment of supplies to the mine from the river landing, the power being furnished by a gasoline hoist. A large tonnage of good ore is exposed in the main workings, and it is understood reduction facilities will be supplied as soon as summer sets in.

Dayton.

The gold dredge of the Rea Con. Co. has been placed in operation and is moving 12,000 to 14,000 cu. ft. of material daily. Tests indicate the placers are among the richest being worked in the west by the dredging process, and large areas of virgin territory are available. The dredge cost approximately \$20,000 and is expected to pay for itself in a few weeks.

Carrara.

Finished marble is being shipped from the quarries of the American Carrara Marble Co. for the first time. The present output is largely blue and white.

NEW MEXICO.

Lordsburg.

Leo XIII Mining Co. has struck considerable water, which was more than could be handled. The company is now driving a tunnel which will strike this ledge at a depth of 300 ft. and this will unwater the mine. The entire property can be worked from this tunnel. The company is preparing to put in an air compressor. In shaft No. 3, at the 100 level, there has been made an important strike in the crosscut south. A body of ore 30 ft. wide was encountered. The ore on the hanging wall runs from $3\frac{1}{2}$ to 12% copper. The ore on the foot wall consists of red oxide, copper glance and native copper. The entire ledge will average about \$6 in silver and \$8 gold.

The Lyons-Atlas Co., Indianapolis, Ind., has installed a new diesel engine at the property of the Eighty-Five Mining Co. which is now running smoothly.

Mogollon.

Wm. Childs, Jr., president of Socorro Mining & Milling Co., and W. Rowland Cox, consulting engineer, made a tour of inspection over the company's properties the past week.

The new shaft on Johnson mine is down about 270 ft., with sinking still in progress. Most of this work has yielded mill ore which is awaiting burros for packing to custom mill.

The Oaks Co. is arranging for another shipment of ore obtained from development work on the Clifton mine, part of the Mother Lode group.

Henry G. Fergusson, of the U. S. Geological Survey, has just finished a complete geological survey of the district, the work occupying the past several months.

The Pacific aerial tramway to the Socorro mill was

placed in regular commission the past week. The dump of lower-grade ore, accumulated the past few years, is now being disposed of by tram.

Lordsburg.

A party of capitalists are inspecting the properties of the National Gold & Silver Mining Co. in the Kimball mining district, north of Steins. In the party are Judge Mark R. Sherman, of Chicago, president of the company; A. R. Lawton, of Iola, Wis.; M. L. Wehrly, of Perth, N. D.; F. W. Jacobs, of Port Byron, N. Y.; W. C. Norse, of Russellville, Ky., and Daniel Minor, of Franklin Grove, Ill. Extensive development of the property may follow the visit of the party.

Silver City.

At the Cleveland camp an additional mill is nearing completion. It will use the flotation process. A Diesel engine for the power plant, making two of these engines for the Empire Zinc Co.'s plant, is now being hauled to the camp. The Cleveland mine is producing steadily and regular shipments made.

OREGON.

Drewsey.

The Idyl City mines will be operated all winter. A large crew has been taken on and the ore will be stocked until spring when shipments will be made via Crane to Salt Lake City smelters. The property is owned and managed by J. Darst, who has a good body opened carrying gold, silver, lead and zinc values.

Sumpter.

At the Cougar trouble was recently met with by the freezing of the pipe line. A pump has since been installed and water is being pumped from Granite creek, a distance of 1 mile over a ridge 400 ft. high. This will keep the mine going until the pipe line can be opened.

Good ore has been encountered at the Ben Harrison but the operators desire to develop it further before giving out details. A raise goes up at the edge of the ore and a drift is now being started which will show something of the extent of the strike.

SOUTH DAKOTA.

Hill City.

The Golden Summit, which was unsystematically worked in the early days at shallow depths, is to be developed by the Dakota Continental Copper Co. The Columbia mine is shipping. Teams are hauling ore from the Cowboy tin mine to the railroad spur which was recently completed to the mill.

Lead.

The Homestake Mining Co. has purchased the property of the Cascade Water Power & Electric Co., located on Spearfish river. Homestake it is rumored will build another hydro-electric plant on this ground.

Sinking is to be resumed at the Oro Hondo and Custer Peak mines. At the former the 3500 level is the objective. The shaft is now 200 ft. deep and in past months a great deal of diamond drilling has been done. The additional sinking will make necessary the purchase of a hoist. In this connection it is expected that the top of the shaft will be concreted, and a higher headframe erected.

At the Custer Peak at a depth of 250 ft. oxidized material was found in lateral work. The company intends to put the shaft down to the zone of secondary enrichment. The company owns a large area, covering the vein for 3 miles.

The Elk Mountain Mining & Milling Co. intends to operate its cyanide plant and mine as far into the winter as possible. Lack of working capital has been a handicap. About \$5,000 would put the plant in condition for handling

three times the amount now milled. The plant has a crushing capacity of 300 tons daily, with a leaching tank capacity of only 100 tons. Hence the crushing department is forced to lie idle two-thirds of the time. Total cost of mining and milling is not far above \$1 per ton.

UTAH.

Milford.

Antelope-Star Mining Co. has a highly mineralized group of nine mining claims, located on the westerly slope of Bradshaw-Lincoln range, Beaver county. The camp is 21 miles northeast of Milford, and 8 miles east of Blackrock. The group extends from the mouth of a canyon to the crest of the range, and 2000 ft. or more laterally, embracing 200 acres on the mountain side. This area covers one main canyon, two minor gulches, and two intervening spurs or ridges between canyons. The camp overlooks the great Escalante valley, drained by Beaver river. In this valley water is readily supplied from springs, small lakes and shallow wells. The Antelope-Star holdings resulted from acquiring and consolidating several individual locations, on which were surface workings in ore. The group is in a section of limestone, flanked on the north by quartzite and on the south by an intrusion of granite. The exposed area of limestone, between the quartzite and granite, has an extent of $2\frac{1}{2}$ miles along the trend of the range. That part covered by the Antelope-Star group is characterized by fissures and fractures, clearly exposed by the erosion along the gulches. These fissures strike north-south, east-west, and northeast-southwest. There is a series of such fissures within an explored zone approximately 800 ft. wide and 1000 ft. in length. In some instances the fissure is vertical, and in others it dips 35° to 60° . In some places there is a smooth defined lime wall on one side, the vein material on the opposite side extending irregularly into the lime beds.

In most cases the fissure veins and fractures contain mineralized gangue. This consists of limestone in various forms, barite, silicified lime and chert, containing galena, lead carbonate, and oxides of iron and manganese. As a rule, the galena occurs in bunches, small lenses and nodules in the barite, or sulphate of barium; the lead carbonate occurs with the iron in the lime gangue. This kind of mineralization seems continuous, so far as drifts and winzes have been extended, and is especially strong where the fissures and fractures intersect. At many places high-grade ore is found, but an average assay of ore from the numerous workings shows around 7% lead, 4 to 5 ozs. silver and 10% iron. The workings extend from the surface to depths ranging from 10 to 50, 100 and 150 ft., showing galena in detached bunches in the barite, which apparently protected it from oxidation and leaching; in the adjacent lime gangue is usually an oxidized and partly leached material. There is every reason to anticipate the finding of solid and continuous bodies of lead-iron sulphide within these fissures at greater depth, or below the leached-out zone.

By sorting, a considerable tonnage of galena and cerussite of shipping grade is being taken from existing workings; and a much larger tonnage of milling ore has been developed. Consequently, the continuance of work may logically lead to the need of a mill to concentrate the low and medium grade ores. In nearly all the veins thus far opened the presence of a large amount of barite is noted. This is composed of 66% baryta, and 34% sulphur tri-oxide, often called heavy spar. It has a specific gravity of 4.3 to 4.8, which is much greater than that of lime and quartz. It so nearly approaches in weight some of the pyrite and carbonate ores as to make difficult its separation from them by gravity concentration. For this reason, it is probable that flotation machines will be installed in any milling plant that may be built.

Those who have studied the ore deposition here predict that deep workings will reveal the concentration of the ore in sulphide bodies and the disappearance of the barite from the vein matter. But the fact remains that much of the ore

available at 100 to 200 ft. or deeper is accompanied by this heavy spar, which will have to be reckoned with in milling.

The projecting ridge to the south of the main canyon is designated as South hill. At its south end, facing the valley, copper carbonate ore was found, assaying between 2 and 3%. Farther east on same ridge is a drift 135 ft. on one of the fissures, all in ore. A winze sunk here shows a dip south 45° . The ore consists of galena in barite and lead carbonate in lime. This drift, when extended farther, will connect with an incline being sunk on the same vein at a higher point, where 200 ft. depth will be gained.

A 75-ft. shaft has been sunk on another fissure, 100 ft. west of the tunnel; this work shows galena in silicified lime as a gangue, with no barite. This fissure lines up with mineralized croppings and a 65-ft. shaft 800 ft. southeast. Numerous other surface workings and shafts in ore are to be seen at other points on this hill, attesting to the existence of the series of fissures referred to. In the deeper exploratory work here the oxides of manganese appear to increase.

On the north side of the main canyon is East hill, Quartzite gulch separating it from the quartzite country to the north. In a similar manner, East hill is cut by numerous fissures and fractures, the same as is South hill, striking north-south, east-west and diagonally. The East tunnel, starting on the main canyon, has been driven 300 ft. north into East hill, following a fissure; and a crosscut has been driven east from it to a second fissure, giving 200 ft. depth on the latter. The ore thus opened contains galena in barite, lead carbonate and manganese in lime, all in the same veins. Surface workings at and near the top of this hill expose similar ore and serve to line up the croppings of fissures with the tunnel openings near the foot of the hill. An excavation on the north slope has exposed lime gangue and barite full of the ore previously described; and this appears to be on one of the diagonal veins. At another point near the crest is an adit level driven 100 ft. on a vein which is identified as the same one opened by a crosscut from a lower tunnel. This upper adit is in ore all the way, the barite and lime carrying galena and lead carbonate, being in evidence as in other places. A 55-ft. winze sunk from this adit follows the ore, showing no change at the bottom except possibly an increase in manganese, which occurs in segregated lenses in the vein, next to the galena. All these minor, exploratory workings are of interest as showing the preliminary steps in the transition from a prospect to a mine in its early stages.

To establish permanent workings on South hill a main vertical shaft will be sunk; and the present scheme of development on East hill is the driving of deep tunnels first, and a shaft later. It will be seen that there may be two centers of operation. The development is under direction of A. C. Nebeker, president and manager. Vitrally interested in the company as stockholders and directors are Woolley Brothers, Noble Warrum, W. N. Williams, C. N. Cheney, Aquila Nebeker, M. O. Hardy and others, all of Salt Lake.

WASHINGTON.

Curlew.

A trial shipment has been made by the Boston-New York group to the Northport smelter. The statement certified to the value of \$45.53 gross per ton, being 41 ozs. silver and $18\frac{1}{2}\%$ lead. The ore also carries 15 to 20% zinc. This is not given credit for, but as soon as the smelter is in shape to handle this metal the zinc contents will have a commercial value. The ore for the test was taken from surface. Here a fair deposit is disclosed. It is only a matter of getting under it when active production will commence. A tunnel, now in 50 ft., by running 20 ft. more will tap ore 200 ft. in depth. The tunnel will be run this winter. By spring the mine should be a regular shipper.

Loon Lake.

Loon Lake Copper has commenced sinking from the 200 to the 500 level. Levels will be established at each 100-ft. interval. The run will be 100 on the 300 level, but will be little if anything at the 400, as the vein is pitching toward

the shaft at a sharp angle. The descent is proceeding at the rate of 3 ft. a day. Three shifts are being worked in the shaft and two on ore. Two small stringers have been encountered in recent sinking. The east face in the stope on the 200 level is 200 ft. wide. It is almost solid chalcocite, and contains little quartz. About a car a week is being shipped which returns \$1400 to \$2000. Returns from the shipments are more than double the operating expense. While sinking is in progress a tunnel will be run to connect with the shaft at a depth of 85 ft. This is designed to improve the ventilation and expose a shoot pierced by the shaft 50 ft. deep. The new 50-hp. steam plant is running smoothly. Native copper has been exposed in a short sump from a drift at the 200 level.

Entiat.

Rex Development has opened a body of good ore but has been forced to shut down because cold weather froze the amalgamation plates. A cleanup of \$450 was made in the last 15 days of operation. The company will let a contract for 150 ft. in the lower tunnel to facilitate stoping. Operation of the mill will be resumed as soon as weather permits. The work is in charge of J. F. Hunt and Fred Knemeyer, Waterville.

Orient.

In reporting on the Butte & Washington, President Ward says a strike was made in the lower tunnel about 600 ft. from the portal. Until the present strike, no permanent ore body had been found. The ore body covers the entire face of the tunnel and has not been developed sufficiently to determine its length. Several shoots of high grade silver-lead have been encountered. The Great Northern railway passes along the Kettle river near the tunnel, thus furnishing easy transportation. The Kettle River Mining Company, three miles down the river, has a concentrating plant and I am hopeful that arrangements can be made with it to concentrate the ore of the Butte & Washington. At the Summit east of us a 1000-ft. tunnel is being run to strike the ore bodies at a depth of 1000 ft. The Summit has installed a compressor plant. It is making 2½ ft. a day in the tunnel.

WISCONSIN-ILLINOIS.

Mineral Point.

Deliveries of ores, for November 1st to 25th, inclusive, were reported by districts, as shown:

Districts.	Zinc. Lbs.	Lead. Lbs.	Pyrites. Lbs.
Benton	17,940,000	348,000	.....
Mifflin	5,084,000	60,000	.....
Galena	4,740,000	80,000	.....
Linden	3,504,000	.....	760,000
Cuba City	3,272,000	.....	2,244,000
Hazel Green	3,082,000	.....	.....
Platteville	2,958,000	156,000	.....
Shullsburg	1,184,000	.....	.....
Dodgeville	912,000	78,000	.....
Highland	894,000	.....	.....
Montfort	328,000	.....	.....
Potosi	260,000	.....	.....
Mineral Point	218,000	.....	2,582,000
Totals	44,378,000	7,220,000	5,586,000

In addition to the above the New Jersey Zinc Co. delivered during November to its smelters at De Pue 64 cars of finished separator blende, 4,926,000 lbs. The gross recovery crude concentrate from all mines for the 25 days reported aggregated 37,000,000 lbs. Net high grade refinery ore to smelter direct and mine run ore to smelter 24,000,000 lbs. No reserve ore was left in the field at the close of last month and refiners were in need of crude ore to keep their plants running on full time. Prices made favorable gains during the month blende opening Nov. 1st, at \$70 per ton base of 60% zinc assay and going at \$98 per ton, with premium grades (refinery product) in advance of \$100 per ton. Lead ore advanced from \$80 per ton to \$90 and iron pyrites from \$4.50 to \$5.00 per ton to \$10.00 per ton.

Platteville.

New producers provided with complete rigs are coming in at several points in the field. The New Rose mine, at

Platteville, begins operations this week. A tunnel has been driven into the hillside from which the mill dirt will be fed to a hopper supplying the concentrator, all hoisting being eliminated. The lease has been extensively proven with drills and gives promise of developing into a good producer.

The Longhorn mine and mill, at New Diggins, property of the Wisconsin Zinc Co., turned out its first concentrates this week. The range cuts three leaseholds, has been proven by drills and two shafts are in ore. Electric power is used throughout. Three shifts schedule has been set for the mill crew which will turn from 300 to 400 tons of mill feed a day.

The surface equipment of the Federal mine, in the Galena district, has been dismantled, the machinery going to the Birkbeck mine and plant and the building material to the Champion property at New Diggins. A general warehouse and machine shop is being added to the Skinner separating plant.

Articles of incorporation have been filed for the New Rose Mining Co. Stockholders of the Big Bill Mining Co. at a recent meeting voted to continue with the work of prospecting. The M. & H. mine, one of the recent additions to newly developed mines is being unwatered and operations will be resumed underground. W. N. Smith, General Manager of the Vinegar Hill Zinc Co., has been appointed resident regent of the State Mining School, at Platteville.

Galena.

Fields Mining & Milling Co. and associate enterprises in the field have been made the targets of adverse public sentiment, the city authorities closing down the magnetic separating plant, presumably on account of sulphur fumes, over the exact source of which has arisen a controversy. A fine was assessed against the Galena Refining Co., the officers of which are connected with R. W. Hunt & Co. Insurance Exchange, Chicago.

L. V. Rice, general manager of the Fields Mining & Milling Co.'s mines, is authority for the statement, that the Crawhall mine, for many years one of the sturdiest zinc ore producers, has closed down and will be abandoned. The ore runs have been exhausted. In its time the Crawhall paid to the owner of the land nearly \$300,000, in royalties. During a 10-month period of 1912, the company paid \$300,000 in dividends. This was the high water mark attained by the Crawhall, which has been operating since with various but usually successful and profitable results. The J. M. Thompson mine, newly developed within the past year, is now operating steadily on extensions of the Crawhall range eastward and Rice is again challenging the field on mill diet hoisted, claiming that 800 tons of concentrator feed is hoisted daily. The plant is one of the best in the field and represents an investment of over \$60,000.

Shortage of cars is claimed in the field, but a careful investigation during the week reveals the fact that refining plants are in need of low grade ore for refining purposes which the mines have been unable to supply.

Benton.

Drilling operations of recent date for the Frontier Mining Co. is resulting successfully on the Calvert, Hird, Grotkin and Robson lands. The Calvert mine is in new runs of ore now being opened up which will restore the heavy output returned by this producer the first six months of this year. A new mill known as No. 2, on the Bull Moose, is operating with creditable results tapping the zinc ore formations found in the flint bed. Underground developments proceed at the Hird, under new plans recently adopted to insure the safety of working forces. The original plans bringing the main hoisting shaft and working face into highly dangerous ground that demanded heavy timbering. Production of zinc concentrate is confidently expected before the close of the year. Drills are testing out the range on the Burr, one of the 1916 finds of the district. The regular 2% monthly dividend was paid to Frontier Mining Co.'s shareholders December 1st and an extra 10% dividend will be disbursed as a Christmas offering.

WYOMING.

Casper.

With 18 wells brought in and 50 drills operating in the Brenning Basin and Big Muddy fields, activity in the former field is increasing. The Douglas-Wyoming Co. expects to complete its first well soon and start drilling its second well. The Penn Petroleum Co. and several syndicates and close corporations are operating also in the Brenning Basin field. Joe Kinney has sold a half interest in his lease on 360 acres for \$100,000. The fourth well was brought in on this property last week, at a depth of 960 ft.

Exploration around Lander has practically been stopped for the winter. A hole that contractor Hyslip has down around 1000 ft. near the Hudson will probably be completed. The Ohio may also do more work at Sage creek if weather permits. However, most of the companies will let their rigs stand idle until spring.

CANADA.

BRITISH COLUMBIA.**Ymir.**

At the Yankee Girl a raise is being driven on the 28-ft. vein of milling ore which has been opened up at a depth of 710 ft. It was struck in the 3000-ft. tunnel driven to develop the mine at depth. It is not known if it is the same vein as that in the 710 levels or a new vein.

Diamond drilling is now being done at the Fog Horn on a gold vein at an approximate cost of \$4 per foot. The drill is being operated from the face of an 1100-ft. crosscut tunnel. This was driven at a cost of \$30 a foot to open up veins exposed in upper workings. It is estimated that the vein is about 900 ft. further in and that another 300 ft. of diamond drill work should locate it at the 1100 level.

Slocan.

J. C. Ryan, manager of the Soho mine, says that ore will be rawhided out before the close of winter. "Ore has been struck at 580 ft. We have a lead that is 5 ins. wide. It goes from 100 to 125 ozs. silver and 50 to 60% lead. Five or 6 ins. more of carbonates carry 50 ozs. silver and 23% lead. This ore has been broken into under the old works. The wagon road is completed to the upper mine and everything is in good condition for the winter."

An effort is now being made by Spokane interests to obtain control of the Alice S. mine owned by the British Columbia Silver Mines Co. A tunnel is being driven to tap the lead at a depth of 200 ft. below No. 2 tunnel. Here a body of high grade silver-lead was opened which gave assays of up to 2000 ozs. silver and over 45% lead.

Nelson.

About 50 ft. have been made in the Granite-Poorman tunnel which was started Nov. 5. The crosscut is from the Poorman shaft and will hit the Hardscrabble vein at about 400 ft. in. Waste had to be cleaned out of the Poorman shaft, since it had not been worked for years. F. H. Skells is manager.

Cash surplus of the Utica Mines Co. is now \$50,000 as against \$37,000 a month ago. Since then 4 cars of ore have been shipped. The returns on the last car shipped prior to these four was about \$7000. Although the company is planning to drive a 1900-ft. crosscut tunnel to develop the mine at depth it has ample ore of shipping grade in the upper levels.

Trail.

An increase in the electrolytic plant of the Consolidated Mining Co. is being contemplated. The plant is now capable of producing 10 tons of 98% copper per day but it is intended to raise this to 20 tons. In speaking of the Trail smelter E. E. Hagen says: "It produces refined gold, silver, copper, lead, zinc, antimony, copper sulphate, lead pipe, sulphuric

acid, hydrofluosilicic acid and proposes entering the manufacturing field in other directions, such as white lead, zinc white, brass founding, nitric acid and probably chemical fertilizers. It handles an average of 42,000 tons of ore a month, of which 10,000 tons are silver-lead ores, 2000 zinc ores, and the balance copper-gold ores, mainly from Rossland. The company is ever on the lookout for new mineral properties to develop. Its Sullivan mine is among the largest silver-lead-zinc deposits, the amount of proved ore being estimated at 3,500,000 tons. Reserves in its other properties aggregate about \$10,000,000. The gross value of its probable ore reserves is not far short of \$100,000,000 and it ranks third in value of ore reserves and assets among the mining companies of British Columbia."

ONTARIO.**Cobalt.**

At the National Mines, Ltd., lateral work has been started at about the 1100 level which is where the lower contact is encountered. The underlying Keewatin takes a rather steep dip to the north and a crosscut south will reach the contact with but a few hundred feet of work.

Five drills are now working on stoping and development at the Chambers-Ferland which is holding a small but steady production. The Nipissing No. 64 vein extension, which was cut at the 425 level is now being developed. The drift on this has been continued some distance, just above the contact and in the conglomerate. It is probable that later one or more raises will be put. The new boiler house has been completed and the new 10 by 12-in. hoist installed. The latter has a capacity for hoisting 1000 ft.

At the Davidson 50 men are employed at present. Development calls for the blocking out of the main ore body on the 100, 200 and 300 levels, and the sinking of the shaft to a depth of 500 in order to prove the vein at that depth. Arrangements are under way for the installation of a test mill, which it is believed will earn sufficient to pay its expenses. If results are satisfactory a large mill will probably be installed next spring. Drilling is being done on three levels. In the meantime sinking is proceeding on a promising vein on the south claim and lateral work will be started on the first level at this point in the near future.

Giroux Lake.

Active development has been started at the mines of the Hargraves Silver Mines Co. These properties have not been touched since 1913 prior to which time considerable underground work was done. In previous operations several promising looking veins were found but aside from the finding of several small pockets of ore no body of any importance was located.

Porcupine.

The plant of the Porcupine Premier has been enlarged and work resumed. Satisfactory development was done on the 100 level before the property was closed. A body of schist was found in a contact some distance to the south of the shaft. Ten feet of it showed gold values. With this as encouragement the management decided to sink to the 400 level before crosscutting.

McIntyre is erecting an aerial tramway across Pearl lake from the McIntyre Extension property to their mill. It will be in operation in about 6 weeks. It is being built because McIntyre has increased its hoisting across the lake. Development work has been concentrated across the lake for the past year. With the opening of the new tramway it puts at the disposal of McIntyre for milling operations a tonnage sufficient to run the mill for 6 months, with a daily capacity of 600 tons averaging \$11.

A new 200-ton crusher has recently been installed in the mill of the Porcupine Crown. At the mine the vein at the 800 level is 4 ft. wide, and good average assays obtained. At the 900 level the vein is better, being considerably wider and the grade a little higher. Drifting on the 900 has been done and the vein almost covers the entire width of the drift. Diamond drilling is under way from the 500 level to cut several parallel veins at 1000 ft. This vein showed a width of several feet of \$6 ore where cut at the 200 level.

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I. GEOLOGY

GEOLOGY AND MINERALOGY.

Geology

Calkins, F. C.—*Molybdenite and Nickel Ore in San Diego County, California*. [Both ores are considered separately. The deposits to date are prospects, but worth future consideration].—U. S. G. S. Bull. 640-D; pp 10*.

Clapp, Charles H.—*Geology of the Nanaimo Map-Area*. [The area is on Vancouver island, British Columbia. Coal is the main product, though sand and gravel, clay and stone are also produced].—Canada Geol. Surv. Memoir 51; pp 135*.

de Schmid, Hugh S.—*Investigation of a Reported Discovery of Phosphate in Alberta*. [The Commission of Conservation, Canada, found phosphate rock near Banff, Alberta. The nature and geology of the deposits are here described in detail].—Canada Mines Branch; pp 50*.

Hinds, Henry.—*The Coal Resources of the Clintwood and Bucu Quadrangles, Virginia*. [A complete description of each bed in the area is given, with a general geologic description of the area as a whole].—Va. Geol. Surv. Bull. XII; pp 206*.

Hopkins, Oliver B.—*Structure of the Vicksburg-Jackson Area, Mississippi*. [The formation and its structure are discussed, with special reference to oil and gas deposits].—U. S. G. S. Bull. 641-D; pp 28.

Scott, Herbert K.—*Manganese Ores of Bulkowina*. [A paper read before the Iron and Steel Inst., London. Geology of the deposits, methods of mining, mining costs and selling prices and grades of the ore are among items considered].—E. & M. J. Nov. 25 1916; p 935; pp 3; 25c.

Stansfield, J.—*The Pleistocene and Recent Deposits of the Island of Montreal*. [The stratigraphy of the area is described in detail. Clay for red brick is the principal economic product produced].—Canada Geol. Surv. Memoir 73; pp 80*.

Watkins, Joel H.—*Railway Geological Department*. [An essay on the relation

of the economic geologists to the railway and what the railway companies are doing in this respect].—E. & M. J. Nov. 25 1916; p 931; pp 2½; 25c.

II. ORES AND METALS

(I) METALS AND ORES

Copper

Addicks, Lawrence.—*Possibilities in the Wet Treatment of Copper Concentrates*. [A paper read before the A. I. M. E. Curves are reproduced and the results of tests in roasting, leaching and chloridizing are dealt with].—Met. & Chem. Engg. Dec. 1 1916; p 628; pp 3*; 35c.

Henderson, Charles W.—*Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1915*. Each state is reviewed separately by counties and by separate metals for the state as a whole].—Min. Res. U. S. 1:14; pp 27.

Robins, Hallet R.—*Flotation at the Calaveras Copper—A Simple Flow-Sheet*. [Costs, transportation and the ore body are described, besides the flotation system. No table concentration is employed at all].—M. & S. P. Nov. 25 1916; p 769; pp 5*; 20c.

Vail, Richard H.—*Pinar Del Rio Copper Region, Cuba*. [Describes the deposits, their development to date and future possibilities. One good mine has already been opened].—E. & M. J. Nov. 25 1916; p 950; pp 2½; 25c.

Wilson, A. W. G.—*On the Possibility of Producing Refined Copper in Canada*. [Published by permission of the Mines Branch, Ottawa, Ont. The deposits, reserves and refining of copper in Canada are discussed].—Canadian Mg. Jnl. Nov. 15 1916; p 529; pp 6½; 35c.

—*Winona Copper-Leaching Test Plant*. [The Slater process is used. A 5-ton plant using hydrometallurgy and electrometallurgy is described and operating costs given].—E. & M. J. Nov. 25 1916; p 929; pp 1½; 25c.

Coal Fields and Mining

Cole, Arthur A.—*The Mining Industry in that Part of Northern Ontario Served by the T. & N. O. Railway*. [Covers the camps of Cobalt and Porcupine with respect to their production, activities, prof-

its and costs].—T. & N. O. Commission, Toronto; Report; pp 71*.

Henderson, Charles W.—*Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1915*. [Each state is reviewed separately by counties and by separate metals for the state as a whole].—Min. Res. U. S. 1:14; pp 27.

—*Gold Dredging in Yukon*. [Abstract of a paper published by the Minister of Interior Canada. The doings and equipment of operating companies in the district are reviewed].—Canadian Mg. Jnl. Nov. 15 1916; p 535; pp 10¾*; 35c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron and Steel

Johnson, J. E., Jr.—*The Chemical and Physical Properties of Foundry Irons*. [Deals with the effects of nickel, titanium and vanadium on these irons with respect to physical and metographical properties].—Met. & Chem. Engg. Dec. 1 1916; p 642; pp 5*; 35c.

McLeish, John.—*The Production of Iron and Steel in Canada During 1915*. [Production statistics and other information allied with the iron and steel trade are included].—Canada Mines Branch; Report 419; pp 48.

Swindin, Norman.—*Design of Acid Resisting Iron Apparatus*. [These are made of iron-silicon alloys in varying proportions. To make them resistive to acids the toughness of the metal must at present be sacrificed].—Met. & Chem. Engg. Dec. 1 1916; p 647; pp 2½*; 35c.

Lead

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Rickard, T. A.—*The Blue Bell Mine, Riodel, B. C.* [The history and transportation which have taken part in the operating of this old silver-lead-zinc property are told in detail].—M. & S. P. Nov. 25 1916; p 765; pp 2½*; 20c.

Manganese

Johnson, J. E., Jr.—*The Chemical and Physical Properties of Foundry Irons*.

[The effects of several different elements on iron are treated separately].—Met. & Chem. Engg. Nov. 15 1916; p 588; pp 8*; 35c.

Scott, Herbert K.—*Manganese Ores of Bulkwina*. [A paper read before the Iron and Steel Inst., London. Geology of the deposits, methods of mining, mining costs and selling prices and grades of the ore are among items considered].—E. & M. J. Nov. 25 1916; p 935; pp 3; 25c.

Nickel

Calkins, F. C.—*Molybdenite and Nickel Ore in San Diego County, California*. [Both ores are considered separately. The deposits to date are prospects, but worth future consideration].—U. S. G. S. Bull. 640-D; pp 10*.

Wilson, A. W. G.—*On the Possibility of Producing Refined Copper in Canada*. [Published by permission of the Mines Branch, Ottawa, Ont. The deposits, reserves and refining of copper in Canada are discussed].—Canadian Mg. Jnl. Nov. 15 1916; p 529; pp 6½; 35c.

—*The Occurrence and Uses of Nickel Ores*. [Canada, New Caledonia and Norway are the principal countries reviewed as regards production, occurrence, etc.].—Bull. Imp. Inst., E. C., 1916 No. 14; p 228; pp 26.

Silver

Cole, Arthur A.—*The Mining Industry in that Part of Northern Ontario Served by the T. & N. O. Railway*. [Covers the camps of Cobalt and Porcupine with respect to their production, activities, profits and costs].—T. & N. O. Commission, Toronto; Report; pp 71*.

Daman, Arthur C.—*The Nevada Wonder Mill*. [Describes a 150-ton cyanide process, where 10 tons per man per day are handled. The distribution of electric power is contained in tables].—E. & M. J. Nov. 25 1916; p 927*; pp 2*; 25c.

Henderson, Charles W.—*Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1915*. [Each state is reviewed separately by counties and by separate metals for the state as a whole].—Min. Res. U. S. 1:14; pp 27.

Rickard, T. A.—*The Blue Bell Mine, Riodel, B. C.* [The history and transaction which have taken part in the operating of this old silver-lead-zinc property are told in detail].—M. & S. P. Nov. 25 1916; p 765; pp 2½*; 20c.

White, H. A.—*The Manganese Silver Problem*. [Discussion of a paper by W. Neal on why low extraction only can be obtained in extracting silver in the presence of manganese].—Jnl. Chem. Met. & Mg. Soc. of S. Afr. Sept. 1916; p 39; pp 2¼; 50c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Zinc

Henderson, Charles W.—*Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1915*. [Each state is reviewed separately by counties and by separate metals for the state as a whole].—Min. Res. U. S. 1:14; pp 27.

Morgan, Harry J.; Ralston, Oliver C.—*Electrolytic Zinc-Dust*. [A paper read before the American Electrochem. Soc. on the electrolytical deposition of zinc from solution which would serve the cyanide process].—M. & S. P. Nov. 25 1916; p 779; pp 2; 20c.

Rickard, T. A.—*The Blue Bell Mine, Riodel, B. C.* [The history and transaction which have taken part in the operating of this old silver-lead-zinc property are told in detail].—M. & S. P. Nov. 25 1916; p 765; pp 2½*; 20c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Clapp, Charles H.—*Geology of the Nanaimo Map-Area*. [The area is on Vancouver island, British Columbia. Coal is the main product, though sand and gravel, clay and stone are also produced].—Canada Geol. Surv. Memoir 51; pp 135*.

Frond, G. E. B.—*South African Mining in 1915*. [Deals entirely with coal mining, production, accidents, timbering, sanitation and stone dusting].—Coll'y Guard. Nov. 10 1916; p 905; pp 1; 35c.

Hinds, Henry.—*The Coal Resources of the Clintwood and Bucu Quadrangles, Virginia*. [A complete description of each bed in the area is given, with a general geologic description of the area as a whole].—Va. Geol. Surv. Bull. XIII; pp 206*.

Hopwood, William.—*Some Personal Experiences of Coal Mining in North Borneo*. [A paper read before the National Assn. of Colliery Mgrs. The methods of mining, prospects for this undeveloped field and geography of the country are among things reviewed].—I. & C. Tr. Rev. Nov. 10 1916; p 574; pp 2*; 35c.

Hurley, Edward N.—*Federal Trade Commission and the Mining Industry*. [A paper read before the American Mg. Cong. Brings out the great need of better cost accounting and selling of coal on this basis].—Coal Age Nov. 25 1916; p 887; pp 3; 20c.

McArthur, J. D.—*The Utilization of Coal to the Best Advantage in the Interests of National Economy*. [A paper read before the Inst. of Marine Engineers, England].—I. & C. Tr. Rev. Nov. 10 1916; p 582; pp 2; 35c.

Nebel, Merle L.—*Practical Uses of Specific Gravity of Coal*. [Abstract of bulletin published by the Univ. of Ill.].—C. Tr. Bull. Dec. 1 1916; p 47; pp 3¼; 25c.

Painter, Walter.—*Virginia Power Co. Coal and Ash Tower*. [Describes a tower arrangement for the handling of coal and ashes].—Pract. Eng. Dec. 1 1916; p 985; pp 1*; 20c.

Pettibone, C. E.—*Testing Mine Rescue Apparatus*. [Abstract of a paper read before the National Safety Council. Advocates testing breathing apparatus with 5 ozs. internal pressure].—Coal Age Nov. 25 1916; p 875; pp 2½*; 20c.

Ralston, O. C.—*Graphic Studies of Ultimate Analyses of Coals*. [A graphic method described in detail by which coals are classified and studied according to their chemical contents].—U. S. Bur. of Mines Tech. Paper 93; pp 41*; 20c.

Smith, George Otis; Leshner, C. E.—*Expert's View on Cost of Coal*. [Met. & Chem. Engg. Dec. 1 1916; p 631; pp 4¼; 35c. A paper read before the American Mg. Cong. advocating that costs should be more accurately kept and speaking of government operation of the mines].—C. Tr. Bull. Dec. 1 1916; p 25; pp 4; 25c.

Warden-Stevens, F. J.—*Coal and Shipping*. [A description and line drawings of the plant for coaling vessels at the Panama canal].—Coll'y Guard. Nov. 10 1916; p 899; pp 2½*; 35c.

Petroleum

Ball, Max W.—*Adequate Acreage and Oil Conservation*. [This discussion of situations applies to natural gas as well as oil].—American Mg. Cong. Paper; pp 12; 35c.

Hopkins, Oliver B.—*Structure of the Vicksburg-Jackson Area, Mississippi*. [The formation and its structure are discussed, with special reference to oil and gas deposits.].—U. S. G. S. Bull. 641-D; pp 28.

—*Possibilities of Wyoming Field*. [In speaking of the possibilities of the oil fields in the state considerable history regarding them is brought out].—Cal. Derrick Nov. 1916; p 3; pp 1¼; 25c.

Natural Gas

Ball, Max W.—*Adequate Acreage and Oil Conservation*. [This discussion of situations applies to natural gas as well as oil].—American Mg. Cong. Paper; pp 12; 35c.

Hopkins, Oliver B.—*Structure of the Vicksburg-Jackson Area, Mississippi*. [The formation and its structure are discussed, with special reference to oil and gas deposits.].—U. S. G. S. Bull. 641-D; pp 28.

(B) STRUCTURALS AND CERAMICS

Clays, Ceramics

Clapp, Charles H.—*Geology of the Nanaimo Map-Area*. [The area is on Vancouver island, British Columbia. Coal is the main product, though sand and gravel, clay and stone are also produced].—Canada Geol. Surv. Memoir 51; pp 135*.

Huac, A. J.—*Cost Accounting for the Clay Plant*. [Tables and forms for keeping costs of haulage teams, superintending and selling are included].—B. & C. Rec. Nov. 21 1916; p 901; pp 2*; 35c.

Stansfield, J.—*The Pleistocene and Recent Deposits of the Island of Montreal*. [The stratigraphy of the area is described in detail. Clay for red brick is the principal economic product produced].—Canada Geol. Surv. Memoir 73; pp 80*.

—*Description of the Laboratories of the Mines Branch of the Department of Mines, Ottawa, Ontario*. [Laboratories for investigating fuels, milling and metallurgical methods, ceramics, metallography, etc., are described in detail].—Canada Mines Branch Bull. 13; pp 111*.

III. TECHNOLOGY

MINES AND MINING

Ore Reserves

Hinds, Henry.—*The Coal Resources of the Clintwood and Bucu Quadrangles, Virginia*. [A complete description of each bed in the area is given, with a general geologic description of the area as a whole].—Va. Geol. Surv. Bull. XII; pp 206*.

Wilson, A. W. G.—*On the Possibility of Producing Refined Copper in Canada*. [Published by permission of the Mines Branch, Ottawa, Ont. The deposits, reserves and refining of copper in Canada are discussed].—Canadian Mg. Jnl. Nov. 15 1916; p 529; pp 6½; 35c.

Yeatman, Pope.—*Mine of Chile Exploration Co., Chuquicamata, Chile*. [A paper read before the Pan-American Sci. Cong. The history, geology, reserves, power plant and testing of hydrometallurgical treatment of the ores are included].—Teniente Topics Aug. 1916; p 1; pp 18*; 35c.

Transport

Robins, Hallet R.—*Flotation at the Calaveras Copper—A Simple Flow-Sheet*. [Costs, transportation and the ore body are described, besides the flotation system. No table concentration is employed at all].—M. & S. P. Nov. 25 1916; p 769; pp 5*; 20c.

Smith, George Otis; Leshner, C. E.—*Expert's View on Cost of Coal*. [Met. & Chem. Engg. Dec. 1 1916; p 631; pp 4½; 35c. A paper read before the American Mg. Cong. advocating that costs should be more accurately kept and speaking of government operation of the mines].—C. Tr. Bull. Dec. 1 1916; p 25; pp 4; 25c.

Warden-Stevens, F. J.—*Coal and Shipping*. [A description and line drawings of the plant for coaling vessels at the Panama canal].—Colly Guard. Nov. 10 1916; p 899; pp 2½*; 35c.

Sanitation

Bain, H. Foster.—*Labor Problems in African Mines*. [Interclass struggles, sanitation, schooling, etc., are things being given considerable study].—Mg. Mag. Nov. 1916; p 261; pp 6; 50c.

Frood, G. E. B.—*South African Mining in 1915*. [Deals entirely with coal mining, production, accidents, timbering, sanitation and stone dusting].—Colly Guard. Nov. 10 1916; p 905; pp 1; 35c.

Key, A. Cooper.—*Miners' Phthisis Prevention*. [From a report of a committee investigating the disease on the Rand, South Africa].—E. & M. J. Nov. 18 1916; p 898; pp 2; 25c.

Production

Cole, Arthur A.—*The Mining Industry in that Part of Northern Ontario Served by the T. & N. O. Railway*. [Covers the camps of Cobalt and Porcupine, with respect to their production, activities, profits and costs].—T. & N. O. Commission, Toronto; Report; pp 7*.

Frood, G. E. B.—*South African Mining in 1915*. [Deals entirely with coal mining, production, accidents, timbering, sanitation and stone dusting].—Colly Guard. Nov. 10 1916; p 905; pp 1; 35c.

Henderson, Charles W.—*Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1915*. [Each state is reviewed separately by counties and by separate metals for the state as a whole].—Min. Res. U. S. 1:14; pp 27.

Hess, Frank L.—*Tungsten Production During First Six Months of 1916*. [A report of the U. S. G. S.].—Chem. Eng. & Mfg. Nov. 1916; p 232; pp 1; 30c.

McLeish, John.—*The Production of Iron and Steel in Canada During 1915*. [Production statistics and other information allied with the iron and steel trade are included].—Canada Mines Branch; Report 419; pp 48.

Wilson, A. W. G.—*On the Possibility of Producing Refined Copper in Canada*. [Published by permission of the Mines Branch, Ottawa, Ont. The deposits, reserves and refining of copper in Canada are discussed].—Canadian Mg. Jnl. Nov. 15 1916; p 529; pp 6½; 35c.

Mining Costs

Cole, Arthur A.—*The Mining Industry in that Part of Northern Ontario Served by the T. & N. O. Railway*. [Covers the camps of Cobalt and Porcupine, with respect to their production, activities, profits and costs].—T. & N. O. Commission, Toronto; Report; pp 7*.

Scott, Herbert K.—*Manganese Ores of Bulkowina*. [A paper read before the Iron and Steel Inst., London. Geology

of the deposits, methods of mining, mining costs and selling prices and grades of the ore are among items considered].—E. & M. J. Nov. 25 1916; p 935; pp 3; 25c.

Accounts and Bookkeeping

Huac, A. J.—*Cost Accounting for the Clay Plant*. [Tables and forms for keeping costs of haulage teams, superintending and selling are included].—B. & C. Rec. Nov. 21 1916; p 901; pp 2*; 35c.

—*Cost Records of Drafting and Engineering*. [Forms and descriptions of the same for the distributing and keeping of costs on different jobs].—Engg. & Cont. Nov. 29 1916; p 472; pp 2*; 20c.

MILL AND MILLING

Crushing, Grinding, Etc.

Bradley, George.—*Crushing and Grinding*. [The use of various kinds of crushing and grinding machinery at present is discussed, as noted from results now being obtained in various mills of the world].—Jnl. Chem. Met. & Mg. Soc. of S. Afr. Sept. 1916; p 39; pp 2½; 50c.

Robins, Hallet R.—*Flotation at the Calaveras Copper—A Simple Flow-Sheet*. [Costs, transportation and the ore body are described, besides the flotation system. No table concentration is employed at all].—M. & S. P. Nov. 25 1916; p 769; pp 5*; 20c.

Flotation

Cole, Arthur A.—*The Mining Industry in that Part of Northern Ontario Served by the T. & N. O. Railway*. [Covers the camps of Cobalt and Porcupine, with respect to their production, activities, profits and costs].—T. & N. O. Commission; Toronto; Report; pp 71*.

Lyon, D. A.; Ralston, O. C.; Laney, F. B.; Lewis, R. S.—*Bibliography of Recent Flotation Literature*. [A paper issued by the U. S. Bureau of Mines. The articles are those appearing in journals and periodicals and briefs of the article are given].—Chem. Eng. & Mfg. Nov. 1916; p 215; pp 3; 30c.

Ralston, O. C.; Lyon, D. A.—*The Present Status of the Ore Flotation Process*. [A paper read before the American Mg. Cong., in which a general review and description of the process is first given and followed by a review of its application to various types of ores].—Mg. World Nov. 25 1916; p 911; pp 1; 10c.

Robins, Hallet R.—*Flotation at the Calaveras Copper—A Simple Flow-Sheet*. [Costs, transportation and the ore body are described, besides the flotation system. No table concentration is employed at all].—M. & S. P. Nov. 25 1916; p 769; pp 5*; 20c.

Stander, Henricus J.—*Flotation*. [A paper read before the American Mg. Cong., being a general review of flotation, its scope and where it is now being found applicable].—Mg. World Nov. 25 1916; p 910; pp 1; 10c.

Cyaniding

Bradley, George.—*Crushing and Grinding*. [The use of various kinds of crushing and grinding machinery at present is discussed as noted from results now being obtained in various mills of the world].—Jnl. Chem. Met. & Mg. Soc. of S. Afr. Sept. 1916; p 39; pp 2½; 50c.

Cole, Arthur A.—*The Mining Industry in that Part of Northern Ontario Served by the T. & N. O. Railway*. [Covers the camps of Cobalt and Porcupine, with respect to their production, activities, prof-

its and costs].—T. & N. O. Commission; Toronto; Report; pp 71*.

Daman, Arthur C.—*The Nevada Wonder Mill*. [Describes a 150-ton cyanide process, where 10 tons per man per day are handled. The distribution of electric power is contained in tables].—E. & M. J. Nov. 25 1916; p 927*; pp 2*; 25c.

Morgan, Harry J.; Ralston, Oliver C.—*Electrolytic Zinc-Dust*. [A paper read before the American Electrochem. Soc. on the electrolytical deposition of zinc from solution which would serve the cyanide process].—M. & S. P. Nov. 25 1916; p 779; pp 2; 20c.

White, H. A.—*The Manganese Silver Problem*. [Discussion of a paper by W. Neal on why low extraction only can be obtained in extracting silver in the presence of manganese].—Jnl. Chem. Met. & Mg. Soc. of S. Afr. Sept. 1916; p 39; pp 2½; 50c.

Mill and Smelter Costs

Cole, Arthur A.—*The Mining Industry in that Part of Northern Ontario Served by the T. & N. O. Railway*. [Covers the camps of Cobalt and Porcupine, with respect to their production, activities, profits and costs].—T. & N. O. Commission; Toronto; Report; pp 71*.

Robins, Hallet R.—*Flotation at the Calaveras Copper—A Simple Flow-Sheet*. [Costs, transportation and the ore body are described, besides the flotation system. No table concentration is employed at all].—M. & S. P. Nov. 25 1916; p 769; pp 5*; 20c.

—*Winona Copper-Leaching Test Plant*. [The Slater process is used. A 5-ton plant using hydrometallurgy and electrometallurgy is described and operating costs are given].—E. & M. J. Nov. 25 1916; p 929; pp 1½; 25c.

Mill Miscellany

Cole, Arthur A.—*The Mining Industry in that Part of Northern Ontario Served by the T. & N. O. Railway*. [Covers the camps of Cobalt and Porcupine, with respect to their production, activities, profits and costs].—T. & N. O. Commission; Toronto; Report; pp 71*.

Robertson, J. A. T.—*An Engineer's Travels in Western China*. [A geographic review of the province of Szechuan, China, as related to the mining industries of the province, which are in their primitive stages still].—Mg. Mag. Nov. 1916; p 267; pp 13*; 50c.

Scobey, Fred C.—*The Flow of Water in Wood-Stave Pipe*. [Tables, curves and text on the practical theory and formulas used in connection with wood piping and a discussion of the adaptability of wood pipe].—U. S. Dept. of Agr. Bull. 376; pp 96*.

—*Description of the Laboratories of the Mines Branch of the Department of Mines, Ottawa, Ontario*. [Laboratories for investigating fuels, milling and metallurgical processes, ceramics, metallurgy, etc., are described in detail].—Canada Mines Branch Bull. 13; pp 111*.

CHEMISTRY AND ASSAYING

Chemistry

Hering, Carl.—*Inadequacy and Inconsistency of Some Common Chemical Terms*. [Deals mostly with the inconsistent and misleading use of the term valence].—Met. & Chem. Engg. Dec. 1 1916; p 649; pp 1½; 35c.

Johnson, J. E., Jr.—*The Chemical and Physical Properties of Foundry Irons*. [Deals with the effects of nickel, titan-

ium and vanadium on these irons with respect to physical and metagraphical properties].—Met. & Chem. Engg. Dec. 1 1916; p 642; pp 5*; 35c.

White, H. A.—*The Manganese Silver Problem*. [Discussion of a paper by W. Neal on why low extraction only can be obtained in extracting silver in the presence of manganese].—Jnl. Chem. Met. & Mg. Soc. of S. Afr. Sept. 1916; p 39; pp 2½; 50c.

— *Description of the Laboratories of the Mines Branch of the Department of Mines, Ottawa, Ontario*. [Laboratories for investigating fuels, milling and metallurgical processes, ceramics, metallography, etc., are described in detail].—Canada Mines Branch Bull. 13; pp 111*.

METALLURGY

Electrometallurgy

Morgan, Harry J.; Ralston, Oliver C.—*Electrolytic Zinc-Dust*. [A paper read before the American Electrochem. Soc. on the electrolytical deposition of zinc from solution which would serve the cyanide process].—M. & S. P. Nov. 25 1916; p 779; pp 2; 20c.

— *Winona Copper-Leaching Test Plant*. [The Slater process is used. A 5-ton plant using hydrometallurgy and electrometallurgy is described and operating costs are given].—E. & M. J. Nov. 25 1916; p 929; pp 1½; 25c.

Hydro-Metallurgy

Addicks, Lawrence.—*Possibilities in the Wet Treatment of Copper Concentrates*. [A paper read before the A. I. M. E. Curves are reproduced and the results of tests in roasting, leaching and chloridizing are dealt with].—Met. & Chem. Engg. Dec. 1 1916; p 628; pp 3*; 35c.

— *Winona Copper-Leaching Test Plant*. [The Slater process is used. A 5-ton plant using hydrometallurgy and electrometallurgy is described and operating costs given].—E. & M. J. Nov. 25 1916; p 929; pp 1½; 25c.

Metallurgy General

Fay, Albert H.—*Accidents at Metallurgical Works in the United States*. [They are given for the greater part in tabulated form and include 1915 only].—U. S. Bur. of Mines Tech. Paper 164; pp 20; 15c.

Irvin, Donald F.—*Strontium Nitrate: A New Industry*. [A flow sheet used for the refining of celestite to this product is given, besides a general review of the industry].—M. & S. P. Nov. 25 1916; p 774; pp 2¾; 20c.

Wilson, A. W. G.—*On the Possibility of Producing Copper in Canada*. [Published by permission of the Mines Branch, Ottawa, Ont. The deposits, reserves and refining of copper in Canada are discussed].—Canadian Mg. Jnl. Nov. 15 1916; p 529; pp 6½; 35c.

— *Description of the Laboratories of the Mines Branch of the Department of Mines, Ottawa, Ontario*. [Laboratories for investigating fuels, milling and metallurgical processes, ceramics, metallography, etc., are described in detail].—Canada Mines Branch Bull. 13; pp 111*.

POWER AND MACHINERY

Electricity

Daman, Arthur C.—*The Nevada Wonder Mill*. [Describes a 150-ton cyanide process where 10 tons per man per day are handled. The distribution of electric power is contained in tables].—E. & M. J. Nov. 25 1916; p 927*; pp 2*; 25c.

Roux, G. P.—*Alternating-Current Distribution*. [Discusses the advantages of 1-phase, 2-phase and 3-phase systems].—Pract. Eng. Dec. 1 1916; p 995; pp 2*; 20c.

Trapp, C. H.—*Wiring for Motor Additions*. [Describes a readily constructed runway for wires leading to machines].—Pract. Eng. Dec. 1 1916; p 994; pp 1*; 20c.

— *Gold Dredging in Yukon*. [Abstract of a paper published by the Minister of Interior, Canada. The doings and equipment of operating companies in the district are reviewed].—Canadian Mg. Jnl. Nov. 15 1916; p 535; pp 10¾; 35c.

Steam and Steam Engines

Gage, Victor R.—*A Study of Heat Transmission in Steam Boilers*. [The tests were run on different types of boilers and the results are plotted onto curves. Formulas are also derived].—Sibley Jnl. Nov. 1916; p 29; pp 10½; 30c.

Painter, Walter.—*Virginia Power Co. Coal and Ash Tower*. [Describes a tower arrangement for the handling of coal and ashes].—Pract. Eng. Dec. 1 1916; p 985; pp 1*; 20c.

— *Indicators*. [Indicators for testing the pressure and stroke of engines are described, various makes being included].—Pract. Eng. Dec. 1 1916; p 987; pp 2¾; 20c.

— *Station Operation*. [From a report of the National District Heating Assn. A board containing recorders and other devices are described as a means tending towards efficiency].—Pract. Eng. Dec. 1 1916; p 991; pp 3*; 20c.

IV. MISCELLANEOUS

MISCELLANEOUS

Miscellaneous Costs

Huac, A. J.—*Cost Accounting for the Clay Plant*. [Tables and forms for keeping costs of haulage teams, superintending and selling are included].—B. & C. Rec. Nov. 21 1916; p 901; pp 2*; 35c.

Smith, George Otis; Leshner, C. E.—*Expert's View on Cost of Coal*. [Met. & Chem. Engg. Dec. 1 1916; p 631; pp 4¼; 35c. A paper read before the American Mg. Cong. advocating that costs should be more accurately kept and speaking of government operation of the mines].—C. Tr. Bull. Dec. 1 1916; p 25; pp 4; 25c.

Testing

Addicks, Lawrence.—*Possibilities in the Wet Treatment of Copper Concentrates*. [A paper read before the A. I. M. E. Curves are reproduced and the results of tests in roasting, leaching and chloridizing are dealt with].—Met. & Chem. Engg. Dec. 1 1916; p 628; pp 3*; 35c.

Pettibone, C. E.—*Testing Mine Rescue Apparatus*. [Abstract of a paper read before the National Safety Council. Advocates testing breathing apparatus with 5 ozs. internal pressure].—Coal Age Nov. 25 1916; p 875; pp 2½; 20c.

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— *Description of the Laboratories of the Mines Branch of the Department*

of Mines, Ottawa, Ontario. [Laboratories for investigating fuels, milling and metallurgical methods, ceramics, metallography, etc., are described in detail].—Canada Mines Branch Bull. 13; pp 111*.

— *Indicators*. [Indicators for testing the pressure and stroke of engines are described, various makes being included].—Pract. Eng. Dec. 1 1916; p 987; pp 2¾; 20c.

— *Winona Copper-Leaching Test Plant*. [The Slater process is used. A 5-ton plant using hydrometallurgy and electrometallurgy is described and operating costs given].—E. & M. J. Nov. 25 1916; p 929; pp 1½; 25c.

Metallography

Johnson, J. E., Jr.—*The Chemical and Physical Properties of Foundry Irons*. [Deals with the effects of nickel, titanium and vanadium on these irons with respect to physical and metagraphical properties].—Met. & Chem. Engg. Dec. 1 1916; p 642; pp 5*; 35c.

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Conservation

Ball, Max W.—*Adequate Acreage and Oil Conservation*. [This discussion of situations applies to natural gas as well as oil].—American Mg. Cong. Paper; pp 12; 35c.

McArthur, J. D.—*The Utilization of Coal to the Best Advantage in the Interests of National Economy*. [A paper read before the Inst. of Marine Engineers, England].—I. & C. Tr. Rev. Nov. 10 1916; p 582; pp 2; 35c.

History

Rickard, T. A.—*The Blue Bell Mine, Riondel, B. C.* [The history and transaction which have taken part in the operating of this old silver-lead-zinc property are told in detail].—M. & S. P. Nov. 25 1916; p 765; pp 2½; 20c.

— *Possibilities of Wyoming Field*. [In speaking of the possibilities of the oil fields in the state considerable history regarding them is brought out].—Cal. Derrick Nov. 1916; p 3; pp 1¼; 25c.

General Miscellany

Hurley, Edward N.—*Federal Trade Commission and the Mining Industry*. [A paper read before the American Mg. Cong. Brings out the great need of better cost accounting and selling of coal on this basis].—Coal Age Nov. 25 1916; p 887; pp 3; 20c.

Parsons, J. L.—*An Office Record System for Civil Engineers*. [Details of methods for filing surveys, literature, etc.].—Engg & Cont. Nov. 29 1916; p 466; pp 4*; 20c.

Robertson, J. A. T.—*An Engineer's Travels in Western China*. [A geographic review of the province of Sze-chuan, China, as related to the mining industries of the province, which are in their primitive stages still].—Mg. Mag. Nov. 1916; p 267; pp 13*; 50c.

Sterling, E. A.—*Timber for Structural Purposes*. [A general talk on timber and its uses].—National Lumber Mfg. Assn. Jan. 1916; pp 20; 35c.

— *Canadian Trade Index*. [Companies are classified alphabetically and according to materials they handle].—Canadian Mfg. Assn., Toronto; pp 560; \$5.

Ore and Metal Markets; Prices-Current

New York, Dec. 7, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended December 6 were as follows:

	New York, Cts.	London, Pence.
Nov. 30.....	Holiday	35 15/16
Dec. 1.....	75 1/4	35 3/4
2.....	75 1/4	36
4.....	75	35 13/16
5.....	75 1/2	36 1/16
6.....	75 3/4	36 1/4

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London Standard Oz.	
	1916	1915	1916	1915	
	High.	Low.	Avg.	Avg.	
January	57 1/2	55 1/2	56.775	48.890	26.875
February	57	56 1/2	56.755	48.477	27.000
March	60 1/2	56 1/2	57.935	49.926	27.080
April	73 1/2	60 1/2	64.415	50.034	31.375
May	77 1/2	68 1/2	74.27	49.915	34.182
June	68 1/2	62 1/2	65.02	49.072	31.038
July	65	60	62.94	47.519	29.870
August	67	64	65.50	47.178	31.25
September	69 1/2	67 1/2	68.515	48.68	32.18
October	69 1/2	67 1/2	67.855	49.385	32.21
November	74 1/2	68 1/2	71.60	51.713	34.1805
December .....	.....	.....	.....	55.038	.....
Year .....	.....	.....	.....	49.690	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Conservatism once more prevails in copper. Excited buying has been replaced by normal trading. Price advances stimulated by speculative activity have given way to the stronger influence of the leading producers who desire to see copper's future prosperity unencumbered by over inflation of the value of the red metal. Since our last report quotations have been held at the top levels. Buying has been on a fair scale and well distributed among dealers and producers. Limitation of business for the second half of next year continues in force, although a number of important consumers are still sounding the market for this period. Buying of copper for first and second quarter delivery continues to appear regularly, indicating that many consumers who were uncovered did not partake in the frenzied buying of a few weeks ago. They have neither gained nor lost by deferring their covering operations, but they have at least assisted in stopping the establishment of a peak too lofty and insecure for even so strongly constructed a market situation as now exists.

The greatest sustaining factor in the copper situation is the wonderful expansion in real domestic consumption. That is production of copper products for home consumers. Export business has been tremendous, but it required an extensive domestic consumption to justify increasing production of copper above 150,000,000 lbs. a month. Wire mills are extremely busy. Many of them are refusing orders for delivery four months ahead. Copper wire has sold above 40 cts.

Transactions in copper since our last report are estimated to total 15,000,000 lbs. Compared with the business taken during November, which by the way, was the largest on record, this total may seem small, but it must be borne in mind the current buying is mainly from small consumers who do not buy well ahead. Many of the orders are only for carload lots so that the aggregate represents a considerable number of transactions. Spot electrolytic has sold at 35 cts. in tonnage lots with higher than 36 cts. paid for small lots. January electrolytic has also sold at 35 cts. in small lots. For first quarter delivery dealers continued to take orders at 34 1/2 cts. with second quarter business done at 33 1/2 cts. Few producers have accepted business for either of these deliveries asserting that they have no metal

for sale. Business for the third quarter has been done at 32 1/2 cts., while the nominal price for the fourth quarter is 31 1/2. January casting copper has sold at 34 cts., while for the second quarter one of the large producers has done business at 32 1/2 cts. Prime lake copper for prompt December and January delivery is quoted at 34 1/2 cts., with February and March delivery held at 34 cts., and second quarter at 33 1/2 cts.

The London market has advanced steadily, electrolytic going up £5 last week, while standard advanced £6 10s in spot and £3 in futures. The fortnightly statistics indicate an increase in stocks of copper abroad on November 30 as compared with November 15, the total visible increasing 2181 tons to 11,798 tons. Stocks of standard copper in England increased 2651 tons to 5478 tons, while stocks of fine copper in France increased 155 tons to 2120 tons. London advices state that the English government has contracted for the entire Australia copper output for all of 1917 paying £120 per ton for this metal. Full details of this transaction have not been received here as yet, but producers assert that such a deal would not indicate that England or the rest of the Allies could forego the purchase of American copper.

Quotations for copper per lb. at New York for the week ended December 6 were as follows:

(For First Quarter Delivery.)

	Lake.	Electrolytic.	Casting
Nov. 30.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
Dec. 1.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
2.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
4.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
5.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
6.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4

Quotations for copper per ton at London for the week ended December 6 were as follows:

	Standard		Electrolytic	
	Spot.	Futures.	Spot.	Futures.
Nov. 30.....	£151 0 0	£143 0 0	£169 0 0	£166 0 0
Dec. 1.....	151 0 0	143 0 0	170 0 0	167 0 0
2.....	151 0 0	143 0 0	170 0 0	167 0 0
4.....	151 0 0	142 10 0	170 0 0	167 0 0
5.....	152 0 0	143 0 0	170 0 0	167 0 0
6.....	153 0 0	144 0 0	170 0 0	167 0 0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	16.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.312
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	28.00	28.75	17.758
October	29 1/2	29.00	29.18	17.925
November	35.00	29.50	33.60	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.96
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	28.00	28.75	17.705
October	29 1/2	29.00	29.18	17.859
November	35.00	29.50	33.60	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	1916	1915	1916	1915	1916
	High.	Low.	Avg.	Avg.	Avg.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	23.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	87.350
September	27.00	25.50	26.40	116.10	68.560
October	28.50	27.00	27.31	117.25	72.577
November	34.00	28.50	32.70	137.10	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—Developments both favorable and unfavorable have upset the tin market. Prices on nearby deliveries have gradually receded, while the strength of the limits from the east are alone supporting futures, as there has been no business to speak of. American deliveries were fair, amounting to 3165 tons, while the stocks and landing fell off to 2850 tons.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended December 6 were as follows:

Month.	New York		London.	Singapore
	Spot.	Dec.		
Nov. 30.....	Holiday	Holiday	£189 5 0	£194 0 0
Dec. 1.....	45¼c	45c	190 5 0	193 10 0
2.....	45¼c	45c	190 5 0	193 10 0
4.....	45c	44¾c	189 5 0	194 10 0
5.....	44¾c	44¾c	188 0 0	193 0 0
6.....	44c	44¾c	187 0 0	190 0 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	48.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.586
September	39.50	38.00	39.00	33.12
October	44.00	39.37½	41.17	33.077
November	45.75	41.75	44.15½	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—An extreme scarcity of lead has resulted in the price jumping forward almost \$10 a ton in a week. Spot lead has sold at 7.60 cts. New York with producers now refusing to sell at 7.75 cts. New York. Lead for December delivery has sold at 7.50 cts. New York and is now ruling at 7.60 cts. New York. Independents have entirely withdrawn from the market on December deliveries. One large independent reports being entirely sold out for December, while the others are holding lead until the principal producer announces a change in its price. Selling for January delivery has also been large and some producers have even withdrawn from the market for that month, fearing overselling. Lead for January, February and March delivery was offered at 7.50 cts. New York this week. On Tuesday the A. S. & R. Co. advanced its price to 7.25 cts. The inaction on the part of the A. S. & R. Co. was mystifying. Few factors can understand why the principal interest adhered to the 7-ct. level when it was not selling at that price and was known that outside interests are receiving 50 to 60 points more for the metal. An interesting probability affecting the future lead situation came to the surface last week when word was received from London that a coal strike had started in Australia and that all manufacturing and mining operations were being affected. As England secures large quantities of lead from Australia a protracted coal strike would compel her to place orders in this country. While it is not expected that the strike will last very long some lead factors are preparing to take care of English trade if such a condition should arise. At London the market continues nominal, as all of the lead has been earmarked for government use.

Quotations for lead per lb. at New York and per ton at London for the week ended December 6 were as follows:

Month.	New York		London	
	Indpts.	A.S.&R.Co.	Spot.	Futures.
Nov. 30.....	Holiday	Holiday	£39 10 0	£29 10 0
Dec. 1.....	7.40c	7.00c	30 10 0	29 10 0
2.....	7.50c	7.00c	30 10 0	29 10 0
4.....	7.75c	7.00c	30 10 0	29 10 0
6.....	7.75c	7.25c	30 10 0	29 10 0
.....	7.85c	7.25c	30 10 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York				London	
	1916			1915.	1916.	1915.
	High.	Low.	Avg.	Avg.	Avg.	Avg.
January	6.20	5.50	5.926	5.730	31.92	18.637
February	6.55	6.10	6.271	3.350	33.108	19.804
March	8.00	6.50	7.47	4.066	34.410	22.010
April	8.00	7.37½	7.70½	4.206	33.70	21.100
May	7.50	7.22½	7.34	4.235	33.209	20.120
June	7.20	6.75	6.88	5.875	29.760	25.750
July	6.85	6.25	6.37	5.738	28.035	25.611
August	6.70	5.95	6.32	4.750	30.260	22.150
September	7.10	6.70	6.88	4.627	31.25	22.983
October	7.10	7.00	7.05	4.612	30.20	23.932
November	7.40	7.02½	7.10½	5.152	30.10	26.240
December .....	....	....	....	5.346	....	28.884
Year ....	....	....	....	4.675	....	23.099

Lead Ore.—Prices were slightly up in the Missouri-Kansas-Oklahoma district during the week ended Dec. 2, and most ore went at \$91 per ton, though a fewer number of lots brought \$92.50. Sales made were a little larger than during the previous week and totaled 2,780,650 lbs. of concentrates valued at \$124,860. This brought the total for the year to 95,788,242 lbs. valued at \$3,983,834.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.46	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9875	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	48.25
October	87.00	70.50	79.875	51.80
November	90.00	82.00	85.5625	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—The market has gotten to a steady basis and was practically unchanged from the previous week, with prices ranging from \$105 to \$90. Shipments made amounted to 18,416,410 lbs. of concentrates valued at \$901,865. The total for the year was placed at 653,758,147 lbs. valued at \$26,366,786.

Calamine.—Calamine at from \$62 to \$46 was about as during the previous week, though it is reported that some producers refused to sell at this figure. There were 892,935 lbs. of concentrates sold during the week which were valued at \$24,120, and this brought the total for the year to \$36,345,050 valued at \$1,082,079.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.26	53.90
February	130.00	86.00	119.75	54.427
March	115.00	80.00	100.50	62.50
April	100.00	98.00	99.25	61.25
May	115.00	60.00	88.125	69.60
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	63.75	60.25
September	55.00	45.00	55.00	76.75
October	75.50	50.00	63.375	82.40
November	105.00	70.00	86.25	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Business held to a good volume last week with prices rising steadily, but this week resellers appeared in the market and shaded prices, resulting in prospective buyers suspending negotiations in hopes of further price recessions. Producers, on the other hand, have not been very large sellers at the prevailing levels, insisting that they

will obtain better prices as the year draws to a close. With copper selling above 30 cts. it is remarked that brass makers will change their mixtures and use more spelter. It is also stated that the bugaboo of increased capacity has not materialized into increased production of spelter and that all around the market is shaping for 15-ct. metal. Spot prime western advanced to 13 $\frac{1}{4}$ cts. New York, but is now holding at 13 cts. Spot brass special is strong at 14 $\frac{1}{4}$ cts. St. Louis. Prime western for the first quarter sold up to 12 $\frac{1}{2}$ cts. and for the second quarter up to 12 $\frac{1}{4}$ cts., but these prices have since been shaded an eighth to a quarter cent. Spelter at London has been advancing, but is still under our parity, which restricts export business. Last week spelter at London advanced £1 10s in spot and £3 in futures, with further advances this week.

Quotations for spelter per lb. at New York and per ton at London for the week ended December 6 were as follows:

	New York.		London.	
	Spot.		Spot.	Futures.
Nov. 30.....	Holiday		£59 10 0	£58 0 0
Dec. 1.....	13.25c		59 10 0	58 0 0
2.....	13.25c		59 10 0	58 0 0
4.....	13.00c		60 0 0	58 10 0
5.....	12 $\frac{1}{2}$ c		58 10 0	55 10 0
6.....	12 $\frac{1}{2}$ c		58 0 0	55 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	1916	1916	1916	1916	1915
	High.	Low.	Avg.	Avg.	Avg.
January	19.42 $\frac{1}{2}$	17.30	18.801	6.619	89.840
February	21.17 $\frac{1}{2}$	18.67 $\frac{1}{2}$	20.094	8.866	97.840
March	20.50	16.50	18.40	10.125	100.720
April	19.37 $\frac{1}{2}$	17.75	18.76	11.48	98.103
May	17.60	13.75	15.98	15.825	89.607
June	13.62 $\frac{1}{2}$	11.25	12.72	22.625	67.410
July	10.75	8.75	9.80	20.803	53.00
August	8.75	8.37 $\frac{1}{2}$	9.11 $\frac{1}{2}$	16.110	56.00
September	9.70	8.12 $\frac{1}{2}$	9.22	14.493	51.30
October	10.42 $\frac{1}{2}$	9.42 $\frac{1}{2}$	9.99	14.196	53.15
November	13.30	10.55	11.92	16.875	56.00
December				16.675	
Year				13.914*	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—A drop of \$3.00 a flask took place in quicksilver last week, but on cables announcing an advance of £1 at London the price advanced back to \$30 per flask for spot virgin metal. Business has been dull and with supplies adequate some sellers felt that a lower price would stimulate buying. That the principal factors abroad did not favor a drop here was indicated by an advance on the other side.

Antimony.—The market has held steady in the absence of business, the strength being based on the scarcity of spot supplies. Chinese and Japanese brands are quoted at 14 $\frac{1}{2}$ cts. duty paid.

Platinum.—There has been no change in the situation. Jewelers have done the bulk of their holiday buying. The market remains steady at \$105 per ounce in retail lots, while in large lots sellers are asking from \$95 to \$100 per ounce.

Tungsten.—A strong trend towards higher levels has come with the cleaning up of spot tungsten supplies. Numerous sales have been made at \$18 per unit and for high grades sellers are now asking \$18.50 per unit. Buying has been very active with sales covering delivery over all of next year. Domestic consumers are now well covered, while a substantial foreign business has just been done.

Aluminum.—The situation remains as previously outlined, demand being fair with the market steady and unchanged at 63 to 64 cts. for spot virgin ingots and 58 to 60 cts. for No. 1 remelted. Sheet aluminum for 1917 contract is quoted at 40 cts., while prompt sheets are held at 75 to 80 cts.

Pig Iron.—Business has continued very large with the market strong at the top prices. Bessemer has sold in tremendous tonnages at \$35 valley furnace, and basic at \$30 valley furnaces. Foundry irons range from \$28 to \$30. Export buyers continue in the market for large tonnages of steel making grades.

Ferro Manganese.—A considerable business has been done in ferro manganese on first half contracts, but domestic makers have taken all of the orders, sales being made as low as \$160 delivered, with the market now holding at \$163 delivered. English makers continue to quote \$164 sea-board.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06 $\frac{1}{2}$	to	.06 $\frac{1}{2}$
Nitric, 40 deg.....	.06 $\frac{1}{2}$	to	.07
Alcohol—U. S. P., gal., Grain, 190 proof.....	2.74	to	2.76
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.95	to	1.00
Denatured, bbl.....	.65	to	.70
Alum—Powdered, lb.....	.06 $\frac{1}{2}$	to	.06 $\frac{1}{2}$
Lump, lb.....	.05 $\frac{1}{2}$	to	.05 $\frac{1}{2}$
Ground, lbs.....	.06	to	.06 $\frac{1}{2}$
Ammonia—			
Muriate, white grain, lb.....	.16	to	.16 $\frac{1}{2}$
Muriate, lump.....	.17	to	.18
Arsenic—White, lb.....	.06 $\frac{1}{2}$	to	.07
Red, lb.....	.65	to	.70
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13 $\frac{1}{2}$	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	6.50	to	6.75
Foundry.....	9.00	to	9.25
Copperas—Spot, bbl.....	1.25	to	1.50
Ferrosilicon, 50%.....			100.00
Ferrotitanium, per lb.....	.08	to	.12 $\frac{1}{2}$
Fuiler's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			5.95
Bessemer, Mesabi.....			5.70
Non-Bessemer, old range.....			5.20
Non-Bessemer, Mesabi.....			5.05
Lead—Granulated, lb.....	.14 $\frac{1}{2}$	to	.15 $\frac{1}{2}$
Brown sugar.....	.11 $\frac{1}{2}$	to	.11 $\frac{1}{2}$
White crystals.....	.13	to	.13 $\frac{1}{2}$
Broken, cakes.....	.12 $\frac{1}{2}$	to	.13
Powdered.....	.13 $\frac{1}{2}$	to	.14
Litharge, American, lb.....	.09	to	.09 $\frac{1}{2}$
Mineral Lubricants—			
Black summer.....	.13 $\frac{1}{2}$	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37 $\frac{1}{2}$	to	.38
Wool grade, 30 gr.....	.19 $\frac{1}{2}$	to	.20
Paraffin—High viscosity.....	.29 $\frac{1}{2}$	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28 $\frac{1}{2}$
Nickel Salt, double.....	.08	to	.08 $\frac{1}{2}$
Single.....	.11	to	.11 $\frac{1}{2}$
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Platinum—Oz. ref.....	105.00	to	111.00
Potash Fertilizer Salts—			
Kalnit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
Refined, bbl.....			.12
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		32.00
Potassium—			
Bichromate.....	.40	to	.42
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.80	to	1.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.95	to	1.00
Prussiate, red.....	2.50	to	2.75
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.31	to	.31 $\frac{1}{2}$
Soda—Ash, 48% (43% basis), bbl.....	3.15	to	3.25
Strontia Nitrate, casks, lb.....	.28	to	.30
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.15	to	.15 $\frac{1}{2}$
Crystals, bbls., lb.....	.30 $\frac{1}{2}$	to	.31
Oxide, lb.....	.50	to	.52
Zinc Chloride.....	.10 $\frac{1}{2}$	to	.11 $\frac{1}{2}$

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest						Paid in 1916	Total to date	Latest	
						Date	Am't.							Date	Am't.
Acacia, g. s. l. c.	Colo.	1,438,989	\$1	\$	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, g. s. l. c.	Colo.	480,915	\$1	\$	\$98,916	Sept., '01	\$0.01
Adams, g. s. l. c.	Colo.	80,000	10		778,000	Dec. 18, '09	.04	Golden Star, g. s. l. c.	Ariz.	400,000	5		120,000	Mar. 15, '10	.05
Adventure, g. s. l. c.	Mich.	100,000	25	50,000	50,000	July 20, '16	.50	Gold Com. Fra. g. s. l. c.	Nev.	922,000	1		92,111	Oct. 15, '09	.10
Abmeek, g. s. l. c.	Mich.	200,000	25	2,000,000	6,050,000	Oct. 10, '16	4.00	Goldfield Con. g. s. l. c.	Nev.	3,559,148	10		28,999,831	Oct. 31, '16	.10
Alaska Goldfields, g. s. l. c.	Alaska	250,000	5		403,250	Jan. 10, '15	.15	Good Hope, g. s. l. c.	Colo.	600	100		941,250	Jan., '03	.25
Alaska Mexican, g. s. l. c.	Alaska	180,000	5		3,507,381	Nov. 28, '15	.10	Good Star Anchor, z. s. l. c.	Nev.	560,000	1	33,000	119,755	June 15, '16	.01
Alaska Mines Sec. g. s. l. c.	U. S.	600,000	5		90,000	Nov. 1, '06		Grand Central, g. s. l. c.	Utah	600,000	1	20,000	1,635,250	Oct. 25, '16	.04
Alaska Treadwell, g. s. l. c.	Alaska	200,000	25	250,000	15,780,000	May 28, '16	.50	Grand Gulch, c. s. l. c.	Alaska	239,845	2.50	17,790	19,187	Sept. 8, '16	.03
Alaska United, g. s. l. c.	Alaska	180,200	6	64,000	2,045,270	Feb. 28, '16	.30	Granite, g. s. l. c.	Cal.	430,000	1	17,200	17,200	May 10, '16	.02
Allouez, c. s. l. c.	Mich.	100,000	25	700,000	800,000	Oct. 4, '16	2.50	Gwin, g. s. l. c.	Cal.	100,000	10		481,500	Feb., '06	.25
Amalgamated, c. s. l. c.	Mont.	1,538,829	100		103,444,983	Aug. 30, '15	3.77	Hazel, g. s. l. c.	Cal.	900,000	1		1,114,000	Jan., '15	.01
Am. Sm. & R. com.	U. S.	600,000	100	2,500,000	31,833,333	Sept. 1, '16	1.69	Hecia, s. l. c.	Idaho	1,000,000	0.25	1,400,000	5,155,000	Nov. 20, '16	.15
Am. Sm. & R. pf.	U. S.	600,000	100	2,625,000	57,421,886	Sept. 1, '16	1.75	Hercules, g. s. l. c.	Idaho	1,000,000	1	2,450,000	13,200,000	Nov. 16, '16	.20
Am. Sm. Sec. A. pf.	U. S.	170,000	100	1,020,000	11,720,000	Oct. 2, '16	1.50	Hidden Treasure, g. s. l. c.	Cal.	30,000	10		457,452	Sept., '00	.10
Am. Sm. Sec. B. pf.	U. S.	300,000	100	1,400,000	17,010,000	Oct. 2, '16	1.25	Holy Terror, g. s. l. c.	S. D.	500,000	1		172,000	Jan., '00	.01
Am. Zinc, L. & Sm.	Mo.	193,120	25	3,093,969	4,147,150	Nov. 1, '16	1.50	Homestake, g. s. l. c.	S. D.	251,180	100	1,795,798	37,601,602	Nov. 25, '16	.65
Anacosta, c. s. l. c.	Mont.	2,331,250	60	16,318,750	180,576,771	Nov. 28, '16	2.00	Hope Dev. g. s. l. c.	Cal.	600,000	1		6,000	Dec. 31, '15	.01
Annie Laurie, g. s. l. c.	Utah	25,000	100		439,561	Apr. 22, '05	.50	Horn Silver, l. s. z. c.	Utah	400,000	1	40,000	5,182,000	June 30, '16	.05
Argonaut, g. s. l. c.	Cal.	200,000	5	55,000	1,095,000	Sept. 25, '10	.07%	Imperial, c. s. l. c.	Ariz.	500,000	10		300,000	June 24, '07	.20
Arizona, g. s. l. c.	Ariz.	250,000	5	576,982	30,279,352	Nov. 1, '16	.50	Inspiration Con. g. s. l. c.	Ariz.	920,887	20	5,454,989	5,454,989	Oct. 31, '16	2.00
Arizona Com. c. s. l. c.	Ariz.	250,000	5	130,000	130,000	Oct. 30, '16	.50	Intermountain, c. s. l. c.	Mont.	1,615,020	1	8,705	37,800	Oct. 20, '16	.00%
Arizona United, g. s. l. c.	Ariz.	2,600,000	1	25,000	25,000	Oct. 2, '16	.01	Inter'l Nickel, com.	U. S.	1,673,384	25	7,948,674	33,451,414	Sept. 1, '16	1.50
Atlantic, c. s. l. c.	Mich.	100,000	25		900,000	Feb. 21, '05	.50	Inter'l Nickel, pf.	U. S.	89,126	100		534,756	Nov. 1, '16	1.60
Bagdad-Chase, g. pf.	Cal.	84,819	5		202,394	Jan. 1, '09	.10	Inter'n Sm. & Ref.	U. S.	100,000	100		4,100,000	May 2, '14	2.00
Bald Butte, g. s. l. c.	Mont.	250,000	1		1,354,448	Nov. 1, '07	.04	Interstate-California	Idaho	464,990	10	2,092,455	4,649,990	Sept. 30, '16	1.60
Baldie, c. s. l. c.	Mich.	100,000	25		7,950,000	Dec. 31, '13	2.00	Iowa, g. s. l. c.	Colo.	1,666,667	1		270,167	Dec. 31, '16	.00%
Barnes-King, g. s. l. c.	Mont.	40,000	6	80,000	80,000	June 1, '16	.07%	Iowa Tiger, g. s. l. c.	Colo.	3,009	1		25,179	Jan. 15, '16	.50
Beck Tunnel Con.	Utah	1,000,000	0.10		940,000	Nov. 16, '07	.02	Iron Blossom, l. s. g.	Utah	1,000,000	1	360,000	2,850,000	Oct. 20, '16	.10
Big Four Exp. l. c.	Utah	400,000	1	100,000	110,000	Sept. 1, '16	.05	Iron Cap pf. d. c.	Ariz.	33,481	10	6,422	29,803	July 1, '16	.35
Board of Trade, z. c.	Wis.	120,000	1		78,000	Jan. 15, '11	.06	Iron Clad, g. s. l. c.	Colo.	1,000,000	1		50,000	Nov., '06	.06
Bonanza Dev. g. s. l. c.	Colo.	300,000	1		1,425,000	Oct. 28, '11	.20	Iron Silver, g. s. l. c.	Colo.	600,000	20		5,050,000	Dec. 31, '16	.10
Bonanza (Reorganized)	Nev.	999,296	5	349,948	349,948	June 26, '16	.05	Isabella, g. s. l. c.	Colo.	2,250,000	1		742,500	Mar., '01	.01
Boss, g. s. l. c.	Nev.	409,600	1	8,170	49,020	Nov. 1, '16	.05	Isle Royale, c. s. l. c.	Cal.	150,000	25	450,000	600,000	Oct. 31, '16	.20
Boston & Colo. Sm.	Mont.	15,000	10		402,350	Oct., '02	.76	Jamison, g. s. l. c.	Cal.	390,000	10		378,300	Jan., '11	.02
Boz. & Mont. Con.	Mont.	100,000	25		63,225,000	May 16, '11	4.00	Jerry Johnson, g. s. l. c.	Colo.	2,600,000	.10		187,500	Nov. 5, '14	.00%
Breece, l. s. z. c.	Colo.	200,000	25		220,000	Dec. 16, '13	.10	Jim Butler, g. s. l. c.	Nev.	1,718,020	1	343,604	516,406	Aug. 1, '16	.10
Brunswick Con. g. s. l. c.	Cal.	300,000	1		203,316	Sept. 15, '16	.06	Joplin Ore. & Spelter	Mo.	400,000	6	62,000	62,000	July 22, '16	.04%
Bullion-B. & Champ	Utah	100,000	10		2,768,400	July 11, '08	.10	Jumbo Ext. g. s. l. c.	Nev.	1,550,000	1	194,000	684,998	June 30, '16	.05
Bunker Hill Con. g. s. l. c.	Cal.	200,000	1	55,000	876,000	Nov. 4, '16	.02%	Kendall, g. s. l. c.	Mont.	600,000	5	50,000	1,555,000	Apr. 3, '16	.10
Bunker Hill & Sulph.	Idaho	327,000	10	1,563,250	1,832,250	Nov. 4, '16	.40	Kenebeck Zinc	Mo.	200,000		80,000	60,000	June 30, '16	.10
Butte Alex. Sulph.	Mont.	75,000	10	814,892	1,054,118	Apr. 10, '16	10.60	Kennecott, c. s. l. c.	Alas.	2,780,999	10	11,200,000	16,200,000	Sept. 30, '16	1.60
Butte Malakoff, c. s. l. c.	Mont.	250,000	10		125,000	Aug. 1, '10	.50	Kennedy, g. s. l. c.	Cal.	100,000	100		1,301,000	June, '09	.05
Butte Coalition, c. s. l. c.	Mont.	1,000,000	16		4,700,000	Dec. 1, '11	.25	King of Arizona, g. s. l. c.	Ariz.	200,000	1		396,000	Aug. 2, '09	.12
Butte & Superior, z. c.	Mont.	272,697	10	7,676,734	13,196,758	Sept. 30, '16	6.25	Klar Pluget, z. c. s. l. c.	Wis.	20,000	1		157,600	Dec. 16, '12	.26
Caledonia, l. s. z. c.	Idaho	2,605,000	1	859,850	1,742,331	Nov. 3, '16	.03	Knob Hill, g. s. l. c.	Wash.	1,000,000	1		70,000	Aug. 1, '13	.00%
Calumet & Ariz. c. s. l. c.	Mich.	641,923	10	3,849,622	26,997,847	Sept. 25, '16	2.00	La Fortuna, g. s. l. c.	U. S.	250,000	1		1,200,500	Oct., '02	.01%
Calumet & Hecla, c. s. l. c.	Mich.	100,000	25	500,000	134,250,000	Sept. 22, '16	20.00	Lake View, g. s. l. c.	Utah	500,000	.05	60,000	114,500	June 12, '16	.01
Camp Bird, g. s. l. c.	Colo.	1,750,000	25	113,584	10,243,961	Jan. 1, '16	.17%	Last Dollar, g. s. l. c.	Colo.	1,600,000	1		180,000	Feb. 23, '03	.02
Cardiff, l. s. z. c.	Utah	600,000	1	875,000	600,000	Sept. 19, '16	.25	Liberty Bell, g. s. l. c.	Colo.	133,661	6		1,762,795	Jan. 31, '16	.06
Carlin, g. s. l. c.	Utah	600,000	25		60,000	Dec., '06	.01	Lightner, g. s. l. c.	Cal.	102,255	1		331,179	June, '06	.05
Centennial, c. s. l. c.	Mich.	1,000,000	1	100,000	100,000	Sept. 1, '16	1.00	Linden, z. c. s. l. c.	Wis.	1,029	10		11,000	Dec. 31, '15	3.00
Centennial Eureka, g. s. l. c.	Utah	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Little Bell, s. l. c.	Utah	300,000	1	16,000	75,000	Apr. 22, '16	.05
Center Creek, l. s. z. c.	Mo.	100,000	10	65,000	815,000	Dec. 1, '16	.10	Little Florence, g. s. l. c.	Nev.	1,000,000	1		430,000	Jan., '08	.03
Central Eureka, g. s. l. c.	Cal.	100,000	1	44,000	798,188	Mar. 6, '06	.05	Little Pecker, g. s. l. c.	Idaho	150,000	1		37,500	Oct. 23, '13	.25
Century, g. s. l. c.	Utah	1,000,000	1	25,000	382,087	Feb. 16, '16	.05	Lower Mammoth, g. s. l. c.	Utah	1,000,000	1		87,000	Dec. 15, '15	.01
Cerro Gordo, l. s. z. c.	Cal.	1,000,000	1	25,000	25,000	Sept. 23, '16	.02%	MacNamara, g. s. l. c.	Nev.	734,676	1		48,800	Apr. 23, '05	12.00
Champion, c. s. l. c.	Mich.	100,000	25	6,920,000	17,920,000	Nov. 14, '16	6.40	Magma, c. s. l. c.	Ariz.	240,000	6.00	360,000	600,000	Sept. 30, '16	.50
Chief Con. g. s. l. c.	Nev.	882,960	1	176,471	627,508	Nov. 14, '16	.06	Mammoth, g. s. c. s. l. c.	Utah	400,000	10	60,000	2,380,000	Sept. 30, '16	.05
Chino Copper c. s. l. c.	Colo.	869,980	5	5,002,385	11,700,377	Sept. 30, '16	2.2								

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1918	Total to Date	Latest							Paid in 1916	Total to Date	Latest		
						Date	Am.	Date							Date	Am.	
Petro, g. s.	Utah..	600,000	\$ 1	3.....	\$65,000	Aug. 9, '08	\$0.04	Success.....	Ida..	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03		
Pharmacist, g.	Colo..	1,600,000	1	.....	91,500	Feb. 1, '10	0.00%	Superior, c.	Mich..	1,000,000	25	100,000	100,000	Oct. 10, '16	1.00	
Phelps, Dodge & Co	U. S..	450,000	100	9,000,000	57,371,527	Sept. 30, '16	8.00	Superior & Pitta, c.	Ariz..	1,499,792	10	.....	10,318,568	Dec. 21, '16	.35	
Pioneer, g.	Alaska	5,000,000	1	.....	2,041,528	Oct. 7, '11	.03	Tamarack, c.	Mich..	60,000	25	.....	9,420,000	July 23, '07	4.00
Pittsburg, I. z.	Mo..	1,000,000	1	.....	20,000	July 15, '07	.02	Tamarack-Custer..	Idaho..	2,000,000	1	71,050	71,050	Aug. 30, '16	.02	
Pittsburg-Idaho, I.	Ida..	1,000,000	1	42,500	291,004	Oct. 2, '16	.04%	Tennessee, c.	Tenn..	200,000	25	390,000	5,206,250	Apr. 15, '16	.75		
Pitts Silver Peak..	Nev..	2,790,000	1	.....	840,800	Dec. 1, '14	.02	Tightner.....	Cal..	100	100	.....	160,000	Jan. 3, '14	.....	
Platteville, I. z.	Wis..	500	60	.....	179,500	June 16, '07	10.00	Tombay, g. s.	Colo..	310,000	6	74,400	3,861,555	June 30, '16	.24	
Plumas Eureka, g.	Cal..	160,625	10	.....	2,831,294	Apr. 9, '01	.06	Tom Reed, g.	Ariz..	909,555	1	.....	2,555,934	Sept. 5, '15	.01
Plymouth Con.	Cal..	240,000	5	118,500	289,300	Aug. 10, '16	.24	Ton-Belmont, g.	Nev..	1,600,000	1	750,000	8,393,027	Oct. 2, '16	.12%		
Portland, g.	Colo..	3,000,000	1	360,000	10,637,080	Oct. 20, '16	.03	Ton-Extension, g. s.	Nev..	1,272,501	1	604,580	1,591,775	Oct. 1, '16	.15		
Prince Con., s. l.	Nev..	1,000,000	2	200,000	325,000	Oct. 5, '16	.02%	Tonopah, g. s.	Nev..	1,000,000	1	600,000	13,600,000	Oct. 21, '16	.15		
Quartette, g. s.	Nev..	100,000	10	.....	375,000	July 31, '07	.20	Tonopah Midway, g	Nev..	1,000,000	1	.....	250,000	Jan. 1, '07	.05%
Quicksilver, pf.	Cal..	43,000	100	.....	1,931,411	Apr. 8, '03	.50	Tremulis.....	Cal..	200,000	2.50	.....	234,000	Apr. 28, '15	.02
Quip, g.	Wash.	1,500,000	1	.....	57,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich..	100,000	25	.....	1,100,000	Oct. 30, '12	3.00
Quincy, c.	Mich.	110,000	25	1,210,000	22,987,500	Sept. 25, '16	4.00	Tuolumne, c.	Mont.	800,000	1	.....	496,625	Apr. 15, '13	.10	
Ray Con., c.	Ariz..	1,571,279	10	2,743,748	7,322,875	Sept. 30, '16	.75	Uncle Sam Con. s.	Utah..	600,000	1	.....	470,000	Sept. 20, '11	.06	
Red Metal, c.	Mont.	100,000	10	.....	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz..	835,350	1	.....	167,070	Nov. 16, '15	.10
Red Top, g.	Nev..	1,000,000	1	.....	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	50,000	100	.....	1,600,000	Apr. 15, '07	3.00
Republic, g.	Wash.	1,000,000	1	.....	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	.....	6,125,000	Aug. 6, '07	1.75
Richmond, g. s. l.	Nev..	54,000	1	.....	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo..	19,556	25	.....	211,527	Oct. 15, '07	.50
Rocco-Home, I. s.	Nev..	300,000	1	.....	152,500	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	.....	40,000	Dec. 21, '12	.01
Rochester Id. & L.	Mo..	4,900	100	.....	190,846	July 1, '12	.50	United (Crip. Ck.) ..	Colo..	4,009,100	1	.....	440,435	Jan. 1, '10	.04
Round Mountain, g.	Nev..	889,018	1	.....	363,964	Aug. 25, '13	.04	United Globe, c.	Ariz..	23,000	100	1,173,000	3,749,000	Sept. 30, '16	15.00	
Sacramento, g.	Utah..	1,000,000	5	.....	308,000	Oct. 22, '06	.00%	United Metals Sell..	U. S..	50,000	100	.....	11,000,000	Sept. 23, '10	5.00
St. Joseph, I. z.	Mo..	1,409,466	10	1,761,830	12,029,729	Sept. 20, '16	.75	United Verde, c.	Ariz..	300,000	10	3,600,000	39,397,000	Nov. 1, '16	.75		
St. Mary's M. L.	Mich.	160,000	25	3,040,000	7,840,000	Nov. 15, '16	2.00	United Verde Ext.	Ariz..	1,000,000	50	1,150,000	1,150,000	Nov. 1, '16	.50		
Schoenh'r-Wal'n.zl	Cal..	10,000	10	.....	90,000	Sept. 20, '11	.20	U. S. Red & R. com.	Colo..	59,188	100	.....	414,078	Oct. 9, '03	1.00
Scratch Gravel.	Nev..	1,000,000	1	20,000	25,000	Feb. 1, '15	.02	U. S. Red & R. pf.	Colo..	39,458	100	.....	1,775,936	Oct. 1, '07	1.50	
Seven Tro. Con., g. s.	Nev..	143,077	1	36,075	252,532	Apr. 1, '15	.02%	U. S. S. R. & M. com.	USMx	351,115	50	1,316,681	7,941,860	Oct. 15, '16	1.00		
Shannon, c.	Ariz..	300,000	10	150,000	900,000	Nov. 15, '15	.02	U. S. S. R. & M. pf.	USMx	456,350	50	1,718,224	18,613,922	Oct. 15, '16	.87%		
Shatuck-Ariz, c.	Ariz..	350,000	10	1,563,300	4,637,000	Oct. 20, '16	1.25	Utah, c.	Utah..	1,524,490	10	13,908,165	46,500,062	Sept. 30, '16	3.00		
Silver Hill, g. s.	Nev..	108,000	1	.....	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah..	528,200	5	396,154	4,877,492	Oct. 2, '16	.25	
*Silver King Coal'n	Utah..	1,250,000	5	750,000	14,334,985	Oct. 1, '16	.15	Utah Con., c.	Utah..	300,000	5	875,000	9,255,000	Sept. 25, '16	.75		
Silver King Con.	Utah..	687,682	1	191,274	1,006,131	Oct. 22, '15	.10	Utah M. & T.	Utah..	750,000	1	325,000	1,255,493	Aug. 15, '16	.50		
Silver Mines Expl.	N. Y..	10,000	100	.....	872,105	July 20, '11	.04	Utah-Missouri, z.	Mo..	10,000	10	10,000	10,000	May 23, '16	1.00	
Sioux Con., I. s. c.	Utah..	745,389	1	.....	250,000	June 16, '10	2.00	Victoria, g. s. l.	Utah..	250,000	1	.....	207,600	Apr. 23, '10	.04
Skidoo, g.	Cal..	1,000,000	5	.....	365,000	Oct. 2, '14	.01	Vindicator Con., g.	Colo..	1,600,000	1	225,000	3,457,500	Oct. 25, '16	.06	
Smuggler, s. l. z.	Colo..	1,000,000	1	.....	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D..	600,000	1	100,000	649,466	May 15, '16	.02%	
Snowstorm, c.	Idaho	1,500,000	1	.....	1,169,810	Oct. 10, '13	.01%	Wellington, I. z.	Colo..	10,000,000	1	600,000	1,250,000	Oct. 2, '16	.02	
Socorro, g.	N. M..	377,342	5	56,599	196,070	Sept. 1, '16	.06	West End Con.	Nev..	1,788,486	1	89,424	625,969	Oct. 24, '16	.06		
South Eureka, g.	Cal..	299,981	1	167,920	1,409,754	Aug. 15, '16	.07	West Hill.....	Wis..	20,000	1	8,000	40,000	June 29, '16	.20		
South Hecla, g.	Ida..	500,000	1	39,450	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal..	200,000	10	60,000	190,000	Aug. 25, '16	.10		
So. Swansea, g. s. l.	Utah..	300,000	1	.....	287,600	Apr. 3, '04	.01%	Wilbert.....	Ida..	1,000,000	1	40,000	50,000	Nov. 15, '16	.01	
Spearsfield, g.	S. D..	1,500,000	1	.....	165,500	Jan. 7, '05	.01	Wolverine, c.	Mich..	60,000	25	720,000	9,120,000	Oct. 2, '16	6.00	
Standard Con., g. s.	Cal..	178,394	10	.....	5,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz..	115,674	15	.....	53,403	Dec. 15, '15	.25
Standard, c.	Ariz..	425,000	1	.....	69,600	Sept. 8, '06	.60%	Work, g.	Colo..	1,600,000	1	.....	1,597,686	Apr. 31, '12	.02
Stewart, I. z.	Idaho.	1,238,362	1	.....	2,043,297	Dec. 31, '15	.05	Yak.....	Colo..	1,000,000	1	190,000	2,197,686	Sept. 30, '16	.07	
Stratton's Crip. Ck.	Colo..	2,000,000	1	.....	300,000	Sept. 8, '08	.02%	Yankee Con., g. s. l.	Utah..	1,000,000	1	.....	187,600	Feb. 1, '13	.01
Stratton's Ind.	Colo..	1,000,000	5	.....	5,028,258	Dec. 23, '06	.12	Yellow Aster, g.	Cal..	100,000	10	33,000	1,206,789	Nov. 5, '16	.06	
Str'n's Ind. (new) g.	Colo..	1,000,000	30	160,000	691,250	Jan. 31, '16	.15	Yellow Pine, x. l. s.	Nev..	1,000,000	1	900,000	1,793,008	Nov. 25, '16	.10		
Strong, g.	Colo..	1,000,000	1	.....	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal..	24,000	10	.....	102,583	July 15, '14	.10

Corrected to December 1, 1916

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				
					Paid in 1918	Total to Date	Latest								Paid in 1918	Total to Date	Latest		
							Date	Am.	Date								Am.	Date	Am.	Date	Am.
Ajuchitlan	Mex.	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrilas	Mex.	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00				
Amistad y Concordia g.s	Mex.	9,600	60		429,358	July 15, '06	1.28	Le Roi No. 2, g.	B. C.	120,000	25		1,527,320	Dec. 15, '16	\$0.24				
Amparo, g.	Mex.	2,000,000	1	360,000	2,292,176	Nov. 10, '16	.05	Lucky Tiger	Mex.	715,337	10	440,061	3,714,053	Nov. 20, '16	.10				
Bartolo de Medina Mill	Mex.	2,000	25		103,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,892	1	269,724	4,877,492	Oct. 2, '16	.03				
Batopilas, s.	Mex.	446,268	20		55,870	Dec. 31, '07	.12%	Mexican, I. pf.	Mex.	12,500	100		1,018,750	May 1, '12	3.50				
Beaver Con., s.	Ont.	2,000,000	1	60,000	710,000	Apr. 29, '16	.03	Mexico Con.	Mex.	240,000	10		660,000	Mar. 10, '08	.25				
Boleo, g.	Mex.	120,000	20		721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex.	180,000	5		4,478,500	June 26, '14	.96				
British Columbia, c.	B. C.	591,709	8		615,399	Jan. 31, '13	.15	Minas Pedrazal	Mex.	1,000,000	10		497,600	Jan. 23, '11	.05%				
Buena Tierra.	Mex.	330,000	5		160,380	Jan. 30, '15	.24	Mines Co. of Am.	Mex.	900,000	10		4,958,000	July 25, '13	.12%				
Buffalo, Ont.	Ont.	1,000,000	1		2,787,000	July 1, '14	.06	Minior Corp. of Canada.	Can.	2,075,000	1	570,625	1,348,750	Sept. 30, '16	.15				
Canadian Goldfields	Can.	600,000	0.10		237,099	July 15, '14	.01%	Monteruma, I. pf.	Mex.	5,000	100		402,500	Nov. 15, '12	3.50				
Cananea Central, c.	Mex.	600,000	10		360,000	Mar. 1, '12	.60	Monteruma M. & Sm.	Mex.	500,000	1		100,000	July 20, '09	.04				
Cariboo-Cobalt	Ont.	1,000,000	1		295,000	Sept. 1, '15	.60	Mother Lode.	B. C.	1,250,000	1	137,500	337,600	Jan. 3, '16	.11				
Cariboo-McKinney, g.	B. C.	1,250,000	1		65,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex.	100	300		3,190,000	Oct. 11, '09	\$2.33				
City of Cobalt	Ont.	500,000	1		138,375	May 16, '09	.01	N. Y. & Hond. Rosario.	C. A.	200,000	10	300,000	4,050,000	Oct. 25, '16	.50				
Cobalt Central, s.	Ont.	3,000,000	1		192,845	Aug. 23, '09	.01	Nipissing s.	Ont.	1,200,000	5	1,500,000	14,940,000	Oct. 26, '16	.50				
Cobalt Lake, s.	Ont.	3,000,000	1		415,000	May 23, '14	.02%	North Star, s.	B. C.	1,300,000	1		533,000	Feb. 1, '10	.02				
Cobalt Silver Queen	Ont.	1,500,000	1		365,000	Dec. 1, '08	.03	Paloma, g.	Mex.	3,000			99,600	Dec. 1, '12	.50				
Cobalt Townsite, s.	Ont.	199,282	5		1,042,258	Aug. 20, '14	.24	Panuco	Mex.	10,000			7,465,000	Nov. 4, '09	5.00				
Coniagas, s.	Ont.	800,000	5	400,000	8,240,000	Aug. 5, '16	.25	Peneoles, s. g.	Mex.	120,000	20		6,451,687	Sept. 13, '12	.50				
Con. Mfg. & Sm., g. s. c.	B. C.	63,650	100	631,204	2,951,341	Oct. 1, '16	2.50	Pesgrina, pf.	Mex.	10,000	100		328,656	Sept. 1, '10	3.50				
Crown Reserve, s.	Ont.	1,999,957	1		6,172,408	July 15, '15	.03	Peterson Lake	Ont.	2,401,820	1	126,096	382,319	Oct. 2, '16	.01%				
Dolores	Mex.	400,000	5		1,374,865	July 24, '11	.22%	Pinguico, pf.	Mex.	20,000	100		780,000	Apr. 15, '13	3.00				
Dome Mines, s.	Ont.	400,000	10	600,000	1,090,000	Sept. 1, '16	.50	Porcupine Crown.	Ont.	2,000,000	1	240,000	660,000	Oct. 2, '16	.03				
Dos Estrellas, (El Oro)	Mex.	300,000	0.50		15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex.	5,000	15		983,360	Apr. 1, '08	1.00				
El Favor	Mex.	3,600,000	1		210,000	Apr. 30, '14	.01	Rambler-Cariboo	B. C.	17,500	100	87,500	607,600	Nov. 15, '16	.01				
El Oro, g. s.	Mex.	1,147,500	5		9,136,492	July 11, '13	.24	Rea Mill, Leasing	Ont.	200,000	1	15,700	15,700	Feb. 20, '15	.06%				
El Rayo, g. s.	Mex.	260,000	20		140,410	Apr. 24, '11	.15	Rich of Way	Ont.	1,685,600	1	25,291	569,600	Sept. 15, '16	.03				
El Triunfo, c.	Mex.	2,000,000	1		20,000	Oct. 23, '11	.01	Rio Plata	Mex.	3,745,618	5		345,744	Feb. 13, '05	.05				
Embaranza, s. g.	Mex.	450,000	5		12,521,250	Dec. 31, '16	.10	San Francisco Mill	Mex.	6,000	25		445,066	Oct. 15, '08	1.00				
Graby Con. s. s.	B. C.	149,985	100	1,049,896	6,650,281	Nov. 1, '16	2.00	San Rafael	Mex.	2,400	25		6,798,260	Jan. 11, '12	.20				
Greene-Cananea, C.	Mex.	474,411	100	3,403,463	7,639,268	Nov. 28, '16	2.00	San Toy, s. l.	Mex.	6,000,000	1.00		540,000	July 24, '13	.01				
Greene Con., c.	Mex.	1,000,000	10	3,600,000	13,544,000	Oct. 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex.	1,500,000	5	364,500	2,819,772	June 16, '14	.24				
Greene Gold-Silver, pf.	Mex.	300,000	10		194,871	Mar. 28, '07	.40	Sta. Gert'y Guadalupe, g.	Mex.	60,000			3,960,000	Mar. 27, '09	1.00				
Guanaquato Con.	Mex.	540,000	5		600,000	Oct. 8, '06	.07%	Sta. Maria del Paz	Mex.	9,600	12%		6,806,000	Jan. 2, '13	2.50				
Guanaquato Dev., pf.	Mex.	10,000	100		274,356	Jan. 1, '11	.70	Seneca Superior.	Ont.	478,844	1	957,750	1,878,902	Nov. 14, '16	.20				
Guggenheim Explorat.	Mex.	833,732	25	10,713,456	34,032,760	Apr. 3, '16	11.85	Soledad, s. l.	Mex.	960	20		4,439,840	Oct. 17, '11	8.00				
Hallebury, s.	Ont.	75,000	1		500,000	Apr. 6, '11	.50	Sorresga, s. g.	Mex.	19,200	20		3,979,240	Jan. 6, '11	\$4.00				
Hedley	B. C.	120,000	10	150,000	2,003,520	Sept. 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	550,000	2,350,000	Nov. 10, '16	.02%				
Hindcon, g. s. l.	Mex.	5,000,000	5		88,000	Feb. 27, '0	.02	Tamiscamg' & Hud. Bay	Ont.	7,761			4,240,250	Nov. 14, '16	.03				
Hollinger	Ont.	4,000,000	5	3,720,000	6,090,000	Nov. 8, '16	.05	Tamiskaming, s.	Ont.	2,500,000	1	150,000	1,609,156	Oct. 22, '16	.03				
Jimulco, c.	Mex.	10,000	100		975,000	Feb. 27, '11	1.00	Tezuinitan, c.	Mex.	8,000	100		1,955,000	Jan. 1, '09	1.50				
Kerr Lake, s.	Ont.	600,000	5	450,000	8,570,000	Sept. 15, '16	.25	Tough-Oakes.	Ont.	531,500	5	285,748	332,187	Oct. 3, '16	.12				
La Blanca	Mex.	140,000	20		2,775,700	Mar. 31, '13	.90	Tretheway, s.	Ont.	1,000,000	1		1,061,988	July 15, '14	.05%				
La Republica, s.	Mex.	400,000	5		110,000	Aug. 15, '11	.05	Wetlaufer-Lorrain, s.	Ont.	1,416,590	1		656,386	Oct. 20, '13	.03				
La Rose Con., s.	Ont.	1,498,627	5	299,724	6,886,844	Oct. 20, '16	.05	Yukon, g.	Y. T.	3,500,000	5	787,500	8,370,610	Sept. 30, '16	.04				

El Dorado Canyon—Mining, Milling and Development

W. A. SCOTT.

El Dorado canyon, in the southeastern part of Clark county, Nevada, has a length of about 11 miles, and drains easterly into the Colorado river. The mining district of that name encompasses the extensive region of igneous formations drained by the main canyon and secondary gulches and washes leading into it. In traversing this canyon from its terminus at the river to its headings near the divide there is an ascent of over 4000 ft. The postoffice and little town of Nelson, situated in the main canyon, 6 miles from its mouth, are 22 miles north of Searchlight, and 45 miles southeast of Las Vegas, both of which are railroad

Geology and Ore Occurrence.

In general features the El Dorado canyon region resembles those of Gold Road, Oatman and Boundary Cone, in Arizona, with respect to the prevalence of igneous and volcanic rocks of several classes. G. A. Duncan, manager of the Colorado-Nevada group of mines in El Dorado canyon, who has spent nine years in the district, has given out a statement relative to the formation and ore occurrence of the district, from which the following is taken:

"The district is near the northeastern edge of an extensive monzonite basin. The canyon is the result



MILL OF RAND MINING CO.



SURFACE WORKINGS ON WALL STREET VEIN.

points. Auto stages make regular trips from both those towns to El Dorado canyon. Nelson is on the route between Las Vegas, Nev., and Kingman, Ariz., and one of the auto stages makes three round trips per week between those towns, a distance of over 100 miles, crossing the Colorado by ferry, at the mouth of El Dorado canyon. Most of the supplies and equipment are hauled into the district from Searchlight. Travelers going into the country over the Los Angeles & Salt Lake railroad usually take an El Dorado canyon stage at Las Vegas, but often go out via Searchlight, which is the terminus of a Santa Fe branch.

of erosion along a profound fracture zone, into which intruded an andesite identical with the Comstock andesite. The dip of the old andesite intrusion is toward the north about 40°; and at various places along its course more recent porphyry dikes mark its hanging and foot wall contacts with the monzonite. Near the middle of this andesite filling of the fracture there intruded a strong porphyry dike, showing the same dip as that of the old andesite which it entered, and is exposed for several miles along the canyon floor. Along this more recent dike the ground movements seem to have taken place, the disturbances inviting erosion, with the obvious result that the canyon and

dike have a common course and position. The ground movements along this dike also caused a brecciated condition to a great depth along its walls, affording a channel for the collecting and passage of mineralized solutions, and making this dike now the one unfailing water course of this section. The ore so far found in this district is in, and along side of the main fracture,



MILL OF COLORADO-NEVADA MINING & MILLING CO.

and in veins departing from it. The outcrop of numerous veins parallel to this dike, and rather close to the old andesite filling of the great fracture, indicate workable ore bodies. Naturally, along so great a shear zone there are departing fractures leading off into adjacent country rock. Mineralizing agencies passed into these fractures, making veins of ore, which, while narrow in comparison to the main fracture vein, have shown some ores of high values."

Colorado-Nevada.

In going over a considerable area of the district, four or five centers of activity were observed along the principal canyon and its tributary gulches. One of the most conspicuous of these is the property of the Colo-

westerly along the course of the great fracture. This mineralized porphyry dike stands between andesite walls, and has a dip of about 45° toward the north. The porphyritic material, or vein matter, has undergone various degrees of alteration, making a gangue not entirely uniform in character. The ore consists of sulphides of iron, lead, zinc and copper, carrying gold and silver. The gold exists in free state but appears in fine particles. The silver occurs as argentite, as native silver and associated with galena. The vein bearing this class of ore has been mined to a width of 8 to 25 ft. Operations are carried on through an inclined shaft, which sinks 500 ft. on the dip of the vein, and levels on the vein both east and west from regular stations. The ore hoisted from the Flagstaff shaft, amounting to 60 tons per day, is treated in the company's mill by concentration and cyanidation. The ore is first reduced by a jaw crusher, then passed to a battery of ten 1250-lb. stamps, having 20-mesh screens. The pulp from the stamps is concentrated over two tables, a Wilfley and a Butchart, making a lead and iron concentrate carrying gold and silver. The mid-



PROSPECTING IN NEVADA WITH AUTO.



COLORADO RIVER FERRY, OPPOSITE EL DORADO CANYON.

rado-Nevada Mining & Milling Co., located on El Dorado canyon proper, $1\frac{1}{2}$ miles below Nelson. The company's holdings comprise the Flagstaff group, on the main fracture zone, and the White Star group covering one of the deflecting veins referred to in the foregoing statement. The ore bodies on the Flagstaff are within the porphyry dike which strikes easterly and

dlings and tailings from the tables are passed to a Dorr classifier and a tube mill, operating in closed circuit, and the cyanide treatment which follows consists of the Dorr system of continuous counter-current and decantation. During the last 4 months the mill operated on ore which assayed an average of \$14.49 per ton and made a recovery by concentration and cyanide treatment of \$13.62 per ton, or 94%. Water for mill work is bailed from the mine, and at times there is hardly a sufficient supply. Power is supplied by gasoline engines, in which California "tops" is used as fuel. The 100-hp. engine, by which the stamps and tube mill are operated, is a De Laverne, the four others, aggregating 150-hp., are the Fairbanks-Morse type. The company's White Star group has been considerably developed, but is not producing. The vein outcropping of the main fissure in the Flagstaff gave very low assays, and this is the case as to the secondary parallel veins. It is by sinking to some depth that the metals are found concentrated in regular ore bodies. In the Flagstaff mine, according to Manager Duncan, the gold and silver in the ore runs in the ratio of 30% gold and 70%

silver, in value; but as greater depth is gained the gold increases and is mostly associated with the sulphide of iron.

Techatticup Mine.

The Techatticup belongs to the Wharton estate and is being operated under option to Chas. L. Denison. It is situated on the mountain side, facing Techatticup wash, a branch of the main canyon, and is about a mile north of the Colorado-Nevada. The Techatticup vein runs nearly parallel to the main fracture vein herein described and is considered one of the offshoots therefrom. This is a comparatively narrow vein, in andesite, and has a dip varying from 20 to 80° to the north. The width of ore ranges from a mere seam to 6 ft. The gangue is composed of calcite and quartz, carrying gold and silver in sulphides of iron, lead, zinc and copper, assaying about \$20. Besides the principal vein, striking east-west, there is a branch vein coming into it from the southeast, called the Savage. This branch vein is likewise a fissure in the andesite and other characteristics are the same as those of the Techatticup vein. In the latter vein 90% of the value is in gold, the iron running 5%, zinc 2%, lead 2% and copper 1%. Ore in the Savage vein runs high in silver, much of which occurs as a chloride. In both veins the ore exists in shoots and other bodies, not continuous. Material between such shoots is mineralized but much of it is too low grade to be mined profitably. The 600-ft. inclined shaft was sunk close to the junction of the Techatticup and Savage veins, drifts therefrom extending into both. In general, the inclination of the shaft follows the dip of the vein, but in places where the vein flattens out considerably the shaft is some distance off the vein in the foot wall. There are five working levels, the longest drift east of the shaft being 600 ft. and the farthest west being 400 ft. A crosscut tunnel runs in 300 ft. to the shaft, connecting with it 150 ft. below the collar. This crosscut is on a level with the crusher floor and all ore is hauled out that way. Hoist and compressor are operated by gasoline engines, using "tops," or 40 to 44 gravity gas oil. Other shafts have been sunk on the property for development purposes. A cyanidation plant on the property treats 50 tons of ore per day. The ore is reduced to 4 mesh by a jaw crusher and two sets of rolls. At that size it enters a 5 by 22-ft. tube mill, using flint pebbles, by which it is so pulverized that 80% of it will pass 200 mesh. The cyanide solution is introduced in the tube mill. In passing this pulp to a Dorr classifier, the coarser sand is returned to the tube mill. The slimes pass to Dorr agitators and thickeners, carrying out the system of continuous counter-current and decantation leaching. In this work it is stated that an extraction of 90% is made. R. T. Walker is general superintendent; mine foreman, Frank Hoin; mill men, Roy Leach and G. M. Cotherton.

Wharton Estate.

This property is in control of the Girard Trust Co. as trustee, Philadelphia, represented in this district by

G. S. Borden. It has 22 patented claims in this locality, not including the Techatticup group. They are located in various parts of the district. All are idle excepting in two or three places where ground has been leased. The most noteworthy of all is the Wall Street group, on El Dorado canyon, a mile above Nelson. In earlier years gold and silver ore of the value of over \$1,000,000 was mined and milled. This was taken from a vein 10 to 15 ft. wide, striking east-west, with a dip of 40° south. The ore was mined to a depth of 80 ft. and a length of about 100. Much of the ore is said to have milled \$250, and was hauled to a stamp mill on the river, in which the gold and silver was recovered by amalgamation. Records show that the ore contained 1 oz. gold to 3 ozs. silver. There is now some water in the bottom of the workings. The property was located in 1871 and came into possession of Wharton in 1892. While the Wall Street has been idle during the last 16 years, it has an interesting history and is today a show place in the district. In that locality some of the richest ore thus far found in the district has been uncovered by surface cuts and shallow shafts.

The Rand.

Rand Mining Co. owns 32 claims formerly controlled by the Black Hawk Mining Co. Under the management of Robert Dunbar, Pittsburgh, operations were resumed in February, 1916, with L. C. Campbell as superintendent. The location is on the south side of Copper canyon, on the Searchlight road, about 2 miles west of the Wall Street. The holdings cover 1½ miles on the strike of an east-west fissure vein in monzonite-porphyry. The vein has a varying dip to the north. It has been opened by a 500-ft. inclined shaft, following approximately the general dip of the vein. Water came in at 400 ft. and workings below that level are now submerged. A big tonnage of oxidized ore was formerly mined in stopes near the surface. The sulphides were found at and below the 100-ft. level. Ore now being stoped above the 300 level occurs in defined lenses, the gangue being quartz, spar and altered rock. The gold is largely free and amalgamable, the sulphides being those of iron, lead, zinc and antimony. The lead is accompanied by silver. An electric duplex plunger pump, stationed at the 400-ft. level, is used for lifting water to a tank on the surface for mill work. In the shaft house is a gasoline engine for operating a skip in the incline and an air compressor. The Venus shaft, 1200 ft. west of main shaft, contains a supply of water and this is considered in a separate basin. An electric pump is stationed at the 200 level of the Venus whereby water is furnished for domestic and other uses at the camp. Electric power is produced by a Westinghouse generator, driven by a gasoline engine in the mill. This is used for lighting and for pumping operations. The milling plant, consisting of 10 stamps, amalgamating plates and two Deister tables, is operating with one shift, but this is to be increased to two shifts. The pulp from the plates runs into a classifier,

the heavy material passing to a sand table and the lighter to a slimer, making lead and zinc concentrates of different grades. The tailings are being impounded. This camp is 2000 ft. higher than that of the Techatticup and is 800 ft. higher than the Wall Street.

This is one of active centers previously referred to. The Quaker City, on a parallel vein lying north of the Rand, belongs to the Wharton estate, and south of the Rand is the Enterprise group, having a parallel vein formerly opened by an adit level, and on which development is being undertaken by present owners, including E. P. Jeanes, C. E. L. Gresh, H. H. Johnson and Leonard & Co. Existing workings show a fair grade of ore. Other holdings in this locality are on strong veins that will probably justify development. The Occidental-El Dorado, half way between the Rand and Wall Street, is well developed by tunnels and shafts and equipped with hoist, air-compressor and cyanide plant. It has been idle several years, but it is possible that operations may be resumed.

Carnation Lode.

This group of 20 claims, lying north and west of the Wall Street, belongs to W. H. Evans and is under a 5-year lease to A. Welk, C. A. Spencer and W. H. Kirchner. These men, who were formerly in Good Spring district, are exploring and developing, and recently struck a 5-ft. face of ore in a 20-ft. shaft. Other veins on the group have been opened by 60 and 40-ft. shafts, exposing pay ore. Assays of the rich ore in the 20-ft. shaft, according to the assay certificates, showed up as follows: Sample No. 1, 3.85 ozs. gold and 32.56 ozs. silver; No. 2, gold, 127.61 ozs., silver, 1246.9 ozs. No. 3, in three parts, gave gold, 12.08 ozs., 6.8 ozs., 3.8 ozs., respectively, and gave in silver 106.12 ozs., 71.6 ozs. and 28.8 ozs., respectively. All this ore consisted of sulphides, the gold being apparently free. Ore taken from other shallow workings assayed \$8 to \$12 per ton. Specimens taken from a high grade streak in the 20-ft. shaft ran over \$3000 per ton in gold and silver. This leasing firm announces that a small mill of 25 to 50 tons capacity will be erected this fall for amalgamation and concentration.

These rich strikes on ground adjacent to the old Wall Street are making this another active center in the district. The lessees named have let a number of sub-leases, one of these being to Jas. German, M. E. Fisher and Chas. Herman, who have taken over the Lombard Street claim for 5 years. Their development has exposed pay ore 18 ins. wide in a 5-ft. vein.

About 1500 ft. farther down the canyon, apparently on the same mineral belt, is the El Dorado-Empire, in the hands of C. E. L. Gresh and associates. Ore of good grade has been found in a 70-ft. shaft, over which they have a gasoline hoist.

Clark M. Alvord has two groups of claims partly developed. One is the Skylark, located between the Techatticup and the Colorado-Nevada. He has an east-west vein in andesite, on which some ore has been blocked out. The ore is similar to that of the two

mines in that locality. A small shipment of sorted ore sampled \$55 per ton. His other group is the San Juan, extending to both sides of El Dorado canyon, half a mile below Nelson. Development by adit levels exposed sulphide ore, assaying \$4 gold, 7 ozs. silver, 18% zinc and 17% lead. There are four parallel veins. A crosscut is being driven to cut the San Juan vein at a depth of 400 ft.

J. B. Caldwell purchased the Little Eohippus, located one-half mile east of Colorado-Nevada, of J. E. Babcock. Surface work has disclosed some ore on an east-west dike of porphyry. He expects to install a gasoline hoist and air-compressor and develop the property.

Allcock & Wells, Nelson, have some development on the Champion group, located on January wash. This wash enters the main canyon in the vicinity of the Colorado-Nevada. It is claimed there are four veins on the group, opened to some extent by adit levels and winzes. The ore contains gold and silver in sulphides of iron, lead and zinc.

Knob hill, at the head of January wash, is the location of a number of properties, some of which are well developed. Included in these are the El Dorado-Star, Empire, Ben-Ezra and Rich Hill. Among other properties farther east are the Capital, the Wallace and Astor-El Dorado. The Knob hill region was not visited.

New Aluminum Smelting Plant.

The Aluminum Ore Co., a subsidiary of the Aluminum Co. of America, Pittsburgh, has bought a tract of 200 acres or more at Sollers Point, near Sparrows Point, Md., on which it proposes to build a plant for refining bauxite, from which aluminum is extracted. The company has maintained at East St. Louis, Ill., for some years a similar plant, obtaining the bauxite from Arkansas, Georgia and Alabama. The capacity of the new plant at Sollers Point will be much smaller than that of the plant at East St. Louis, but it will be enlarged when the demands of the company make this imperative. The new plant will be built by the engineering organization of the Aluminum Co. of America, which is fully equipped to do the work. C. B. Fox, general superintendent of the East St. Louis plant, will be in regular consultation with the company's engineers in Pittsburgh during the progress of the construction work. The Sollers Point plant is expected to cost somewhat in excess of \$1,000,000 and to be in operation early in 1918. The Aluminum Co. of America is the largest manufacturer of pure aluminum in the world, its principal plants being located at Merryville, Tenn.; Baden, N. C.; New Kensington, Pa.; East St. Louis, Ill.; Niagara Falls and Messina, N. Y., and at Shawinigan Falls, Quebec. The last named plant is operated by the Northern Aluminum Co. of Canada, an identified interest of the Aluminum Co. of America. The company has several smaller plants at other locations.

Outlines for the Determination of Zinc

R. FRANKLIN HEATH.

In preparing the sample it is advisable that it be of uniform fineness of at least 100 mesh. Many chemist-assayers consider 60 to 80 mesh proper, but time saved in putting the zinc in solution will make up for careful work. In place of tenth-normal solutions as named in the volumetric outlines, any standard strength solution can be used with satisfaction.

Gravimetric Methods.

Weigh out 1 gram of the sample and put it in a casserole. Add 10 cc. HCl and 5 cc. H₂O, boil until decomposed, evaporate to dryness but do not bake, take up with 10 cc. HCl and bring to a boil, then filter and wash residue with boiling H₂O. The filtrate contains the zinc. Cool the solution and pass H₂S gas through it until precipitation is complete. Then filter and wash the precipitate with H₂S water. The filtrate and washings contain zinc. Bring the filtrate to a boil and boil until all H₂S gas is removed. Add 10 cc. of saturated solution of sodium carbonate and bring it to a boil for 1 minute, filter through an ashless filter and wash the precipitate with boiling H₂O. Then dry, ignite and weigh the precipitate, which is zinc oxide. The zinc factor is 0.8034.

Another method is as follows: Weigh out 1 gram of the sample and add 5 grams of potassium chlorate and 10 cc. HNO₃. Bring it to a gentle boil and evaporate to dryness, take up in 10 cc. H₂O and again evaporate to dryness. Next add 15 cc. HCl, bring to a boil, dilute with 10 cc. of acetic acid, boil, filter, and wash the precipitate with hot water. The filtrate and washings contain the zinc. Add 10 cc. of saturated solution of NH₄Cl, bring to near boiling and at the same time pass H₂S gas through the solution until precipitation is complete. Filter through an ashless filter, dry, ignite and weigh the precipitate as zinc oxide. The zinc is first precipitated as a sulphide. Test the filtrate for any remaining zinc by adding a solution of sodium phosphate or potassium ferrocyanide. In either case if any zinc remains it will give a white precipitate, in which case add more ammonium chloride and pass more H₂S gas through it until all zinc is down. The results of gravimetric analysis are always somewhat higher than those of volumetric methods.

Volumetric Methods.

Weigh out 0.5 grams of the ore, add 3 cc. HCl and 1 cc. HNO₃. Let it simmer until the ore is decomposed. Dilute with water, about 22 cc., filter and wash the insoluble matter with hot water. The filtrate and washings contain the zinc, together with other metals. Add 3 grams of aluminum foil, heat to a boil and the iron, lead, copper and cadmium will deposit on the foil. Filter and wash with water. The filtrate contains

zinc. Add 5 cc. of ammonium chloride solution and acidify with HCl if not distinctly acid in reaction. Dilute to 100 cc. exactly, shake, remove 10 cc. with a pipette and titrate this amount with tenth-normal solution of potassium ferrocyanide using a dilute solution of uranium nitrate or acetate, or ammonium molybdate as an indicator.

The calculations are:

(cc. titrated):(to amount diluted):(factor times cc. used): X.

Weight used: X::100:X₂. Here X₂ equals the percentage of zinc.

Many chemists prefer to titrate the whole amount of metallic solution, but if the zinc contents is high a large amount of potassium ferrocyanide will be required to secure the end reaction.

Sodium Sulphide Method.

Weigh out 0.5 gram of the sample in a small casserole, add 5 cc. HCl and 3 cc. HNO₃. Heat until decomposed and then add 5 cc. of hydrogen peroxide. Bring to a boil and add 3 grams of test lead or aluminum foil. Let it stand for 3 minutes, then filter, wash with dilute ammonia water, cool and titrate with tenth-normal or standard solution of sodium sulphide, using a solution of ferric oxide (1 gram of ferric oxide dissolved in 10 cc. HCl and diluted to 100 cc.) as an inside indicator. The end reaction is reached when the last drops turn the solution to a dark brown or black, caused by the formation of ferric sulphide.

Ores Containing Silica.

Weigh out a 1-gram sample and place it in a casserole. Add 5 cc. HCl and 3 cc. HNO₃, evaporate to dryness, take up in 10 cc. HCl, bring to a boil, add 3 cc. HNO₃, boil 1 minute, dilute to 25 cc. with water, filter through an ashless filter, wash the insoluble SiO₂ with hot water, dry, ignite and weigh as SiO₂. Take the filtrate and washings from the silica, reduce the copper present with test lead or aluminum foil, and proceed as given in any of the above outlines.

Electrolytic Methods.

For Spelter, Concentrates and Alloys—Weigh out 1 gram of the sample into a casserole, add 10 cc. HCl and 5 grams of potassium chlorate with a little water. Bring the whole to a boil, evaporate to dryness and cool. Then take up in 22 cc. of dilute HCl, add 10 cc. of cold water and pass H₂S gas through it until precipitation is complete. The gas precipitates Cu, Cd, As, Sn, Pb, Sb and Au. Filter this and wash the sulphides and other matter with H₂S water. The filtrate and washings contain the zinc. Evaporate to 20 cc. and add 5 cc. of ammonium chloride solution.

Make this neutral with ammonia water. If iron is precipitated filter, and wash the precipitate with water. Take the filtrate and washings and make them acid with lactic acid. Add 1 gram of ammonium sulphate and 3 grams of ammonium lactate. Dilute to 100 cc. with luke warm water and proceed with the electrolysis. For the cathode (negative electrode) use a platinum, gold or nickel dish of about 200 cc. capacity, about 8 cm. in diameter and 4.5 cm. in depth. For the anode (positive electrode) use a heavy piece of platinum or gold foil, about 4.2 cm. in diameter fastened to an upright (of same material as anode) in the center of the dish. Any of the various stands and supports can be used, to hold the dish and anode in position. Pour the solution into the dish and start electrolysis with a current density of 0.5 amperes and 5 volts and electrolyze until the solution shows no indications of zinc, which usually requires about 1½ to 2 hours. By agitation the process may be somewhat shortened. When the zinc is completely removed from the solution first wash with cold water, then hot boiling water and dry in a desiccator. Then weigh and determine the percentage of zinc. In place of a dish as the cathode some prefer a plain cylinder of platinum, gold or nickel about 5 cm. long and 1.5 cm. in diameter, and for an anode a plain heavy platinum wire in the form of a flat spiral about 2.5 cm. in diameter and long enough to make connection with the support. With the cathode and anode as described above use a plain beaker to electrolyze the solution in. For current wet cells are more adaptable than dry, one Grove cell being able to generate sufficient current to electrolyze two solutions at one time. Where alternating current is available use a step-down transformer and rectifier, connected in series with one or more regulator-rheostats. Such an outlay will soon pay for itself where any great number of analyses are made in a day.

Another method for the determination of zinc is based on the fact that the metal is separated by electrolysis from a double salt of zinc ammonium oxalate and zinc potassium oxalate. Weigh out 1 gram of the sample. Add 10 cc. HNO_3 , bring to a boil, evaporate, take up in 5 cc. HNO_3 and again evaporate to dryness, dry, cool, take up in 15 cc. dilute H_2SO_4 , bring to a boil, dilute to 35 cc. and pass H_2S gas through it until all sulphides are precipitated. Then filter and wash the sulphides with hot water. The filtrate and washings contain the zinc. Evaporate to 10 cc., make neutral with ammonia water, add 3 grams of potassium oxalate to the neutral solution of zinc and bring to a boil. Next add 3 grams of ammonium oxalate in 10 cc. of warm water to the zinc solution and bring the precipitate into solution by agitation and heat. Electrolyze as given in preceding directions. When the solution has been electrolyzed for about 5 minutes make it acid with tartaric or oxalic acid and keep the solution acid until complete precipitation. Do not add an excess of acid to start but add gradually.

In the determination of zinc by electrolysis the result is always somewhat higher than the volumetric methods, but by careful work will check on either volumetric or gravimetric methods, besides having the advantage of making a large number of analyses possible per day.

Davis-Daly Co.'s New Hoist.

A hoist which has some very interesting features is now being installed by the Davis-Daly Copper Co., Butte, Mont. This is a Nordberg first-motion unit, having 22-in. duplex steam cylinders with a common stroke of 48 ins. The hoist has two clutched drums, 6 ft. in diameter, 56-in. face. Both drums are equipped with Nordberg axial plate clutches and parallel motion post brakes. The hoist is designed to handle the following loads:

Rock, 7000 lbs.; skip and cage, 8300 lbs.; rope, 8000 lbs.; total rope pull, 23,300 lbs.; depth, 4000 ft.; hoisting speed, 2000 ft.

The engines are of the Corliss type and are equipped with the Nordberg 4-gear reverse. Features pertaining particularly to this hoist are the use of oil for operating the brakes and clutches and the installation of shifting valves in the cylinder heads. To operate the brakes and clutches by steam requires a considerable percentage of the total steam consumption of the hoist, and therefore makes a very wasteful arrangement from the standpoint of steam economy. It was, therefore, decided to operate the brakes and clutches by oil furnished by a weighted accumulator. The oil supply is obtained from a triplex plunger pump which is operated from the lay-shaft driving the valve gear, and an auxiliary motor-driven oil pump is also furnished.

The shifting valves referred to above are relief valves, which are placed in the cylinder heads so that should the engine ever expand below atmosphere these valves will open, thus admitting atmospheric air. Where the loads to be hoisted are of considerable proportions and the depth of wind great, the engine at the end of the run is very apt to draw a loop in the indicator card thus meaning a loss of power. It is for the purpose of eliminating this bad feature that the shifting valves were installed.

The hoist is equipped with a Lilly safety stop to prevent over-wind, over-speeding, etc.

Drag line excavators are in rapidly increasing demand for working placer ground or in open-cut mining, as well as in excavating for surface plant construction, building up fills for mill and smelter sites, handling tailings piles, etc.

Natural abrasives produced in the United States include the following: Millstones, oilstones, diatomaceous earth, tripoli, pumice, grindstones and scythestones, garnet, pulpstones, emery and corundum.

Dredging for Minerals: Past and Present

F. W. PAYNE.*

Probably the first mineral dredges were those put to work in New Zealand in the late eighties. At that time a small fleet of dredges was built for the Shotover and Clutha rivers. The first dredge was, I believe, one built by a Dunedin company to work on the Clutha river, near the township of Alexandra South. Not meeting with immediate success, the dredge was moved some 30 miles down the river to just above Roxburgh, where it had a long and checkered career. This dredge was originally equipped with two bucket ladders, one on each side. This arrangement was a failure owing to one line of buckets getting into heavy work and then the other causing the dredge to rock sideways to such an extent as to render satisfactory cleaning up of the river bottom impossible. The pioneer builders were, however, men of resource and prompt action, and they cut the dredge down the center and formed two separate pontoons, between which they then set one of their bucket ladders to work. This plucky old-time ship had practically the whole of the river to choose from and, as often happens in such cases, she left the richest portions for later ventures.

Before the advent of the dredges, the banks of the Clutha river had been in many places worked for gold to a line as near as possible to water level, and these old workings with in some cases long water races leading to them, still stand as monuments of what a few men can do when lured on by the stimulus of gold. The location of the early-time dredges was generally determined by the amount of success these old miners had achieved in the river banks or beaches.

The first small fleet of dredges, already alluded to as commencing work in the late eighties, were not very successful, and on the companies going into liquidation the dredges were bought up for trifling sums by small private parties. These men were many of them sailors, and worked the dredges themselves. As the working expenses were low and the only wages to be paid were to themselves, they could afford to work and wait, and their rewards came.

The first dredging ventures were confined to the river beds, and when the dredges began to trace the gold leading into the banks the problem arose as to the disposal of the tailings, and the first tailings elevators were installed. As river flats and high banks were dredged into, these elevators quickly developed into a very important feature of the gold dredges. A dredging venture that failed to strike gold during the first few weeks of its working had small chance of success, as few had sufficient capital behind them to effect more than a start. No doubt there are still large tracts of land in New Zealand that will some day pay

handsomely for dredging. The dredges that ultimately work these deposits will of course be far in advance of the machines that were built in the nineties. Prospecting has now become more easy to carry out and has achieved a reliability unheard of in the boom time, and it is safe to say that never again will dredges be built and put to work before the value of the ground has been thoroughly tested.

Probably the chief center of Australian dredging interest at the present time is the Federated Malay States and Siam. Tin dredging has achieved a great success in these countries and under conditions that, from a dredging engineer's point of view, are by no means ideal. The results, however, are the only test worth considering. Dredging in Malay had first, as elsewhere, to overcome prejudice, and also an opinion honestly held by many mining men that it was not feasible to dredge where a limestone bottom existed; especially as the limestone is sometimes in pinnacles, which no doubt is not an ideal condition for bucket dredging.

The first dredge of the Malayan Tin Dredges, Ltd., the pioneer dredge of Malay, was started with serious misgivings. A. C. Perkins, consulting engineer, had boldly declared for bucket dredging in this company's area, and remained long enough in Malay after supervising the erection of the first dredge, to see his optimistic views justified. This dredge has now been followed by three others of larger and improved type, the company now having four dredges at work.

Further up the Kinta Valley the Ipoh Co. has a dredge at work which, although hampered financially at the start, has now cleared itself and is paying dividends. The pessimists were loud in their condemnation of this property, and it required a bold man to hold hopeful views concerning it, but the results have vindicated the faith of the few. Almost adjoining the Malayan company's ground on the opposite side of the railway line is the Kinta Valley Co.'s area. This ground is practically the same as the Malayan, and as exhaustive boring shows highly satisfactory values the success of this venture may be taken as assured.

A most important condition to a successful result in a dredging venture is the class of dredge that is put to work on the claim. A peculiarity of bucket dredging is that variations in design of machinery are required for almost every claim, and thus a dredge cannot be ordered like a reaper and binder or a motor car. Every detail has to be carefully thought out and designed with a view to the particular requirements of the area concerned. Engineers cannot increase the mineral contents of the ground, but they can reduce the working expenses, which effects the same result. The aim of the designer should be to secure the great-

*In Mining and Engineering Review, Melbourne.

est return at the least expense, and whether this is effected by large, expensive dredges or smaller and less imposing machines, the result is equally satisfactory from the point of view of the shareholder, which is the only point of view that has a right to be considered. One important feature of dredge design is simplicity. An old client of the writer's who was largely interested in New Zealand dredging used to say that he wanted a dredge with one wheel. This, although impossible, is perhaps as good an ideal as any for the dredge designers to aim for. When complications are introduced he must be satisfied that such complications are justified by reduced expense somewhere—that they will reduce labor or facilitate operation in such a way as to effect a sensible saving of time or fuel or effect a better saving of the mineral.

Losses in recovery should be combated strongly. It should not be overlooked that every cubic yard of material that is lifted has cost the company so much actual cash, and to let mineral go overboard again is equivalent to the action of a shopkeeper who, when emptying the till, would throw away the coppers on account of the trouble incurred in counting them. The dredge designer has, therefore, two requirements to study: (1) save every possible cent in working expenses; (2) save every possible grain of mineral that comes on board. There is still room for the engineer to exercise his ability and inventive faculties in bringing these two questions nearer to the irreducible minimum. The second problem is definite, as when all the mineral is recovered no more can be done. The first will always be comparative, as with whatever power is used and whatever machinery employed it will always cost something to run. In practice both questions offer good margins for improved methods.

The future of dredging is largely with the engineers. Every sensible advance made by the engineer in the directions indicated brings fresh territory into the range of paying propositions. The opinion is often expressed that the palmy days of dredging are over. This is no doubt true if what is meant are the days when capital could be secured to dredge any likely looking piece of ground without prospecting it, but in the opinion of those in the best position to be able to judge, real legitimate dredging enterprise is practically only commencing.

Asbestos in Arizona.—Up to the present time Canada was the only locality in America where long-fibered asbestos was obtained. While Wyoming produces asbestos, this material is of the serpentine type and is short-fibered. Lately large deposits of the long-fibered type of asbestos were discovered in Arizona, the largest deposits being in the Sierra Ancha and at Ash creek. The asbestos of Arizona is chrysotile asbestos and is found in lime and diabase. Its nature makes it especially useful for the manufacture of fabrics. The high-grade material is at least 50% of the total material mined and is the only material that is being shipped, due to the high freight.

The Tenth Chicago Cement Show.

The 10th Chicago Cement Show will be held in the Coliseum, Wednesday, Feb. 7, to Thursday, Feb. 15, 1917, inclusive. This is the ninth successive cement show that has been held in Chicago, and will be housed under one roof, making necessary the use of the balcony as well as the main floor and annex of the Coliseum.

The unusual number of manufacturers and producers of building materials and concreting equipment who have already made application for space at the Tenth Chicago Cement Show, makes it highly probable that builders who attend the 1917 show will find an even wider range of products and equipment than was presented at the ninth show. In addition to the standard machines which will be displayed, a number of the better of the new machines and devices which have been developed since the last show will be on exhibition.

Every possible effort is being made by the show management to conserve the available space in order to accommodate as large a number of applicants as possible. Exhibitors have been requested to make application for the minimum amount of space in which their exhibits can be installed and the arrangement which eliminates the drawing for space and permits the management to make direct assignments should do much towards saving space and making the show truly representative of the industry.

The joint exhibit of cement companies at the tenth show will in all probability excell the last exhibit in real educational value. Cement manufacturers have contributed more money for the exhibit and the plans to show concrete products in the making should make this exhibit worthy of careful study.

Production of Scheelite in New Zealand

Scheelite, according to Consul General Alfred A. Winslow, Auckland, is found in several sections of New Zealand in the neighborhood of the gold mines both in the North and South Island, and has of late been quite extensively mined. The output has increased from 58 long tons, valued at \$20,746, in 1909 to 130 tons, valued at \$64,953, in 1912 and to 194 tons, valued at \$135,211, in 1915.

Since September, 1915, the British government has requisitioned all supplies of scheelite and other ore containing tungstic acid, and from that date all exports to other markets have been prohibited. The price fixed by the imperial government was £2 15s (\$13.38) per unit (a unit being 1% of tungstic acid in the sample) delivered at London or Liverpool, the scheelite concentrate to contain not less than 65% (65 units of tungstic acid).

It was reported in the latter part of 1915 that a large body of scheelite was located in the eastern part of the North Island in the Hawke's Bay district.

The Discovery of "Kimberlite" in Brazil

A. L. M. GOTTSCHALK.*

Some correspondence from the United States has reached this office concerning my report of August 8 on "The Diamond Fields of Brazil," in which mention was made of the presence in this country of the eruptive masses commonly known as "pipes" of kimberlite, or diamond matrix.

The subject is of intense interest naturally enough to geologists as well as to diamond miners generally, and a report upon as much of its history as is known at present may be interesting.

Brazilian diamond mining has traditionally been *placer* mining. There may have existed here the vague dream that all *placer* miners indulge in, in all countries, of finding the mother-lode "further up" but these never appeared to attract attention until the arrival in this country, in 1909, of Samuel Draper, the geologist, well known as the discoverer of the Premier mine in South Africa, and an acknowledged expert among geologists on the question of diamond prospects.

It should be remembered that the first orderly attempts at systematizing the geological work of Brazil date back to the early '70's when the country still being under the Empire, Messrs. Branner, Hartt and Derby first visited it and described certain portions of it. Of these three geologists only Dr. Orville E. Derby remained in Brazil, becoming first geologist to the state of São Paulo, and then later, through the efforts of the famous Baron de Rio Branco, being attached to the geological section of the Federal Government's Department of Agriculture and Industry.

It was to the late Dr. Derby that his friend and colleague, Draper, first addressed himself when in 1909 he had completed certain examinations of the Aguas Sujas mine at Baggagem in the State of Minas Geraes. It is a *placer* mine—an ancient conglomerate lying high above the present river levels—and Mr. Draper believed that he had found there traces of a broken-down "pipe" of kimberlite.

Dr. Derby was busied with other things at the time and not until 1913 did he begin seriously to direct his attention to the matter, when Mr. Draper again reopened the question with him and a petrographer in the service of the Brazilian Government, a German named Everard Riemann, at Tiros, a village in the State of Minas Geraes on a branch of the São Francisco river, in the Serra de Matta da Corda, where he believed again to have found evidence of kimberlite.

In 1914 Dr. Derby, who was at the head of the geological work of Brazil, sent Riemann the petrographer, and Horace Williams, a geologist, together on an expedition to Tiros and beyond to investigate. They returned, bringing with them good but still not quite

conclusive evidence, substantiating and adding to Mr. Draper's prognostications.

In 1916 Mr. Riemann went on a mission alone to Tiros and beyond that point. He reported, it is said, the discovery of at least five "pipes" of kimberlite. Toward the close of the year 1915, Dr. Derby made an official report to the Brazilian Government of these conditions, which, I believe, was printed in the *Imparcial* newspaper of Rio de Janeiro of that time. Mr. Draper has stated to me that Dr. Derby, whose kindness and fairness to all his associates had become proverbial here, also sent him a letter about that time acknowledging that to him was due full credit for the discoveries. I am in hope that by another mail I may have obtained for transmission to the department a copy of the letter in question, which has been promised me.

The Brazilian Government, as stated in my report of August 8, has given serious consideration to this matter and is awaiting the reports of a geologist and a petrographer who are studying conditions at present.

Two months ago Dr. Draper returned to Brazil and will now, I am told, continue his investigations of this subject. Their result, as may naturally be supposed with a man of his acknowledged ability, will be awaited with intense interest here.

Plastic Flow.

There is a property of certain forms of matter, such as clay used in making pottery, which has long been regarded as of great importance, but which has never been understood. This property, known as plasticity or the capacity of a material for being molded into a desired shape and then retaining it, has been made a subject of study by the Bureau of Standards, and the results of the study have just been published in Paper No. 278.

Forcing mixtures of clay and water through tubes of small diameter, the rates of flow at different pressures were measured. The experiments showed that, in a plastic substance, a considerable force is required to start the flow or to overcome the friction between the particles of solid. This friction in plastic flow enables one easily to distinguish between a plastic substance and a true fluid, even though the fluid may be very viscous like pitch. It was found that the plasticity of a material depends principally upon the fineness of the solid particles. It can be measured by the force required to overcome the friction, and by the rate of flow after the friction is overcome, this latter quantity being known as the "mobility."

If you don't know the name behind the product, you cannot be sure of the wear ahead of it.

*Consul-General, Rio de Janeiro, Brazil.

U. S. Bureau of Mines on Complex Ore Problems.

A bulletin has been recently issued by the U. S. Bureau of Mines giving in detail the work carried on by Oliver C. Ralston, in a study of the complex ore problems of various mining districts in the west. He visited portions of Colorado, Arizona and California, in all of which the ore problem was studied and the metallurgical plants investigated.

At Pueblo, Colo., there was found a zinc smelter which is the only one in this country running on a zinc-lead basis. The zinc in complex ores of this type is first distilled and the residue is then sent to lead blast furnaces for extraction of the lead, silver and gold. As far as could be learned, most of the zinc, lead, silver and gold values in such ores are being recovered in this plant, but the present ore-buying conditions are such that such a smelter pays for only 60% of the lead in a zinc ore, and at a figure considerably below the market value of the lead, and the same is true of silver. In fact, the present metallurgical margin between the value of the metals in such complex ores and the price usually paid for such an ore is so large that many people are considering entering the field of treatment of complex ores. Throughout southwest and central Colorado are numerous deposits of such complex ores, most of which are not being worked, as the total cost of smelting is at present so high as to make it almost prohibitive to treat the ores.

In New Mexico the magnetic separation plants at Kelly, Silver City and Hanover were visited by Mr. Ralston. Each of these plants is located in the complex ore district, and is making zinc or zinc-lead products from ores contaminated with iron sulphide. The magnetic concentration plants are removing the iron from such ores. It was learned that such large losses of ore were sustained in these plants from dusting, etc., that as a rule one pound of zinc is lost for every two pounds shipped from the mill in a concentrate. On that account methods of treatment of such ore yielding higher recoveries of the zinc should be developed and used. Plans are now on foot for doing this.

At Bisbee, Ariz., it was found that while this mining camp is reputed to be a producer of copper, it is now developing large reserves of lead and zinc ores. Lead carbonate ores, which are very difficult to concentrate, are present in many of the copper mines, and are being exploited in only a few instances. As the Salt Lake station has developed three alternative methods of treatment of such ore during the study of Utah problems, it has been quite easy to get out an immediate solution of the difficulties in this district; and the Shattuck-Arizona Copper Co. has now employed as metallurgist Glenn L. Allen, formerly one of the "fellows" of the department of metallurgical research at the Salt Lake station. It is further learned that in the Junction mine of this district a very large body of com-

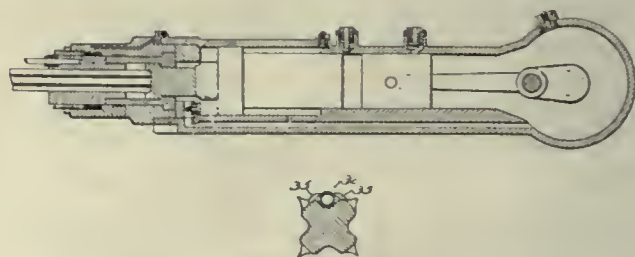
plex sulphides of lead, zinc and iron has been developed. These are very similar to the Colorado complex ores.

In the Chloride-Kingman district of Arizona considerable activity is now going on in the mining of complex ores, and throughout Arizona at various places are locations where this type of ore is being developed.

At Los Angeles Mr. Ralston visited the plant of the Stebbins Dry Concentrator Co. In many of the intermountain mining camps not enough water is available for milling purposes, and it has been found that many of the lead and zinc ores of lower grade are not being concentrated, due to this deficiency; hence a study of the various methods of dry concentration will some time be taken up by the Salt Lake station. The plant of the Western Precipitation Co. at Los Angeles was also visited and samples of some strange products for testing in flotation were obtained. This company is exploiting the Cottrell precipitation process, and in passing petroleum and other oil vapors through a Cottrell treater some strange new products were obtained, which promise to be good "frothers" for flotation work.

Rock Drill with Flooding Attachment.

A pneumatic rock drill is shown in this illustration, which embodies an arrangement whereby the drill hole is continuously washed out by a stream of water as the drilling proceeds. The hollow handle, with the pneumatic piston which drives the crank to operate the drill, is shown, as well as a part of the drill itself. In the sleeve is inserted the water pipe (32), which extends nearly to the drill point. It is secured to the



ROCK DRILL WITH FLOODING ATTACHMENT.

drill by a series of ears (35) shown in the sectional view. The pipe slides through these ears as the drill operates back and forth. Since the point of discharge of the water pipe is at all times directed at the drill point, the drill hole is continuously flooded and the drilled out material washed away. William A. Smith of Denver, Colo., is the inventor, and he has assigned one-half of his patent to William W. Hassell, Colorado Springs, Colo.

For the water-supply wells now being sunk in semi-arid regions, air-lift pumps are coming into service, particularly where the air can be piped from a mine compressor connected with an electric power line.

Tractors Hauling Ore in Salt Lake Valley, Utah

After a demonstration the Utah-Idaho Motor Co. proved conclusively to the officials of the Cardiff mines that it could haul the ore from the mines to the smelters in the Salt Lake valley, Utah, and coal and other supplies back to the mines by tractors. Teams were formerly employed at a great expense to haul the ore from the mines down the canyon.

Following is a brief synopsis of the results of 11 demonstrations: The equipment consisted of one model 36 Knox tractor, with 5-ton ore body, and two 5-ton Troy trailers, equipped with regular steering apparatus, roller bearings and 36 by 7-in. tires. On the down trip from the mines the trailers were practically always held back by the brakes on the tractor; in many places the grades are as steep as 16%.

24 hours, the average time coming down being $3\frac{1}{2}$ hours and returning $4\frac{1}{2}$ hours, which, with allowing 1 hour for loading and unloading, gave 3 hours for oiling, taking on gas and inspecting the machine. No repairs of any nature were necessary during the 11 trips. The distance covered on each trip down included 9 miles in the canyon proper, and 7 miles across the valley, which included one very steep hill. The radiator showed signs of boiling at no stage of the demonstration. Considering that a rise of 3050 ft. is negotiated in this trip of 16 miles, 7 of which are across the valley, the fact that the radiator did not overheat is even more remarkable.

The company which has the contract for hauling ore from the Cardiff mines to the smelters reports



KNOX TRACTOR HAULING ORE FOR THE CARDIFF MINING CO., UTAH.

Traffic was never interfered with in any manner, on account of the fact that the Knox tractor could pass as easily as the ordinary automobile. The tractor was equipped with steel wheels 14 ins. wide, which were fitted with diagonal cleats. After the 11 trips up and down the canyon no appreciable wear was noticeable on the tires. Some of the demonstrations were made during heavy rainstorms and no difficulty in negotiating the trip was encountered at any time.

The total tonnage of ore hauled during these 11 demonstrations was 272,660 lbs., and, although coal was not taken back on every return trip, a total of 27,080 lbs. of coal was hauled back from the valley up to the mines. The amount of coal hauled per trip ranges from 3600 to 4300 lbs.

An average gas consumption of 21 gals. per round trip was registered, and the road trip consumption of oil averaged 2 quarts. Two trips were made every

utmost satisfaction with the performance of the tractors. Their records show an average of 20 tons of ore per tractor each trip and that the schedule of the trips does not vary 7 minutes.

The present output of benzol and toluol in the United States is conservatively estimated at 3,500,000 gals. per month, or 42,000,000 gals. per year. Of this total 3,000,000 gals. each month is benzol. When the new by-product ovens still under construction are completed the yearly output will easily exceed 50,000,000 gals. per year. Before the war this output was inconsequential in comparison.

Nitrate production in Chile in November totaled 5,100,000 quintals. Output is increasing and sales are being contracted for next two years at highest prices yet reached.

The Nevada-Utah Property at Pioche, Nevada.

STAFF CORRESPONDENCE.

Consolidated Nevada-Utah Corporation, having about 10,000 shareholders, owns and operates the old Raymond & Ely mines at Pioche, Nev., H. R. Van Wagenen being manager. The group covers 4500 ft. along the strike of the Raymond & Ely fissure, and 4000 ft. of the Yuba dike. The fissure, which is in quartzite, strikes east-west and dips 70° south. Yuba dike is porphyritic and mineralized, and has a width



MILL AND SHAFT OF CON. NEVADA-UTAH AT PIOCHE, NEV.

of 10 to 40 ft. Dike and fissure come together and strong ore bodies occur at and near their junction point. The main working shaft has a depth of 1450 ft. It starts in the hanging wall of the fissure and cuts the vein at 650 ft., passing then into the foot wall. The ore from surface to the water level, at 1200 ft., consisted of lead carbonate and chloride of silver; below water level are sulphides of lead and zinc, both carrying silver. Operations now are mostly in the sulphides between the 1200 and 1400 levels, close to the Raymond & Ely and Yuba contact.

The mine water is handled by a Cameron pump at the 1440 station, an Epping-Carpenter at the 1200, and another of same pattern at the 600. These lift 165 gals. per minute, all water being taken from the 1400 level. Pumping to the surface continues 16 hours each day, and during the remaining 8 hours the water is pumped only to the 1200, there discharging from a tank into a metal pipe line 700 ft. long, by which it is carried laterally beyond a bulkhead where it sinks. The hoisting is done by an Ottumwa geared, double-drum hoist, operating one cage in balance. The air compressor is the Ingersoll-Rand piston inlet, duplex, 2-stage type, of 600 cu. ft. capacity. The pumps, hoist and compressor are steam operated.

The mill was completed and put in operation in April, 1916. Its machinery is driven by two 25-hp. and one 100-hp. gasoline engines, using 33 to 34 gravity light oil known as "tops." About 60 tons of ore per day is crushed and concentrated by tables and

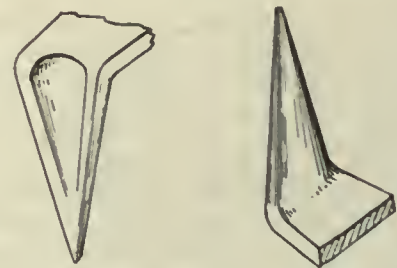
flotation machines, making a lead concentrate that samples ½ oz. gold, 60 ozs. silver, 20% lead, the balance being iron; also, making a zinc product running about 42% zinc, accompanied by silver and iron. The output of the mill is about 20 tons per day of zinc concentrates, and 1 ton of lead concentrates. These, of course, are shipped separately, the zinc product being sent to the U. S. Zinc Co.

The mill flow sheet is as follows: The ore is reduced to 1½-in. size by a jaw crusher, then to 16 mesh by a Marcy 5 by 4-ft. mill. This material is then concentrated over two Overstrom-Deister tables, making a lead and zinc concentrate. The table tailings are reground to 42 mesh in a Power & Mining Machinery Co. tube mill, and is reconcentrated on two Overstrom tables, making finer lead and zinc products. These table tailings, after passing through a Dorr thickener, are concentrated by flotation, in which Callow machines are used—3 roughers and 1 finisher. The tailings from the roughing machines are reconcentrated by two Overstrom tables, by which a zinc-iron product is made, the table tailings passing to waste. The tailings from the Callow cleaner cells are passed back into the flotation circuit.

A rotary blower is used for supplying air for the flotation machines. In the tube mill broken quartzite rocks are used instead of imported pebbles. The cleaner machine concentrates are passed to an agitating tank to settle the froth, and this is followed by decanting the water; the product is then reduced to 9% moisture by a Portland filter. The flotation concentrates are mostly zinc, accompanied by silver.

Non-Cutting Belt Fastener.

Belt fasteners of the staple type, which consist of teeth or prongs to be driven through and then clinched, usually have sharp edges or projections which cut the fibers of the belt when under pulling strains. A belt fastener in which the teeth are fashioned with rounded



NON-CUTTING BELT FASTENER.

inner surface, smooth and free from sharp edges, has been patented by Nicholas P. Mader of Beaumont, Calif. The illustration herewith shows the general conformation of the tooth.

Exports of copper from Atlantic ports for the week ending Dec. 7 were 5597 tons; since Dec. 1, 5597 tons; a year ago, 15,444 tons.

Electric Smelting at Heroult, Calif.

The Noble Electric Steel Co., San Francisco, has operated continuously its electric smelting plant at Heroult, Calif., since April 15, 1916, turning out a ferromanganese product. Previous to that date the plant had been operated intermittently since 1911. The furnace has undergone several changes, the one now in use having been evolved after special experience with several original types. It is described as the

H. H. Noble, San Francisco, is president of the company; E. E. Mead, secretary. W. W. Clark is metallurgist, at the plant.

Trolley Splicer with Smooth Under-run

This trolley wire splicer is so made that it has a smooth under-run surface, there being no saw cuts or shoulders at the inner ends of the lips which embrace the wires. The grooves which receive the wires are

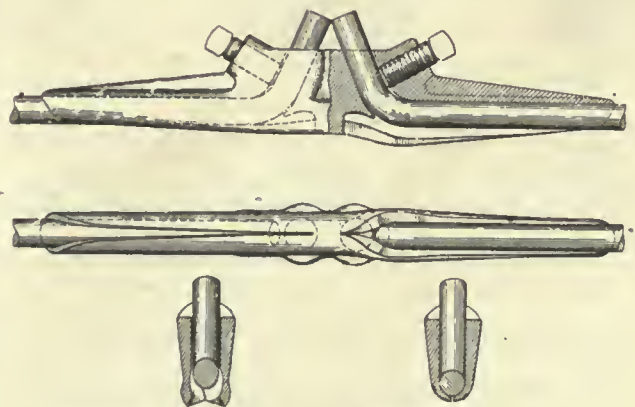


NOBLE ELECTRIC STEEL CO.'S PLANT AT HEROULT, CALIF.

Frickey open delta, split-phase arrangement of electrodes. It is considered a success on ferromanganese ores, the smelting of which was begun in 1914. The closing down at intervals is said to have been due to a shortage of ore of the kind mentioned. The ore smelted varies, but much of it runs 46 to 48% metallic manganese, 14 to 16% silica, and 2 to 3% iron. It is claimed the plant can be successfully operated on ore as low as 40% manganese, and as high as 20% silica. Other elements in the ore are sulphur, 0.01%; phosphorus, 0.1%; carbon, 6.5 to 6.75%. The furnace product contains 80.5 to 81.5% manganese. The plant capacity is 9 tons per day, but this is to be increased. The product is marketed on Pacific coast mostly, though some shipments are made to the eastern states. The ore is mined by the company at several places in California, and a manganese property is being developed in Nevada.

This company, in 1915, began developing and mining chromite ore on a number of properties it had previously acquired in California. Part of the ore tonnage is shipped east, and a part is smelted at the Heroult plant by methods practically similar to those employed in ferromanganese smelting. The analysis of average ore shows 30% chromic oxide, 13% ferrous oxide. The furnace product is a ferrochromium containing 60% chrome oxide and 30 to 32% iron oxide. This class of ore occurs in lenses in serpentine. Heroult camp is on Pitt river, 26 miles from Redding.

inclined upward slightly from the ends of the splicer, forming bendable lips. These lips increase in thickness from the tips of the splicer to the inner ends, where they are of sufficient thickness to withstand the



TROLLEY SPLICER WITH SMOOTH UNDER-RUN.

pounding action of the trolley wheel. When the lips are properly bent around the end of the wire, they form a gradual and smooth approach, so that the wheel will not have a tendency to jump.

According to the Department of Commerce, October imports of copper totaled 34,577,885 lbs., against 36,578,445 lbs. in September. Exports in October totaled 64,713,082 lbs., against 70,905,317 lbs. in previous month.

Money Loss Due to Boiler Scale.

It has never been disputed that boiler scale is a bad thing—that it is and has been the cause of much money loss. The actual money loss due to a definite thickness of scale is a variable quantity, for much depends upon the "kind" of scale, whether carbonate, sulphate, hard, soft, etc.

The most used rule for determining the money loss is given in Sames' Mechanical Engineering Handbook as follows: "Scale of 1-16-in. thickness will reduce boiler efficiency $\frac{1}{2}$, and the reduction of effi-

Stamp Mill with Rotating Heads.

The heads in the ordinary stamp mill are subject to rapid wear, which, moreover, is not evenly distributed over the surfaces of the heads. It was thought to decrease the wear and also to distribute it evenly by rapidly revolving the heads at the same time they are reciprocated, an idea of Richard Raycraft, of Genoa, Nev. The accompanying diagrams explain the operation. The stamp shafts are reciprocated vertically by means of the upper horizontal shaft turned by the crank at the right, tappets on the shaft performing this operation. At the same time another shaft below is turned by gear wheels, as shown, and

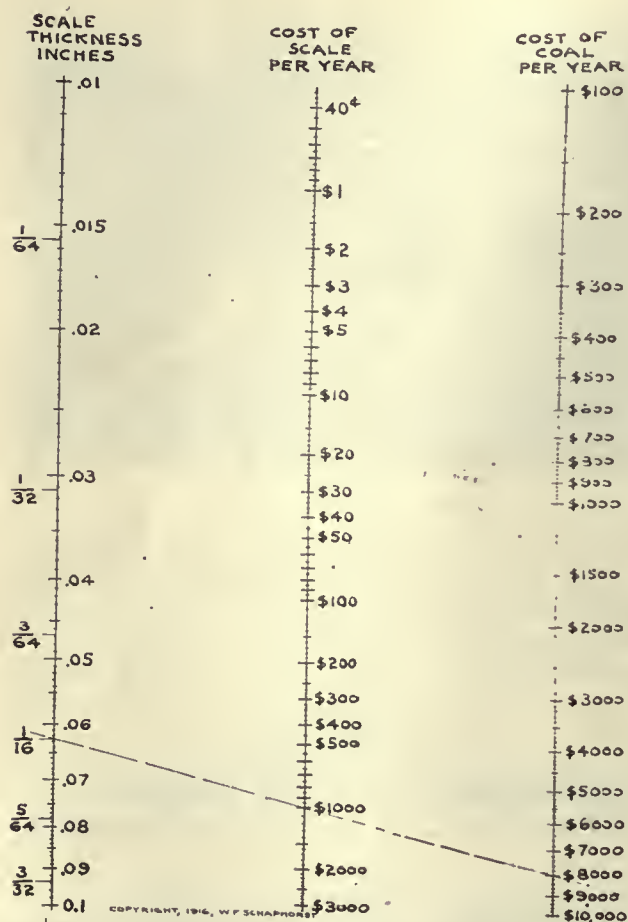
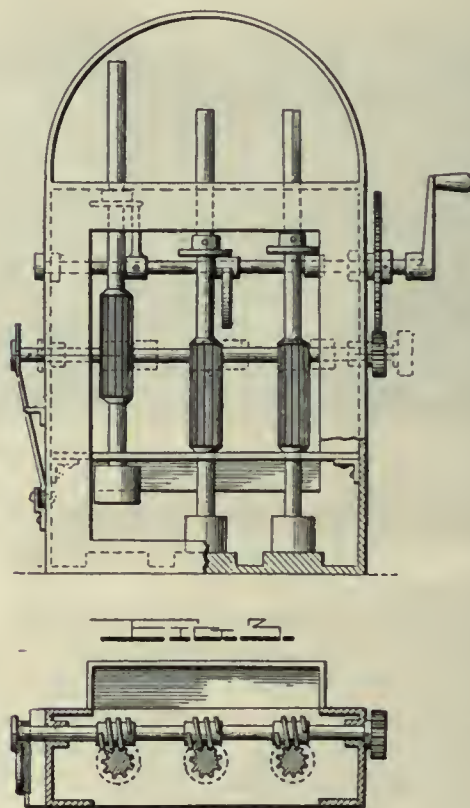


CHART SHOWING LOSS DUE TO BOILER SCALE.

ciency increases as the square of the thickness of scale."

The chart herewith is based, therefore, upon the above rule. It covers all scale thicknesses from .01-in. to 0.1-in., and for convenience shows thicknesses in fraction as well as in decimals of an inch. The dotted line indicates that where \$8000 is spent per year for coal, \$1000 per year is lost due to a scale 1-16-in. thick.

Whatever your scale thickness and whatever your coal costs per year (up to \$10,000), this chart shows the money loss in strict accordance with the given rule. It may help you to decide upon a water treating device or it may show how often your boilers should be cleaned.



STAMP MILL WITH ROTATING HEADS.

this second shaft carries worm gears, one for each stamp shaft. These worms engage rather long gears on the circumference of the stamp shaft and rapidly revolve the latter as they do their work.

Ferromanganese Imports in October.—Ferro-manganese imports into the United States in October were 7914 gross tons, against 9237 tons in September and 8515 tons in August. The October receipts bring the monthly average to 6289 tons for the first nine months of this year. The imports in 1915 were only 4600 tons per month. Of the October imports 2641 tons came through Philadelphia, 2657 tons through Baltimore, 1113 tons through New Orleans, 880 tons through Newport News and 623 through New York. The entire receipts were from Great Britain except 203 tons from India through New York.

What the Mining Companies are Doing

Shattuck-Arizona.

The production of the Shattuck-Arizona Copper Co. for November is given in the following table, with a comparison of the previous months in the year:

	Copper, Lbs.	Lead, Lbs.	Silver, Ozs.	Gold, Ozs.
November	1,536,723	458,153	22,531	282
October	1,663,671	335,008	35,995	361
September	1,566,446	233,300	26,928	419
August	1,699,675	253,143	30,542	508
July	1,397,445	174,091	22,525	314
June	1,446,030	61,889	24,636	367
May	1,383,963		25,865	326
April	1,366,830	130,570	19,849	353
March	1,594,330	714,379	32,187	393
February	1,523,137	499,155	27,139	630
January	1,565,224	267,853	30,369	514

This makes total production for 11 months of 16,743,421 lbs. of copper; 3,128,041 lbs. of lead; 298,566 ozs. of silver and 4471 ozs. of gold.

Butte and Superior, Mont.

The Butte & Superior Mining Co. in November produced 15,158,000 lbs. of zinc in concentrates, a decrease of 536,000 lbs. from October. Production of silver was 312,000 ozs., against 320,000 ozs. in October. Two months compare as follows:

	November.	October.
Ore milled—tons	53,880	64,450
Tons concentrates	14,300	14,850
Concentrates assayed	53%	52.72%
Zinc recoveries	93.7%	92.5%
Total zinc in concentrates, lbs.	15,158,000	15,694,000

Old Dominion, Ariz.

The old Dominion smelter output in November was 3,650,000 lbs., compared with 3,200,000 lbs. the previous month. Comparison of monthly outputs follows (in lbs.):

	1916.	1915.	1914.	1913.
January	3,121,000	1,745,000	2,797,000	2,727,000
February	2,823,000	2,074,000	3,066,000	2,381,000
March	3,277,000	603,000	2,997,000	2,953,000
April	3,290,000	1,338,000	2,779,000	3,040,000
May	3,405,000	2,868,000	3,303,000	2,749,000
June	3,843,000	2,744,000	2,937,000	2,511,000
July	3,852,000	3,199,000	2,962,000	2,526,000
August	3,600,000	2,843,000	2,236,000	2,524,000
September	3,011,000	2,538,000	2,121,000	2,679,000
October	3,200,000	2,970,000	1,616,000	2,037,000
November	3,650,000	2,443,000	1,924,000	2,170,000
December		2,495,000	1,700,000	2,613,000

East Butte Copper, Mont.

The November copper production of the East Butte Copper Co. was 1,640,040 lbs., compared with previous months as follows (in lbs.):

Months:	Copper, lbs.	Months:	Copper, lbs.
November	1,643,040	May	1,517,000
October	1,650,160	April	1,501,000
September	1,760,100	March	1,306,900
August	1,849,120	February	1,277,160
July	1,893,120	January	1,060,000
June	1,639,560		

Silver production compares as follows:

	November.	October.	Sept.	August.
Silver, ozs.	51,520	51,022	46,239	49,449

Directors of the East Butte Mining Co. will meet this month to take action on a dividend declaration which is expected will be for \$1 a share. The estimated profits of the company for October were \$256,000, which was at the rate of better than \$7 per annum on 411,000 shares. The company has \$2,000,000 in cash and copper at the present time. East Butte's production has been ranging between 1,600,000 and 1,700,000 lbs. of copper per month and one-third of the output comes from the 1500-foot level.

Costs of production have risen along with other companies due primarily to increased wages and higher costs of materials. Advantage has also been taken of the high price

for copper to work on war-grade ores than would otherwise be possible and this treatment has added somewhat to the copper costs, which in the year 1915 averaged 11.85 cts. a pounds.

Miami Copper, Ariz.

Miami Copper Co. production in November mounted to 4,968,500 lbs. Comparisons with previous months are shown:

	1916.	1915.	1914.	1913.
January	3,892,468	1,807,928	3,136,069	2,934,670
February	3,934,220	2,441,719	3,162,958	2,691,343
March	4,236,791	2,958,922	3,287,749	2,929,103
April	4,114,338	2,976,218	3,210,451	2,217,630
May	4,729,323	3,634,100	3,224,657	1,836,128
June	4,516,395	3,756,992	2,997,171	2,727,457
July	4,310,000	4,084,863	3,107,843	2,780,479
August	4,698,795	4,039,517	1,993,104	2,952,759
September	4,381,367	4,081,444	2,103,616	2,551,930
October	4,859,443	4,094,957	2,318,527	2,821,300
November	4,968,500	4,075,194	2,265,829	3,084,184
December		3,880,205	2,488,036	3,340,692
Total		41,832,059	33,296,010	32,867,666

Braden Copper Co.

The company produced in November 4,419,000 lbs. of blister copper, comparing with previous months as follows:

	1916.	1915.	1914.	1913.
Six months	23,110,000	15,238,000	12,451,000	8,438,000
July	2,760,000	2,890,000	1,332,000	1,046,000
August	2,616,000	2,858,000	4,532,000	1,572,000
September	2,970,000	3,222,000	3,130,000	1,332,000
October	4,048,000	3,726,000	2,078,000	2,006,000
November	4,419,000	3,684,000	2,402,000	1,592,000
December			2,298,000	2,122,000

Kennecott Copper.

Kennecott Copper Corporation's production was 7,080,000 lbs. of copper in November, comparing with previous months as follows:

	Pounds.		Pounds.
November	7,080,000	May	10,500,000
October	7,300,000	April	10,500,000
September	8,000,000	March	10,150,000
August	10,200,000	February	9,750,000
July	10,750,000	January	10,000,000
June	10,500,000	December	10,500,000

Tennessee Copper Litigation.

Following the decision of the Appellate Division in reinstating four attachments made against properties of the Tennessee Copper Co. in New York state in suits of W. H. Stiner & Son, four motions have been made in the Supreme Court for dismissal of suits brought by the Tennessee Copper Co. against the surety company which guaranteed payment of damages and costs in case the attachments were vacated.

The Tennessee Copper Co. instituted counter suits against William H. Stiner & Son, to offset the four suits brought against the company by Stiner, in which damages amounting to \$986,000, are claimed for breaches of contract. After these suits were commenced in the Supreme Court of the state of New York, attachments against all the property of the Tennessee Copper Co. in the state were issued. On motion before Justice Goff, in the Supreme Court, these attachments were vacated, whereupon an appeal was taken by Milton Mayer, counsel for W. H. Stiner & Son in the Appellate Division which reversed Justice Goff's decision.

Justice Laughlin of the Appellate Division, who wrote the opinion, in which all the other justices concurred, said: "Each of these actions is brought to recover damages for breaches of a contract. The contracts and the alleged breaches are in all respects similar. Action No. 1 has been argued and is to be decided herewith. Therefore, it is the unanimous opinion of the court in so far as relates to the causes of action for damages for breaches of contract, this decision applies to, and is decisive on the questions arising on these appeals.

It follows that the order in each action should be reversed with costs and disbursements, and the motions to vacate the attachments in each action denied with costs, and the attachments are reinstated."

Alaska Gold.

The November report of Alaska Gold Mines shows that 167,600 tons of ore were milled, assaying an average of \$1.13 per ton. Percentage of gold extraction and loss of gold in tailings compare as follows:

	Tons ore milled.	Assay value per ton.
November	167,600	\$1.13
October	158,000	1.32
September	135,760	1.30
August	169,100	1.38
July	150,403	1.24
June	164,800	1.06
May	175,215	1.40
April	165,930	.94
March	162,796	1.03
February	122,856	1.02
January	119,914	1.42
December	114,183	1.26

	Per cent of extraction.	Loss in tails per ton.
November	81.71	20.7c
October	82.49	..
September	82.94	..
August	81.51	25c
July	80.64	24
June	79.25	22
May	82.85	24
April	78.71	19.8
March	77.47	20.3

Greene-Cananea.

Greene-Cananea Copper Co.'s November results compare with previous months as follows:

	Copper, lbs.	Silver, ozs.	Gold, ozs.
November	5,100,000	164,360	951
October	6,030,000	177,999	915
September	4,900,000	153,495	814
August	5,000,000	144,480	862
July	4,600,000	116,800	745
June	4,500,000	128,700	800
May	5,948,000	183,809	1,199
April	5,348,000	205,748	1,193
March	5,388,000	200,709	1,146
February	5,180,000	181,895	984
January*	3,348,000	113,691	716

*Does not include custom ores.

Goldfield Con., Nev.

Operating costs at the Goldfield, Con. for October are given in the following table:

	Per Ton Ore Handled.	Per Ton Total Ore.
Mining—		
Stopping	\$ 2.40	\$....
Development	13.48	....
Total mining	\$ 2.74	\$2.35
Tailings dump moving .....	.16	.02
Transportation .....	.06	.06
Milling	2.05	2.05
Marketing .....	.02	.02
General expense .....	.24	.24
Bullion tax .....	.01	.01
Filter royalty .....	.04	.04
Flotation royalty .....	.04	.04
Surface .....	.05	.05
Total operating costs .....	....	\$4.88
Miscellaneous earnings .....	....	.10
Net operating costs .....	....	\$4.78

During the month of October, 1916, the total production of the company was 30,000 tons from which resulted net realization of \$17,045.51.

Miscellaneous Company Notes.

November production of Greene-Cananea totaled 5,100,000 pounds of copper, 164,360 ounces of silver and 951 ounces of gold. October's copper production was 6,030,000 pounds.

The Utah Metal & Tunnel Co. and Bingham-New Haven Co. combined operating accounts for the 9 months ended Oct. 1 last show total income of \$1,299,914, and net profits of \$567,177, equal to about \$1.20 on the company's 685,266 shares. The company has cash in bank amounting to \$197,677,

and cash due for ore sold amounting to \$176,104. During the nine months the company reduced its bonded debt by \$145,500 leaving outstanding \$229,500, and paid its initial dividend in August, amounting to \$342,472.

Application has been made for listing Davis-Daly on the Boston Stock Exchange. Papers are understood to have been satisfactory and trading on the regular Exchange should start within a few days.

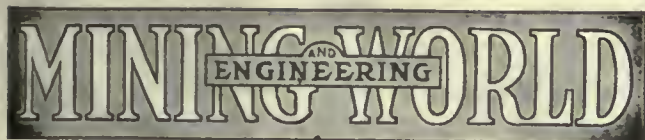
At the annual meeting of the Superior & Boston Copper Co., the former directors were re-elected. The company announced its intention of starting at the 1400-foot level to crosscut in direction of the Old Dominion vein.

The Nichols Copper Co. has resumed dividend payments with a declaration of \$4 a share, payable Dec. 22. The company owns and operates what was once the largest copper refinery in the world. For several years it was the only plant in the country having a daily capacity for refining 1,000,000 lbs. of copper. That capacity has since been increased to about 35,000,000 lbs. of copper a month, but the Anaconda refinery at Perth Amboy, New Jersey, has an equal capacity while the Baltimore refinery of the American Smelters Securities Co. has a present capacity of 40,000,000 lbs. of copper monthly. Control of the Nichols Copper Co. has always rested with the Nichols family, Dr. W. H. Nichols, chairman of the General Chemical Co. and president of Granby Con., being credited with the largest interest. The Nichols refinery refines the Phelps, Dodge & Co., Granby and Old Dominion product.

A renewal of the option from the Calumet & Hecla Mining Co. carrying control of the Seneca Mining Co. has been secured by Tucker, Hayes & Bartholomew of Boston in association with Lewisohn Bros. of New York. The company has 20,000 shares, of which 11,207 shares are owned by Calumet & Hecla. It is proposed to form a new company under New York laws with 250,000 shares, no par value. The stock will be made non-assessable. At the present time only 200,000 shares will issue, 50,000 shares to remain in the treasury for future requirements. The new stock will be offered for subscription, without commission to brokers, at \$15 per share. Incidentally, the minority interest in Seneca will be offered \$60 per share cash for their holdings and an opportunity to subscribe to the new stock at \$15. This arrangement will give the new company a working capital of something over \$1,000,000.

Ray Hercules Copper Co., whose properties adjoin the producing properties of Ray Con. Copper Co., of which they are an extension, originally intended to construct a mill having a daily capacity of 1000 tons of ore, but recently it has been decided to start production with a mill having a daily capacity of 2000 tons. It is estimated that ore in sight will last 14 years and yield a profit of at least \$2.10 a ton, or \$21,000,000 on 15-ct. copper and about \$55,000,000 on 25-ct. copper. Expectations are that Ray Hercules beginning with next September will start production at 25,000,000 lbs. of copper a year at a cost not to exceed 8½ cts. a pound. Estimates place earnings thereafter at \$1.25 a share on 15-ct. copper and \$3.50 a share on 25-ct. copper. Ray Hercules now has \$1,200,000 cash, compared with close to \$1,000,000 on July 1. This item is regarded as ample to finish the concentrator and prepare the mine for stopping.

A new management has taken over control of the Tennessee Copper Co. through the Tennessee Copper & Chemical Corporation, which was formed to finance the older concern and furnish it with working capital. Succeeding Utley Wedge as president, Adolph Lewisohn has been elected; S. A. Lewisohn has been chosen vice-president, and E. H. Westlake, secretary and treasurer. The new board of directors comprises: Adolph Lewisohn, S. A. Lewisohn, S. S. Rosenstamm, E. H. Westlake, J. H. Susman, J. Parke Channing, J. S. Bache, H. M. Kilborn, Richard Sutro, W. B. Joyce, Martin Vogel. The last four hold over from the former regime. But little stock of the Tennessee Copper Co. has not signified intention of depositing for shares of the new Tennessee Copper & Chemical Corporation. Holders of the new shares will have the opportunity to subscribe at \$16 a share for stock of the new corporation on the basis of one share of new for each share of old held.



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Butte Miners' Wages Again Voluntarily Advanced.

Butte mining companies have announced an advance in the wages of miners from \$4.50 to \$4.75 per day, effective after Dec. 1. This is done without altering or changing any existing contracts or obligations. The advance applies not only to the mines of Butte but to the men employed in the reduction works and plant at Anaconda and Great Falls. The price of copper is to be computed in the same way as in the past.

All salaried employes of the Anaconda Co. receiving \$300 per month or less will receive an additional 5% on the base rate as long as the average monthly price of copper remains at 27½ cts. per pound or more.

This is the third voluntary increase in the wages of the employes of the Anaconda and other mining companies of Butte in the past year. The increase, it is estimated, applies to between 20,000 and 25,000 men in the district. It will mean an increase in the daily wages of Butte, Anaconda and Great Falls of between \$5000 and \$6000 and a monthly addition to the pay rolls of approximately \$150,000. This is at the rate of an annual increase of \$1,800,000.

It will affect 4500 men employed at the Washoe smelter at Anaconda, 3000 men employed in the reduction works at Great Falls and 17,500 men employed in the mines and mills of Butte.

The pay rolls for the month of December, estimated on the basis of the number of men employed at present, will run between \$3,000,000 and \$3,500,000. It will be by far the largest pay roll in the history of the Butte mining district.

The companies joining in the advance are the Anaconda Copper Mining Co., the Elm Orlu Mining Co., the Timber Butte Milling Co., the Davis-Daly Mining Co., the East Butte Mining Co., the East Butte Extension Co., the Tuolumne Mining Co., the Butte & Bacorn Co., the Bullwhacker Mining Co., the Butte & Great Falls Mining Co., the North Butte Mining Co., the Butte & Superior Mining Co., and about 25 other small mining companies.

The Pig Iron Situation.

Sensational advances in the prices of pig iron have stimulated buying and predictions are freely made that there will result a serious shortage. Operations at furnaces have been greatly handicapped by a shortage of coke and several have had to shut down for short periods. The one consolation is the almost entire absence of labor troubles, a few plants only being affected.

Pig iron is now selling at around \$30 per ton, and a prominent maker predicts price may reach \$50 before it begins to recede, based on higher cost of iron

ore, coke, shortage of labor, fuel, and above all enormous demand. If the quotations should reach \$50 per ton, or anywhere near that point, they will be the result of increased consumption rather than cost of manufacture. Iron ore and freight rates may increase cost of production next year by about \$2.50 per ton. Contracts for coke are being based around \$3 a ton and less, and labor may receive an increase in wages. With all added details of cost, pig iron selling around \$30 a ton is being made at a handsome profit.

Large sales have been few, as it is practically impossible to obtain a great volume of either bessemer or basic. A sale of 22,000 tons of basic was made for delivery during second half of 1917 at about \$26. Interests who have not as yet filled requirements are in the market for around 50,000 tons of malleable iron.

Export demand is increasing steadily. Inquiries from all countries of Europe except the central powers aggregate more than 100,000 tons. Italy is in the market for about 25,000 tons of bessemer. French inquiries amount to over 30,000 tons.

Iron production in October amounted to 3,510,000 tons, a new record, and at rate of 41,000,000 tons per annum. The previous record production was in May, 3,365,000 tons.

The Situation in the Silver Market.

The silver market has been swept more clear of supplies and a further advance in rates is predicted by Samuel Montagu & Co., of London. This increase in rates became unavoidable owing to continued strength of the China exchanges which led to purchases in America and also in London. Inquiries embraced mintage orders, orders for general purposes, and for Indian bazaars. The bearish view of the Indian bazaars had led to bearish selling in London, putting the market in a strong technical position, which is, in view of statistical conditions, not without danger.

Conditions are now more sound than when the spectacular movement in May carried the quotation to high records. During the intervening time the Chinese stock has been greatly reduced. America has been relieved of certain accumulations she then held, and the Indian currency figures, notwithstanding very large continuous purchases for the Indian mints, show a declining tendency. The silver market has often lived up to its reputation of doing the unexpected, but the situation is such that further advances may be looked for before the close of the year, provided no new factor intervenes.

The higher price of silver will reduce cost of production of the prominent metal companies, as value of gold and silver in the ore is used as an offset to reduce the cost of producing. Anaconda, for instance, is a bigger silver producer than most silver mines, and the increasing copper output of that company means

an increasing silver output. The same applies to other coppers, as Utah and Granby. Butte & Superior with its November production of 15,158,000 lbs. of zinc concentrates produced 312,000 ozs. of silver. All the smelting companies treating custom ore profit from advancing silver prices.

Labor in the Lake Superior Region.

The Lake Superior labor situation has become vastly improved and is now in an entirely satisfactory condition. The number of men employed is increasing steadily now that winter is ahead, and the men are doing more work. That applies particularly to contract mining and tramming where the pay is remarkably high.

Ten years ago there was a plan on foot to do away entirely with contract mining—the old Cornish mining system that came to the Lake Superior district with the first copper miners. Some of the mines applied the plain day wage system to all miners. But in recent years more and more of the mines have gone back to the contract system. When the Calumet & Hecla took over the Fay mines and the Bigelow mines they instituted the contract system, which has always been popular with Calumet & Hecla. It has resulted in greater efficiency. At present the men are making very heavy wages. Miners that are able to get better than \$200 a month are not now exceptional.

Lake Superior miners, 17,000 out of the 25,000 employed in the copper mines, will participate in a bonus distribution on the first payday in January, 1917. This bonus was announced last summer. It is additional premium, over the regular increase in wages, of 25 cts. for every day for every employe who worked from July 1 to Dec. 31. It applies to men who worked steadily. The bonus payment at the Wolverine and Mohawk mines will be made on Jan. 15 at the time of the regular pay.

In graceful recognition of earlier successful work and the naming of a town after him, J. Parke Channing is to present a modern up-to-date clubhouse to the employes of the C., M. & St. P. railroad and to the population in general at Channing, Mich. In 1893 Mr. Channing examined that region geologically to determine the trend of the ore-bearing ground, and a branch railroad to Ontonagon was built along the line indicated by him. The clubhouse, which will be one of the best of its type and equipped with baths, reading rooms, bowling alley, billiard and rest rooms, will be maintained by the railroad company, which presented the site.

Advices from Washington are to the effect that the U. S. Supreme Court has upheld the patents for the flotation concentrating process of the Minerals Separation, Ltd. An infringement injunction was ordered against James M. Hyde.

PERSONAL.

C. Leonard Ball, mining engineer, Bisbee, Ariz., will leave for New York on Dec. 19.

Archie McDonald has been appointed superintendent of the United Copper Co., Chewelah, Wash.

A. L. Waters, mining engineer, Los Angeles, Calif., has been on professional duties in Globe, Ariz.

Thomas Christian, Chicago, is in Custer City, S. D., inspecting mica properties which he owns there.

R. C. Berlin, superintendent of the Golden Chest Co., Murray, Idaho, is on a visit to New York city.

A. C. Barrett, mill foreman for the Backus & Johnston Co., Casapalca, Peru, has returned to the United States.

R. W. Marston is to be acting manager of the smelter at Northport, Wash., in place of Samuel James, deceased.

Samuel Colt, superintendent of the Princeton mine, Dolomi, Alaska, is spending the winter in Nevada City, Calif.

Ben R. Labaree, mining operator of Juneau, Alaska, is spending the winter in Spokane, Wash., at the Davenport hotel.

Murray Godbe, Salt Lake City, general manager of the Prince Con. Mining & Smelting Co., Pioche, Nev., is at the property.

J. B. Tyrrell, of Toronto, is in the East Kootenay district of British Columbia examining and sampling a silver-lead mine.

Otto Ruhl, of Ruhl & Stewart, mining and civil engineers, Joplin, Mo., has completed a two weeks' examination in northern Arkansas.

Roy Grissom has left the employ of the Chino Copper Co., Santa Rita, N. M., for Valparaiso, Chile, where he will enter the employ of the Braden Copper Co.

D. R. Thomas, formerly with the Moose Mountain, Ltd., Selwood, Ont., has been appointed mine superintendent of the Davidson Gold Mines, Ltd., Porcupine, Ont.

M. G. Rodearmel, president of the old Interstate Co., and now holding a large interest in the Interstate-Callahan Co., is in Wallace, Idaho, from Minneapolis, Minn.

J. Cleveland Haas, mining engineer, Spokane, Wash., has returned from Ainsworth, B. C., where he was in connection with the Wolverine Mining & Development Co.

William H. Reeves, formerly manager of the East Hercules Ext. Co., Burke, Idaho, is now superintendent of a station of the Montana Power Co., at Crow Creek, Mont.

A. J. Canavan, formerly superintendent of the Goldfield Con. Co., Goldfield, Nev., has recently been made general mine superintendent of the Pioneer Con. Mines Co., Pioneer, Nev.

George S. Rice, chief mining engineer for the U. S. Bureau of Mines, Washington, D. C., is inspecting the coal mines near Fernie, B. C., for the provincial government of British Columbia.

G. Komorowski, metallurgical engineer, representing the Girod electric furnace, recently arrived in New York from France. His headquarters are with C. W. Leavitt & Co., 30 Church street, American agents for this furnace.

George A. Burrell, formerly in charge of research work in gas and related investigations for the Bureau of Mines, has resigned his position to enter consulting work, and has opened an engineering office in the Benedum-Trees building, Pittsburgh, Pa. Mr. Burrell has been with the Bureau of Mines for 12 years, and is well known for his work and

publications on mine gases, natural gases, gasoline and illuminating gas.

Benj. F. Sparks, who, with his partner, Williard J. Smith, both Michigan College of Mines men, comprise the firm of Smith & Sparks, contractors, of Houghton, Mich., will pass the winter in Detroit superintending cement construction work for the Rockwood Silica Sand Co.

H. R. Graham, superintendent of mines for the Braden Copper Co., Rancagua, Chile, is making a tour of inspection of the copper mines of the United States. He has recently been in Salt Lake City, Utah, and will return to Chile via New York immediately after the first of the year.

W. J. Elmendorf has become associated with Campbell-Wells Co., engineers, metallurgists, chemists, 114 James street, Seattle, the new firm name to be Campbell, Wells & Elmendorf. Mr. Elmendorf is well and favorably known throughout the West, having had 25 years' experience in the United States, Canada and Mexico, as mining engineer, mine manager and mill designer. A new testing plant completely equipped is to be installed.

OBITUARY.

Howard Gray, a mining operator in Parral, Chihuahua, Mexico, was shot and hung by Villa followers during a recent raid on the city. He was born in Peoria, Ill., and went to Mexico about 23 years ago at the age of 25. He leaves a wife and five children in Parral.

Tony Jacobson, an extensive operator in the Alta district of Utah, recently passed away in Salt Lake City. Mr. Jacobson had considerable to do with the opening and placing of the Alta district before the public. In recognition of this a committee has been appointed to erect a monument to his memory. Among those with whom he was closely associated are George H. Watson, Frank Mozley, and other operators of the district.

Samuel James, manager of the Northport smelter, Northport, Wash., died at his home on Nov. 25 from apoplexy. He was born in Boston, Mass., in 1854 and graduated from the Massachusetts Institute of Technology in 1876. He first came to the west in 1889 as superintendent of the Globe smelter, near Denver, Colo. In 1891 he took charge of the Mingo smelter at Murray, Utah. His next change was back to Colorado, where in 1901 he became manager of the Arkansas Valley smelter at Leadville and in 1903 he resigned this position to accept the superintendency of the Ohio & Colorado smelter at Salida, Colo. About 1907 he became interested in Matehuala, Mexico, and remained there until last year when he was selected as manager of the Northport smelter.

SCHOOLS AND SOCIETIES.

Colorado School of Mines.—The third annual short course for prospectors will be given at Golden during the 4 weeks beginning Feb. 5 and ending March 3, 1917. It is good training for the prospector, miner and mill man. If you contemplate attending, notify the secretary.

Lake Superior Mining Institute.—It has been practically decided to make the trip to Birmingham, Ala., as proposed at the last annual meeting. The trip will be made during March and to date it is expected that at least 150 of the members will take advantage of the trip. The present program calls for a 4 days' stay in Birmingham, from March 13 to 17. One day will be spent in Chattanooga, Tenn. The trip from Chicago to Birmingham and return will be made on a special train, over the Queen & Crescent route, and the round trip fare will be \$26.90. There has been some talk of including the ladies on this trip, but no decision has been reached as yet.

Progress Made in the Manufacturing Industries

Compressed Air Reservoir Made from Pipe.

The idea of using a number of lengths of pipe joined together to constitute a compressed-air storage reservoir is a good one, and can be employed for temporary requirements in a great many cases. In this instance Universal pipe, made by the Central Foundry Co. of New York, was used, which is best for the purpose, on account of the method of joining the pipes, which is so much more readily done than with ordinary pipe connections.

An 8-in. well, 220 ft. deep, had been cased all the way down and screened. Quicksand got in, however, and blocked up the whole well, which had to be blown out with com-



COMPRESSED AIR RESERVOIRS MADE FROM PIPE.

pressed air. The owners tried to get a tank suitable for holding air under considerable pressure, but could not get one without a great delay. Finally they hit upon the idea of hooking up pipe as shown, and using that as storage capacity sufficient to regulate the pressure while pumping out.

They used 39 lengths, 6 ft. long by 6 ins. in diameter. This gave in all approximately 50 cu. ft. of storage capacity. Two T's and four 90° bends were sufficient to put it together. The pipe was already on hand and was afterwards used for general purposes.

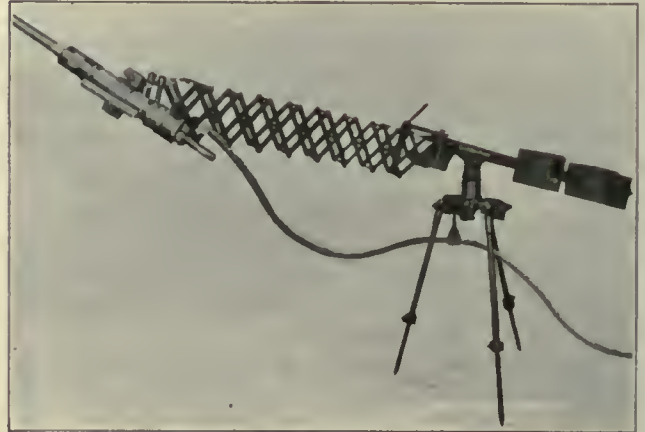
The Jackson Flexible Tool Holder.

The Jackson tool holder is designed to carry in suspension all portable tools, thereby increasing their utility and range of operation. It facilitates the use of pneumatic riveters, chippers, busters, blacksmithing tools, jack hammers, drills, tamping tools; electric grinders, drills, coal cutters, etc. By using the tool holder, the workman is entirely relieved

of the weight and shock of the tool, and his energy may be directed to guiding the tool to its work, thus allowing one man to replace several, and maintain continuous operation without fatigue.

The holder is quickly adjusted by the workman to suit conditions, and when the arm is fully extended as shown in the accompanying illustration, it has an operating range of 16 ft.

Portable tools, weighing from 20 to 150 lbs., can be



THE JACKSON FLEXIBLE TOOL HOLDER.

used to equal advantage with the standard type "E" holder, which is constructed to withstand the most severe usage above and below ground. It is mounted on either tripod or adjustable truck as standard equipment.

The inventor of this device is George W. Jackson, who is well known as one of the most able tunnel experts in the country. It will be marketed by Jackson, Schmitz & Shanks, 1117 S. Desplaines street, Chicago.

TRADE PUBLICATIONS.

Welch Hoisting Engine Controller. Welch, P. O. Box No. 2, Denver, Colo. Booklet; pp. 16; illustrated.

Many illustrations are contained in the booklet showing both the controller and installed hoists in connection with which the controller is being used. Line drawings of the controller and installations show clearly the way in which it operates and is constructed and placed in connection with the hoist. Other than this the booklet contains a list of companies using the company's controller.

Steam Condensing Plants, Barometric Type. Ingersoll-Rand Co., New York. Form No. 9024; pp. 31; illustrated.

In the first 10 pages there is a general talk on different types and methods of operating for steam condensing plants such as counter-current condensers, barometric condensers, jet condensers, etc. A more detailed account of the Beyer counter-current plant follows this. This system operates on a dry system; the cooling water is automatically removed and the vacuum and water pumps are operated by separate prime movers. Several types of the company's vacuum pumps for use in this service are separately and briefly described.

Sullivan Air Feed Stopping Drills, DF-21, DA-21 and DG-21. Sullivan Machinery Co., Chicago. Bulletin 66 G; pp. 11; illustrated.

The bulletin describes air-feed stopping drills intended for use in raising and stopping where the holes point upward and the cuttings run from the hole by gravity. It is interesting but marred by exaggerations, an example of which is

the statement that "Sullivan stopers have been tested in all parts of the United States, Canada and Mexico, under a wide variety of conditions and in direct competition with nearly every other stope drill manufactured. The results of these tests have been uniformly favorable to the Sullivan drill." The best that can be said of this assertion is the Scotch verdict, "Not Proven."

Power Transmission Equipment. Medart Patent Pulley Co., St. Louis, Mo. Catalogue; pp. 38; illustrated.

The catalogue has been gotten up, not to consider the entire line handled by the company, but rather to give a general idea. Separate catalogues are published which deal with each separate line more in detail. Equipment for every kind of power transmission is included in the company's line and among things here considered are sheave-wheels for the hoist; idler wheels for the rope from the drum hoist to the sheave on the head frame; countershafting, pulleys, hangers and sundry equipment for the same of use in transmitting power about the shop, plants, mill and smelter; rope drive equipment, etc.

Halby Shovelling Machine. Lake Shore Engine Works, Marquette, Mich. Folders and Pamphlet; illustrated.

A sufficient number of views and drawings of the machine and places where it is in operation have been included, so that description of things other than what it has done and can do are not necessary. The shovelling apparatus is mounted on a special car and can be moved any place on the haulage tracks underground. For motive power either compressed air, electricity or a gasoline motor can be used. One man with four levers controls the machine, which picks up the dirt much the same as a man with a shovel. The dirt is carried by means of a short belt to the rear where a tram car is located and there discharged. The shoveling arm can be revolved in a manner somewhat similar to a steam shovel's boom.

INDUSTRIAL AND TRADE NOTES.

The Terry Steam Turbine Co., of Hartford, Conn., announces the appointment of Stephenson & Nichols, Monadnock building, San Francisco, as its representatives in northern and central California and the northern part of Nevada.

Through the error of one of our field correspondents, the grinding mills of the Nevada Packard Mines Co., recently illustrated in this paper, were designated as Marcy. We are now advised by the company that these tube mills, one of which has been converted into a ball mill, were manufactured by the Power & Mining Machinery Co. They are driven through Morse silent chain from Westinghouse motors.

N. B. Ford, who for 10 years traveled for the Corbin Screw Corporation from their Chicago office, having his headquarters in Kansas City, and who left some 2 years ago to become connected with the Ford Chain Block & Mfg. Co., of Philadelphia, has re-entered the employ of the Corbin Screw Corporation, as salesman, with headquarters in New Britain, and covering the territory formerly traveled by A. H. Harrop.

The entire business of the Minerals Separation American Syndicate (1913) Ltd., a British corporation, has been taken over, as from Dec. 7, 1916, by Minerals Separation North American Corporation, an American company, organized under the laws of the state of Maryland. Messrs. Beer, Sondheimer & Co., 61 Broadway, New York, will be general agents, not sole agents. Edward H. Nutter, 825 Merchants' Exchange building, San Francisco, is chief engineer for and on behalf of the new corporation.

The Denver Rock Drill Manufacturing Co. of Utah has been incorporated with offices at 115 West Second South street, Salt Lake City, and with officers and directors as follows: W. H. Leonard, Denver, Colorado, president; R.

A. Scott, Salt Lake City, vice-president and general manager; J. R. Elmendorf, O. D. Lindstrom, and F. B. Matheson. The company is a subsidiary of the Denver Rock Drill Manufacturing Co. of Delaware. Its incorporation in Utah is for the purpose of arranging affairs so that western business can be taken care of more advantageously, and the company will give special attention to the territory embracing Utah, eastern Nevada, southern Idaho, and Montana. During the past year the business of the present company has been exceedingly gratifying.

NEW PUBLICATIONS.

Mine Ventilation Stoppings. By R. Y. Williams. Washington, D. C., U. S. Bureau of Mines. Bulletin 99; pp 30; illustrated.

This bulletin has been compiled with special reference to Illinois coal mines. The first cost of several types of ventilation stoppings is discussed as well as the annual cost of maintaining the stopping during its period of service. It furnishes a basis for comparison of efficiency of the different types as well as data for the engineer in planning the development of a mine.

The Mines Handbook and Copper Handbook. By Walter Harvey Weed. Vol. XII. 1916. Published by the Stevens Copper Handbook Co., 29 Broadway, New York. For sale by Mining World Co., \$10.

A study of Vol. XII, the current edition, shows that the name has been changed to the Mines Handbook and Copper Handbook and the work enlarged to cover all the more important North American mining companies producing gold, silver, copper, lead, zinc, tungsten, bismuth, antimony and tin, in other words all metals save iron.

Although the descriptions of foreign properties have been omitted, owing to the war and also lack of space, the volume has 11 chapters compared with 5 in the previous issue. Chapter I, Glossary of Mining Terms and Chapter II, Mineralogy, The Important Ore Minerals, will be especially valuable to readers unversed in technical and mining terms. Chapter III, a Description of All Known Copper Bearing Minerals, is the only complete list of copper minerals published. Chapter IV, has 1162 pages of detailed descriptions of mines in the United States, Canada and Mexico, including amount and location of holdings, finances, profit and loss, geology, nature of ore, output, methods of mining, milling and smelting, probable future, successful or otherwise. Chapter V, the Metal Mining Industry, is particularly interesting as it gives the occurrence, demand for and uses of the different metals, together with production and prices for years back. Chapter VI, A Resume of the Copper Industry, covers this field in a most thorough manner. Chapter VII gives a table of Dividend Paying Companies, also a table of mining stocks listed on the New York Stock Exchange and on the Curb. Chapter VIII includes Data of the World's Principal Mines and a tabular comparison of operations and costs of the "Porphyry Coppers." Chapter IX, List of Obsolete Securities of Dead, Merged, Liquidated or Bankrupt Mining Companies, with references to former volumes in which they are described. A striking innovation is a list of several thousand mining company officials in Chapter X, including the name and address of a large number of men connected with the mining industry of North America. The geographical index, Chapter XI, includes the names of the properties described in the book arranged by states, districts or towns for handy reference.

The mine descriptions proper have been more conveniently arranged than heretofore. Black face type has been used to denote the address, capitalization, property, geology, equipment, etc., in each company description. Tabulating has been used freely; this is of especial advantage when making comparisons of operating statement and yearly production.

The vast amount of new data contained in the Handbook has made the work far more valuable to the mining world.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Fairbanks.

On Chatham creek, an old producer which is a tributary of Cleary creek, Frank Brandham and Fred Thompson, have uncovered gravel which runs as high as \$17 per sq. ft. of bed rock. The discovery of the pay was made on No. 2 Chatham. Thompson & Brandham used a hand drill in their prospecting. It is from results obtained from the drill hole that the value of the ground has been figured. It is 12 ft. to bedrock there and the ground has been prospected before, but with poor results. One reason for this was that the ground is wet, and it was therefore nearly impossible to get a shaft to bedrock.

The Hughes-Timmins-Lewis dredging interests in the Tatlamka have been managed during the season by W. G. Jack, mining engineer. Jack has left the north for the winter. Before leaving he secured options on most of the claims on Goldstream between No. 11 and No. 24. On the majority of the claims very little work has been done. Most of the owners have considered the combined properties an ideal proposition, and have been waiting to get dredge men interested.

Falcon Joslin has left for New York to interest capital in some of his developments. Before leaving he secured options on several more of the quartz properties in the gold belt on Ester, Dome, in addition to the options he secured on the Tyndall, Finn & McLaughlin and Smith & Meylone properties. Some of his new options are on properties owned by J. C. Kinney, Carl Franklin, McLaughlin and O'Laughlin. An expert engineer is now making an examination of the properties, the results of which have not been made public yet.

ARIZONA.

Jerome.

Phillip Carroll, of Hancock, Mich., was elected president of the Decatur Copper Co., at a meeting of the directors held in Decatur, Ill., last week. Mr. Carroll has the necessary executive experience and the financial backing to make the most of the company's mineral resources. The property is most favorably situated, and work will be done at once to follow up the recent finds of the Green Monster. The secretary is Samuel Morthland, of Decatur.

Among the companies having holdings in the district is the Michigan-Verde Copper Co., one of a number of recent incorporations. It consists of 310 acres, divided into three lots, all of which are unusually attractive as mining propositions. Two of these lots, one of 90 and the other of 40 acres, are located in the immediate vicinity of the famous "glory hole" from which the United Verde has extracted millions. One of the lots is within 1500 ft. of the glory hole. Miners in the employ of the United Verde assert that they are working in ore in the west drives of the United Verde mine within a few hundred feet of the Michigan-Verde line. These miners believe the ore bodies of the United Verde extend into Michigan-Verde ground, and are backing their belief by purchasing Michigan-Verde shares. Plans are now being made for the development of that portion of the Michigan-Verde adjacent to the rich ore exposed in the west slopes of the United Verde.

Oatman.

Among the numerous prospective mines of Oatman which are being vigorously developed interest just now centers on

the Crescent, Nellie and Adams in the Black Range section and the Ivanhoe, which lies between the Times mine and the Crown City property of the Tom Reed Gold Mines Co., all of which have reached interesting points in their underground workings.

The Nellie mine has entered the vein in the shaft at 375 ft. and proposes to continue sinking, passing through the vein and to the 500 level where a crosscut will be driven to cut the vein again. On the 350 level considerable drifting was done and some good ore encountered but it was not uniform. It is the belief that a depth of 500 will disclose a body of good ore and it is the plan of development to drive a drift to the east where three veins appear to form a junction.

At the Crescent the tunnel has cut the vein 640 ft. from the portal, disclosing 3 ft. of quartz showing the chloritic greenstone characteristic of the Black range. A drift will be extended southeast toward a known shoot.

The Adams shaft was sunk to a depth of 425 ft. and a station cut at the 400 level from which a crosscut is to be driven to the vein, which should be cut within 50 ft. The company is now installing an 80 hp. engine and large pumps and making provision to handle a heavy flow of water which is expected. The Adams has a good surface showing and the acquisition of the property was recommended by C. H. Palmer Jr., upon whose report Frank Keith, Seeley W. Mudd and associates undertook the development of the United Eastern mines. E. H. Newlands of Los Angeles is president of the Adams Mining Co. and N. A. D'Arcy, a Nevada mining man, is manager. These two and Palmer form the board of directors.

Work has been resumed at the Murdock, which is north-east of the Black Range section and on one of the main dikes. The Murdock has some rich ore on surface and has a good outlay of machinery. It is under the management of S. S. Porter, for many years superintendent of the Gold Road mines.

The Arizona Rex mine has replaced the hoist that was removed from the main shaft and resumed work. This property is cornered with the United Eastern mine on the north-east and is controlled by Frank Keith, Seeley Mudd and associates of the United Eastern.

Horace V. Winchell, mining engineer, spent the week examining the Big Jim and Ivanhoe mines, these properties being under the same management. The Ivanhoe recently cut a promising vein on the 500 level after passing through a fault and is now drifting in ore on the hanging wall of the big dike.

At the Big Jim preparations are being made to resume sinking from the 500 level and by the time the proposed 400-ton mill is under construction, two or more levels will have been opened below the 500. Superintendent Keating places the tonnage already developed on and above the 500 level at 250,000 of an average value of \$12 to \$15. He estimates mine and mill costs at under \$5 per ton. It will take 2 or 3 months to complete the mill plans and actual construction of the mill will not commence until spring.

While the exact date on which the United Eastern mill is to start has not been definitely decided, it will be some time before Christmas. Practically all the construction work has been completed and everything is about in readiness to start the machinery. The No. 2 3-compartment shaft has been fitted with ore pockets on the 4th, 5th and 6th levels, an electric flashlight signal system installed and electric lights strung along the crosscut which connects with the vein. This work having been finished and everything put in readiness for stopping, shaft sinking has been resumed in No. 2, which is down 60 ft. below the 665 level. According to the dip of

the vein on the levels above the shaft should cut the hanging wall at about 950. Developed ore between the 300 and 665 levels is estimated at 200,000 tons valued at \$5,000,000. All of this has been opened since March, 1915. The vein is 25 to 50 wide and with the exception of an occasional "horse" of country rock it is solid ore throughout. Some good ore has been encountered in the drifts and crosscuts and the vein on the 400 level averaged \$22.93 across 25 ft. The mill will have a capacity of 200 tons and is expected to make an extraction of 97% at a cost of less than \$2 per ton. Active preparations are being made for the construction of a mill at the Gold Ore mine near the Gold Road. For 3 months the Gold Ore milled its ore at the Gold Road mill. It is said that the average returns of the company were \$30 per ton. The money received from this source will be added to by subscription from several wealthy eastern stockholders and the mill will be built early in 1917.

Development work continues on the easterly end of the Tom Reed properties and a large body of good ore has been opened through the Aztec shaft at a depth of 500. What relation the vein bears to the Big Jim has not been established but in dimensions and structure it bears a strong resemblance, both veins having an average width of 30 ft. The Aztec ore shoot is said to average \$50 per ton for some distance in one of the drifts. E. W. Rabb, superintendent of the Tom Reed mine, is placing orders for a new unit to the mill which will increase the capacity from 175 to 350 tons. He expects to have this unit finished and in operation in 6 months.

The success of the Big Jim, United Eastern, Tom Reed, Gold Ore, and other companies has brought about renewed activity throughout the district and there are now between 40 and 50 properties operating besides those doing assessment work.

Chloride.

The Rattlesnake mine has picked up the ore in a short crosscut run from the bottom of the new shaft. An average of 2 ft. at that point yields returns of \$99.20 per ton. Much copper is showing in the ore.

The Schenectady has broken into very rich silver ore in the North drift, 175-ft. level. Much wire silver and rich specimens are obtainable, exciting great interest, as proving old Chloriders did not go deep enough.

The Hidden Treasure tunnel ought soon to cut vein. Much water is coming in at face and formation changing.

Elkhart expected to start up in a few days. Mill is to be remodelled and active campaign mine development pursued.

Tennessee has completed raise from 1400 to 1170, making good air on lower levels. Men are being put to work as fast as found. The winze was started on 1400 level, 130 ft. from shaft; much copper is coming in.

The Copper Age just broke ground for new mill. The company is well financed and progressive. Mine development has exposed large ore reserves of splendid quality.

Globe.

At Inspiration Con. a pipe line is being constructed on pontoon bridges, across the tailings dam. It will connect the mill with the power house and furnish hot water at the mill during the winter. This is being done because it has been found that the temperature of the mass passing through the flotation machines has considerable influence on the efficiency of the machines. The hot water used will be that coming from the condensers which serve the steam engines. This water when it leaves the condensers ordinarily has a temperature of about 120° F., and under present conditions has to be pumped up to the cooling pond and forced through the spray nozzles for cooling before being returned to the condensers. Under the new arrangement part of the cold water from the Kiser pumping station will be diverted from its passage to the mill for use at the power house, instead of making use of the partially cooled water from the cooling ponds. Thus the scheme is doubly effective, the power plant requiring cold water, and the mill warm water.

At the mill just west of the machine shop, the erection of two steel tanks is progressing. These are to contain fuel

oil which will be used in generating steam in a boiler plant located at the foot of the mill and used for raising the temperature of the concentrate mass fed to the Oliver filters. It has been demonstrated that if this material is allowed to become too cold the filters are not so efficient.

CALIFORNIA.

Atolia.

Atolia Mining Co., San Francisco, is mining and concentrating 60 to 70 tons per day of scheelite ore. The mill product runs about 60% NO₃. This year's shipments of concentrates and high-grade ore will reach about 2500 tons. The mill being operated is a new plant, containing a crusher, a Marcy and four Huntington mills, and Vanners and Deister tables. E. C. Voorheis is president, J. H. Mackenzie, manager.

Grass Valley.

The Grass Valley Boundary Mines Co. has been formed by M. J. Brock and associates to work the Oak Tree, Cabin Flat and New Idea claims, located near the Peabody mine of the Golden Center Co. Arrangements have been made to expend approximately \$10,000 on preliminary development of the Oak Tree ledge, an ore body that has yielded much rich quartz.

The Grass Valley Con. Co., operating the Allison Ranch mine, has acquired for \$50,000 the adjacent territory owned by the Henderson and Lewis interests. The area comprises 53 acres, and is believed to contain the apex of the Caribou vein and other important ledges. Unwatering of the Allison Ranch mine is rapidly nearing completion, and arrangements have been made to resume mining on Dec. 25. All mine equipment is in position, and construction of the mill is proceeding rapidly.

At the Empire, now the leading gold-quartz producer of California, much new work is in progress. Large areas of new productive territory have been opened recently from the 4600 level, and a heavy tonnage is going to the 60-stamp mill from this portion of the property. At the Pennsylvania mine the company is keeping 20 stamps dropping on good ore. It is conservatively estimated the company is producing fully \$125,000 per month.

Jamestown.

The Sierra Nevada Exploration Co. has installed two pumps and a hoist at its Turner Flat placer mine, 3 miles southwest of Jamestown, and is constructing an electric transmission line. Several shafts are being sunk to tap the old river channels under Table mountain, and drifts will be extended into the gravel at a depth of 90 ft.

Amador City.

Foundations for mine and mill machinery have been completed at the South Keystone, and construction of buildings is making good progress. The extensive plant formerly in use at the Amador Queen mine has been moved to the South Keystone, and will be operated near the North Star shaft. Unwatering of the shaft will be rushed and work started from the 600 level with a view to opening several promising veins.

Within 2 weeks the management of the Keystone expects to resume mining on a normal scale. Retimbering of the shaft has advanced to the 400 level, and at all the important stations concrete floors have been put in, and ore-handling facilities greatly improved. C. R. Downs, of Sutter Creek, is manager.

Oroville.

The Oro Electric Corporation has placed orders for the building of a gold dredge of 6 cu. ft. capacity. It will operate on a 100-acre tract at Thermalito, near the valuable producing properties of Natomas Con. It will go into commission in the early spring.

Carrville.

The J. F. Nadern property, containing 60 acres of dredging ground on Coffee creek, has been taken under bond by E. A. Wiltsee, understood to represent eastern capital. The same people are reported to be negotiating for the Nash

deep-gravel mine, one of the largest placer properties in Trinity county.

Construction of the massive gold dredge of the Pacific Dredging Co., a subsidiary of the Yukon Gold Co., has been completed, and the dredge will go into commission within a few days. The company is prospecting large areas of promising ground adjoining the developed holdings, and plans the building of a second large gold boat, according to report.

Kennett.

Despite inclement weather the Mammoth Copper Co. is rapidly completing the \$400,000 electrolytic zinc plant at this place, and it is believed everything will be in shape for commencement of production in February. The plant embraces the process developed by the Bully Hill Smelting Co. after over 5 years of experiments, and will operate on ore from the Bully Hill district and the fine dust from the Mammoth baghouse, which contains considerable zinc, together with gold, silver and copper.

Sutter Creek.

An ore body ranging from 5 to 15 ft. in width has been opened on the 2600 level of the Oneida mine, controlled by the South Eureka Co. It has been developed for over 100 ft. and is of good milling character. The Oneida is provided with a 20-stamp mill, hoist and compressor, and is connected with the South Eureka at the 1800-ft level.

Nevada City.

The Mohegan property at Gold Flat has been taken under bond by A. J. Burke, who will operate it in conjunction with J. C. Campbell. The hoisting and pumping plant formerly in service at the Mt. Auburn mine has been moved to the Mohegan and electric power secured by the building of a transmission line from the Pittsburg property. The shaft will be deepened and drifts extended to seek extensions of veins which formerly yielded good ore.

The Champion Mines Co., controlled by the North Star Mines Co., is hoisting a heavy tonnage of good ore through the Providence shaft, which has been converted into the main working outlet. Preparations are being made to place more stamps in commission, and to prosecute extensive work from the deep levels of the Providence shaft. In addition to the ore going to the mill, considerable sulphurets are being shipped to the Selby smelter.

Iowa Hill.

Colfax people are busily completing arrangements for extensive work at the Golden Streak mine, a large gravel property. Considerable equipment has been installed at the property, which will be worked by the drift method. A number of gravel claims are being worked in this vicinity with good results. A company of Chinese capitalists has taken a 3-year lease on the Rose and Schwab canyons, containing tailings from the once-famous Morning Star, Big Dipper and Jupiter mines, and is preparing for extensive work.

COLORADO.

Cripple Creek.

The November production of this district amounted to 75,623 tons, with an average value of \$16.54, according to mill reports. The gross bullion was \$1,251,356, and is divided as follows:

	Tons.	Value ton.	Gross value.
Golden Cycle	38,000	\$19.00	\$ 722,000
Portland	11,333	19.85	233,969
Smelters, Denver and Pueblo..	4,550	55.00	250,250
Portland, Crip. Ck.....	18,700	2.51	45,937
Isabella Mines	2,640	3.00	7,920
Worcester-Rubie	400	3.20	1,280
Total.....	55,623	\$16.54	\$1,251,356

Steamboat Springs.

The Royal Flush mine, owned by the Hahn's Peak Gold M. & M. Co., has made a strike of gold and silver ore in

three levels tributary to the raise which connects the lower and upper tunnels. Ore has been found in the 400, 460 and 476 levels. Three classes of ore are being mined, namely: first class smelter ore, second class smelter ore, and mill ore. The first class will run \$100, the second class \$50, and the mill ore \$18. The smelter ore is being sacked for shipment to the Globe smelter, Denver, while the mill ore is being conserved for treatment in the company concentrator at the mine. From here concentrates will be shipped to the Globe smelter. Connection between the 400 level and the old winze is being made. When this is completed mill ore from the upper levels will be passed through the old winze, trammed through the 400, dropped through the raise to the lower tunnel, and taken to the mill. At present 300 sacks of smelting ore have been mined from rich stopes, and mining and sacking is still in progress.

Leadville.

A contract has been let to Don McKay and work started in the Ontario tunnel in the Tiger and Green Mountain mines. The Ontario has been taken under lease by local men who have advanced the breast of the main tunnel 200 ft. They plan on doing extensive development in the property. The new contract calls for the driving of the tunnel another 275 ft., a distance which is expected to put the breast in ore.

Though extensive development is being carried on in the several mines of the Down Town section, aside from the large body of iron-manganese recently uncovered no important discoveries have been made. At present an output of 40 tons daily is being shipped from the Penrose. The flow of water in the property continues strong and the pumps are forced to operate to capacity. Lessees on the Hibsche are driving prospecting drifts in search of the bodies supposed to exist. Some of the old workings are being cleaned out and retimbered.

Telluride.

In the recent annual report of the Tomboy Gold Mines Co. the accounts show a profit of £76,923 16s 11d, which with the carry forward from the last balance sheet, £20,778 7s 4d, has placed at the company's disposal £97,702 4s 3d. During the year the company treated 150,488 tons of ore, which is the largest ever passed through the mill. The average yield was \$7.14 per ton against \$7.05 last year, but this increase has been offset by an increase in costs of 30 cents per ton. In the Argentine section of the property exploration work will not be continued, at least at present. The lower levels of this section contain a large tonnage of ores carrying lead, zinc and copper. In the Montana section practically the whole work of the year has been carried out. About 5159 ft. of development work was accomplished in drifts, raises and crosscuts.

Kokomo.

Recently the Michigan Mining & Milling Co. has installed a No. 10 Imperial type Ingersoll-Rand compressor and several jack-hammer drills. Its main tunnel is in 750 ft. The company is shipping 50 tons per day to the Globe smelter, Denver and an average of 2 cars of lead ore to the Leadville smelter. The ore shipped to Denver is an iron sulphide carrying gold and silver.

The tunnel on the Tucker mountain property, which has been retimbered and tracks laid, has reached the ore. The body is 6 to 7 ft. wide, carrying gold, silver and copper. Among other current producers here are the Robinson, Champion, Felicia, Grace, Wilfley and Colonel Sellers.

Boulder.

The Nil Desperandum is under the supervision of Mgr. Brandt. In the 2nd level the greater part of the work has been done. There is an ore body there 15 ft. wide and 50 ft. long which is being broken down and shipped with but little sorting. In association with this body a streak of telluride from 2 to 4 ins. wide is carefully mined and conserved. It carries from 15 to 30 ozs. gold. A steady output of ore is to be maintained. The second level is to be made the main working level of the mine by extending the level east a short distance to surface. Mine buildings, shops and ore houses will be erected at that point and the lower levels operated from that station. A force is engaged driving the 3rd level east to undercut the old workings which have been

mined out to the 2nd level. This 3rd level will give 100 ft. of stoping ground on an ore body that was a producer of high grade some years ago.

Idaho Springs.

At the Edgar, the operators have drifted in 1100 ft. and are stoping 180 ft. up from the tunnel level.

They have let a lease to Walde & Co. to drive 1500 ft. east from the present workings in the Edgar on the Edgar No. 2 extension of the Edgar. They have a good streak of ore in the breast of the drift, and soon expect to cut the same vein from which the Roy lease extracted a tonnage of high grade. The new operators expect to soon start a raise in the Edgar No. 2. They have 1000 ft. of virgin ground to work to the surface, if the Edgar No. 2 shows up as well as did the Edgar.

IDAHO.

Wallace.

The Consolidated Interstate-Callahan Mining Co., which is controlled by the American Metals Co., is the third largest zinc producing corporation in the world, and it probably will assume even better rank in the next year, as the extensive development under way is more than counterbalancing output from the property. Official reports state that there is more than 5 years' ore supply in reserve at the prevailing rate of production, about 6800 tons monthly of crude lead and zinc ore and lead and zinc concentrates. Plans have been prepared for a 1200-ton mill at Enaville, where a site was purchased a number of months ago, but it is probable that construction will not begin for another year, as it is estimated that there is enough ore in the upper workings of the property on the Nine-Mile side to keep the present plant operating for 3 or 4 years. Several months ago the company acquired the Amazon-Manhattan group on Beaver creek, and the workings of the two properties have been connected by the main working shaft, which has been extended to the No. 3 tunnel of the Amazon-Manhattan. This affords an outlet on the Beaver creek side, and the new branch being constructed up Beaver creek by the O. W. R. & N. from its Murray branch will run within less than a mile of the tunnel portal. The product of the property now is shipped from Sunset station on the Nine-Mile branch of the Northern Pacific railway, the mill and shipping bins being connected with a 10,000-ft. aerial tramway.

Through a defaulted board bill for \$40, Elsie Heller of New York a number of years ago secured possession of the Four S group of lead-silver claims in the Yreka district. This investment has increased to \$30,000, George H. Heller, manager of the Elsie Heller estate, having bonded the property for the latter amount to Edward S. Crane of Spokane, the payments extending over a period of 2 years. The group adjoins the Liston, Polaris and Yankee holdings, regarded as among the most promising partly developed groups in the district, and Crane plans to install a compressor plant and let a contract for 200 ft. of tunneling. The ore already exposed carries a high percentage of silver, and 100 sacks shipped in 1899 are said to have yielded the largest silver values of any ever sent out from the Evolution and Yreka districts.

Under terms of an agreement recorded at Wallace, the Horst-Powell Copper Mining Co. takes over the control and operation of its property, held under option by the Empire Copper Co., of which Alfred Page and Andrew Devlin are heavy stockholders. The original option on the property was given to Alfred Page in November, 1914, and was subsequently assigned to the Empire Copper Co. The property consists of five lode claims, millsite and water right located on the Little North Fork river, about 15 miles from Enaville. For the last 2 years the property has been under steady development, and the mill has been constructed and put into operation during last summer. It is recited in the agreement that the Empire Copper Co. in developing and equipping the property has become indebted \$75,000, and is unable to meet its obligations. Under the agreement the option of November, 1914, is extended for 2 years, and the Horst-

Powell Co. waives its rights to royalties under option. The Empire Copper Co. turns over the property and the mill to the Horst-Powell Co., which will operate the mine, and it agrees to collect all money due and to pay all operating expenses, and pay over to the Empire Copper Co. 90% of the net profits of \$75,000 to liquidate the present outstanding indebtedness. It is stipulated that the Horst-Powell Co. does not assume any responsibility for debts of the Empire Co., and that if the option is not exercised on Jan. 2, 1919, the Empire Co. waives all right to remove any machinery, equipment or mill from the property, and that title shall pass to the Horst-Powell Co.

In a report to stockholders of the Highland-Surprise Mining Co., P. F. Rogers, general manager, intimates that there is a reasonable belief that the corporation soon will be paying dividends. Conditions at the property are better than ever before, and a revision of the smelter contract has been secured that will add between \$3 and \$5 a ton to the net value of the concentrates. During the last year the company has enlarged and improved the mill at considerable expense and development in the mine has blocked out about 160,000 tons of ore. Besides this block in the Highland Chief, there is another block in the Surprise, the extent of which has not been determined. During the last month changes in the flotation plant were made by T. Owens, general mill superintendent of the Federal Mining & Smelting Co. When the changes were completed it showed a considerable increase in recovery.

Murray.

At the annual meeting of the stockholders of the Murray Hill Mining Co. in Spokane it was decided to begin sinking a 2-compartment shaft as soon as the supply of water for power is available, according to President C. E. Mallette. The shaft will be sunk at a point about 1200 ft. from the portal of the tunnel and at a depth of 750 ft. It will start on an ore shoot about 3½ ft. wide and which has been proven for a distance of 70 or 80 ft. The ore is of excellent milling grade, yielding a zinc concentrate, it is said, of from 49 to 52%. The company has a mill and water power for all purposes, and is altogether well equipped for operation. The following officers were re-elected: C. E. Mallette, Spokane, president; J. C. Feehan, Murray, vice-president; C. C. Tenny, Spokane, secretary.

Owing to the shortage of water and other difficulties in handling the ore, the Golden Chest mine has suspended operations for the winter. The Golden Chest came into prominence during the last year on account of the large amount of tungsten ore in connection with the gold, and considerable expense was incurred in changing the mill to recover both metals. While these changes were not as successful as was anticipated, they demonstrated the practicability of the system. In the meantime the price of tungsten has dropped from the high level of a year ago to about \$17 a unit. At this figure it is still a very valuable factor in the Golden Chest ore, and it is reported that the owner of the property, Vivian Green of New York, is now considering the construction of a new mill with the view to a close recovery of both the gold and tungsten.

LAKE SUPERIOR.

COPPER.

Houghton.

About 17,000 employees will participate in a bonus distribution on Jan. 1. This bonus was announced last summer. It is the additional premium, over the regular increase in wages, of 25 cts. for every employee who works July 1 to Jan. 1 steadily. It is expected that the same or a larger bonus will be announced for the first half of 1917.

Copper Range will at each of its mines make a larger production than that of last year, when Champion had 33,407,599 lbs., and Baltic 12,028,947, and Trimountain 8,302,896.

Hancock's own shaft No. 2 has been examined from top to bottom, which is a very few feet short of 4000 ft. deep. All five veins were visited. All the lodes Nos. 2, 3, 4, 8 and 9, were found to be well opened in length, and though some

of them are only 4 and 5 ft. wide, they all carry the rock in profitable values. The No. 4 lode is narrow, but the copper is almost sure to be there; No. 8, the Pewabic or Quincy, is really the best, and barrel work was seen sticking out of the sides of the drifts and the stopes everywhere. The rock has run somewhat low in grade at times owing to so much new work; costs have been high because of so much dead work in the way of crosscuts. With the present abundant supply of men Manager J. L. Harris will rapidly increase his production, as he has everything underground ready; the ground opened up ahead is sufficient if no further new work should be done for some time; a winze from the 44th level down to the 49th has been completed, and another from the 49th to the 53d is almost completed, the two to be used for chutes for rock and for man-way, so that intermediate and sub-levels can be opened; and a connection at the bottom with the Quincy shaft No. 7 and other openings has been made, so that a lively current of air is constant and the company's richer ground on the Pewabic is being steadily prepared for stoping. Pres. J. D. Cuddahy says the company is now out of debt and that the earnings are at the rate of \$6 annually.

Michigan is meeting with good grades of copper in all three of its lodes. On the Evergreen $1\frac{1}{4}$ tons of mass and the usual amount of stamp values was taken out in the 26 ft. opened by drifts; the first 8 ft. were only fair, but the remainder with this heavy mass has high values, which are still being laid bare in the faces of the drifts. On the Ogimah, which has the reputation of carrying nothing but stamp varieties, a second bunch of mass in the 180 ft. covered is now being passed through. On the Butler in the western drift the diamond drill that has been seeking the good ground since it was lost about 3 weeks ago through a fault, was turned to the fault instead of away from it, and the good grades were encountered in a short time. In the eastern drift on the 5th level it is expected that the top of the raise made from the 6th level will be cut into at any time.

Cherokee has high grade in the shaft, which is 7 by 12 ft., being made purposely small so as to explore the lode with as little expense as possible and it found the width of its vein at the depth of 118 ft. by a crosscut to be 29 ft. with the first 10 ft. of good values, and some copper all the way in the rest. One drill in the eastern drift on the 118 level will be operated both shifts, and the other two will do the sinking. All the openings have averaged very high from the start.

LaSalle has very good grades so far in the drift on the 32nd level that is being extended from the Old Osceola, and that has a length of over 500 ft., about 200 ft. being made monthly. This means very much for this property even if it is at a great depth. A crosscut might be driven over from the Kearsarge lode at the bottom of LaSalle shaft No. 1 on the 21st level, to test its mineral contents, though the distance, 2200 ft., is quite long.

Isle Royale is in splendid condition at present, as it is so far ahead of its own and the available stamp service at the Centennial-Allouez mills that it has had to stop hoisting at one of its shafts in the past week because the rock could not be taken away. Drifting south of No. 7 shaft has been started, so as to get a tonnage ready here as soon as possible, to ascertain the grade of the copper, and if it is good, which there is every reason to believe it to be, to probably drive out the long drift that can be used some time in the future for raising when a new shaft is sunk. The foundations are all ready at No. 7 for the new wooden rockhouse which will be begun within 2 months.

Superior is sending to the Centennial-Allouez mill about 12 to 13 cars or 540 to 585 tons of rock daily, and about 14,500 tons monthly. Shaft No. 1 is bottomed at the 29th level and it is understood that considerable drifting is being done with not much success; but the mine has the advantage of having a few years reserves ahead, and there is at least an even chance of its finding other mineralized areas before this supply is exhausted.

Houghton is cutting out the good copper ground at the bottom level, the 12th, and is opening into an excellent quality of rock that will go far in spite of the great expense

of getting it to the surface towards paying for the disbursements being made for the present work at the mine.

New Baltic is now down about 65 ft. with its shaft, and the work is going rather slowly owing to quite a large quantity of water that is apparently coming up from the lode. The latter is thought to be very near, as a large piece of well mineralized amygdaloid was met with, and also from the presence of the water. The water is being pumped out after great delay now common in getting supplies.

Michigan Smelter which smelts and refines the copper of the Copper Range, Mohawk, Wolverine, Lake and Franklin, in October and November produced an output of 9,000,000 lbs. of refined copper; its normal is about 6,000,000 and the increase was due to the scrap copper that came from the manufacturing of Detroit to be smelted for commercial use. The output this month will be considerably smaller, as there is no scrap copper coming. Of course this resmelting is profitable business for the smelter.

IRON.

Iron Mountain.

Recently the Indiana stopped shipping for the season with a total of 45,000 tons. The mine will employ a considerable force throughout the winter. Some ore will be mined and much development work done. An electric haulage and pumping plant will be installed, the work to be done by company men under the direction of Supt. Richards.

The stock-pile steam shovel suspended operations at the Pewabic Dec. 6 and the last shipment from the mine was loaded at Escanaba on Dec. 7 which amounted to 34,000 tons. The total for the year was about 300,000 tons. A fairly large force will be kept to operate the mine through the winter.

The Dober mine at Iron River was unsuccessful in its attempt to do away with sulphur fumes by flooding the mine so as to extinguish the fire in the slate formation which is the source of the sulphur fumes in the mine. The mine, however, will not be abandoned, but General Supt. Davidson will try other methods to accomplish this end.

Ishpeming.

The Cleveland-Cliffs Iron Co. and Oliver Iron Mining Co. will adopt a 10% wage increase Dec. 15. This is the third increase in less than 2 years. All employees in the mining departments of these concerns will share in the increase, a total of nearly 4000 workmen. Other companies, including the Republic Iron & Steel Co., operating the Cambria and Hartford mine in Negaunee, announce a similar increase.

MISSOURI-KANSAS.

Joplin, Mo.

Zinc ore slumped during the past week, top grade ores to \$100 and seconds down to \$90, a cut of \$5 per ton on the former and \$10 per ton on seconds. Friday, however, after several days of weakness and lack of demand the market steadied and there is hope among producers that the coming week will see higher prices. Lead took a decided jump during the past week. Sales were reported as high as \$97 top basis, ranging down to \$87.

The Empire District Electrical Co. has replaced one of the two generators recently burned out, and is able to furnish about 60% of the normal demand to the Joplin district. They expect to complete the installation of an entire new set of machinery shortly, when there will be an adequate supply. The majority of mines which have been closed down on account of lack of electric current are now running one shift.

The C. S. & P. Mining Co., composed of O. E. and Harry Stephens and LeRoy Clayton of Joplin and W. T. Pennington of Wilmington, Del., is making fair sized turn-ins. The mine is located on an 18-acre lease of the Stephens land about 1 mile northwest of Four Corners. After a number of drill holes had been put down, with good findings, a shaft was started 2 months ago and has been completed to

a depth of about 123 ft. The property is just north of the old Abou Mine, which was a fine producer 20 years ago, and a big dividend payer when ore was bringing only an average of \$15 per ton.

The Baldry Mines on the E. Rose land south of Joplin have greatly augmented their output of silicate and lead by adding another working force. Two crews have been put to work at the No. 2 shaft, which recently was drained. One crew will go after the lead at the shallow level and the other after the silicate deeper down. At the No. 3 shaft two crews also have been put to work, but here both will work on the silicate.

The old Grand Haven mine at Midway, which will be known in the future as the Tonotwa property, has been taken over by Asquith and Berlin, who will open up the property. This formerly was a good producer, the ore body being worked at the 175 to 190 level. A total of seven drill holes have been put down by G. A. Shively on this property, four of them being particularly good.

Webb City, Mo.

The Red Bird Mine, south of Cartersville, is producing 125 to 135 tons of concentrates per week, the mill being operated one shift only. Besides this the output of sludge is considerable. The Red Bird has a double compartment shaft, one of the largest in this field.

Two shafts are going down a short distance south of the Baltic and Onamena Mines at Duenweg and both are now in good ore. Although the shafts are only a short distance apart, they are being put down by different companies and on different leases and tracts. Wampler and Co. are putting down one on the Hackett land, and Shoemaker and Co. are putting down the one a short distance to the north, on the Norton tract. At the Wampler shaft good lead was encountered in addition to the blende.

The Coahuila Mining Co. has started up its No. 1 plant at Duenweg once more, after a shutdown since last Sept. The No. 3 plant, which was completed and placed in operation during the summer, has been going steadily with good production. It is one of the biggest plants in the district. Coahuila some time ago purchased a 40-acre lease to the northeast of the No. 1 mill, and drilling has been under way on it for some time.

Miami, Okla.

The Piokee Mining Co. has started the erection of a new 250-ton mill on its 80-acre tract $\frac{1}{4}$ mile east of the Picher properties at Picher, Okla. It is expected the new plant will be completed within 90 days and will cost about \$40,000.

Church & Wright have an 80-acre tract near the Blue Bird & Lennan, which is under development. A shaft is being sunk. Drill holes uncovered rich faces of ore which assayed as high as 32%. The ore lies in disseminated form. Also, east of the famous Welsh mines in the Century camp, these operators have a 240-acre tract which is under development. Four drill holes have been put down and showed ore that assayed 14.30% and higher. A shaft has been put down to the 135 level. A mill will be erected on this tract as soon as the ground is more thoroughly developed.

The Golden Rod Co. has 300 acres leased near Cardin and have purchased the Cramer concentrating plant at Cave Springs and moved it to a lease near Cardin. The mill is nearing completion and will be in the producing class soon.

Chas. Swartz has begun the construction of a 400-ton concentrating plant on a tract 1 mile east of Picher. The boilers have been installed and one derrick is up. The tract has been thoroughly drilled and the ore body proven.

The Rex Mining Co., which has leases on 105 acres at Cardin, has been making some good strikes, and will build a mill soon.

MONTANA.

Butte.

The stock of the Davis-Daly Copper Co. is traded in on the Boston stock exchange, the issue having been favorably passed upon by the governing board recently. For some

time Davis-Daly stock has been one of the leaders in the the trade on the Boston curb. It also is listed on the New York curb.

It is unofficially stated that the management of the North Butte Mining Co. has decided to sink a shaft in its east side property which is now being developed by the Northwestern tunnel, now in a distance of 600 ft. It is stated that the tunnel has been driven through well-mineralized ground and that the ore showing is such as to encourage the sinking of a shaft to a depth of 1500 to 2000 ft. for the further development of the property. The location of the shaft has not been decided on definitely. Last month the tunnel was driven 425 ft.

The East Side Mining Co., lessee of the Butte Bullwhacker property, has contracted with the Garfield smelter for the treatment daily of 100 tons of Bullwhacker ores. The agreement, it is understood, was consummated during the recent visit to Butte of E. L. Newhouse. It is stated that the leasing company during November earned net, above the amount paid the Bullwhacker Co. in royalties, approximately \$11,800. Including the royalties the net earnings for the month totaled about \$25,000.

Work of cutting through the new ore shoot recently disclosed in the Main Range mine of the Tuolumne Co. has been completed, showing the body to have a total width of 30 ft. Assays of 15 ft. of the vein returned 8% copper and 16 ozs. silver. The balance of the vein shows 4% copper and 6 ozs. silver. The ore bins at the Main Range mine have been filled while the shoot was being cut through and as a consequence new bins are being built. The management will install a 200-hp. electrical pump on the 700 level and two new boilers each of 175-hp. capacity have been purchased. These will give increased capacity for the steam line which runs from the Main Range to the Colusa-Leonard and both hoisting plants can be supplied with power from one central boiler plant.

The Great Butte Copper Co. has concluded the work of unwatering the Butte & Bacon shaft down to the 500 level and is installing a new electric pump. From the 250 level to the old station on the 500 the shaft was found to be filled with mud, rock and timbers. In order to reopen the shaft it was necessary to retimber portions of it, and at places piling had to be driven to hold the running ground. From the 500 level down, however, the shaft is apparently open, and as far as can be ascertained the timbering is in good shape. If it is possible the water will be bailed out, for which purpose a 300-gal. tank will be used. The Great Butte surface plant has been completed, although some little equipment for the sawmill and blacksmith shop is yet to arrive, being expected this week.

Missoula.

The Clinton district of Missoula county, with which two companies of Spokane investors have become identified recently, is the scene of a rich strike of bismuth ore running well in the metal. A report of the discovery has been made by Fred G. Bond, Missoula, who says: "The strike was made on the Senate group. The vein is 6 to 8 ft. wide and is composed of crystalline matter in banded form containing metallic bismuth. The dimensions of some of the larger cubes are $\frac{3}{4}$ by $\frac{1}{8}$ by $\frac{1}{16}$ of an inch. Ore was drifted on 45 ft. before discovery of the bismuth, it having been mistaken for lead-silver ore. The hanging wall is quartzite and the foot wall Butte granite. About 2 tons are on the dump. The apex of the vein is traceable 2000 ft.

Spokane operators who invaded the Clinton district recently are developing copper properties on which they report the exposures of highly promising conditions.

Troy.

E. M. Sander, an expert diamond drill man of Libby, left here for the Sylvanite mining district to take charge of the Jim Hill mine, a property of the Yakt Valley Mining & Milling Co., of which H. J. Ehlers is president and manager. A gold-bearing body of milling grade, said to be 45 ft. wide in the upper workings, is to be sought by a tunnel to be driven 1000 ft. A 200-hp. plant is to be installed on Fourth of July creek for the generation of electricity for mine operations and camp illumination. Among those behind the enterprise are V. D. Evans, of Fairview; V. R. Mitchell, of

Brockton, Mont., and L. G. Blanchet, of Grand Forks, N. D. The property is in northwestern Montana, near the Montana-Idaho line.

NEVADA.

Tonopah.

The Tonopah Mine Operators' Association has voluntarily increased the wages of all miners from \$4 per 8-hour shift to \$4.50. The same scale of advance applies to all workers, consequently machinists are receiving \$5.50 per day. The scale will remain in force while silver remains above 70 cts., and means the addition of \$22,500 to the local payroll. Tonopah operators are demonstrating their confidence in a still higher value for silver by their retention of huge stocks of the metal. The amount of silver held in storage by the Tonopah Mining and Tonopah Belmont companies is said to be fully 2,000,000 ozs., and several smaller companies are also awaiting higher prices.

The upward swing of the silver market, and the growing output of Tonopah properties lacking milling facilities, has generated a demand for the operation of more stamps. The Rescue Eula, Halifax, North Star and other properties are hampered by the inability of the active mills to take care of their maximum yields, and it is understood the Montana-Tonopah Co. has been encouraged to place its 40-stamp mill in commission. Much ore in the district formerly too low-grade to profitably work has now become remunerative as a result of the silver advance.

Goldfield.

The Red Hill Florence Mining Co. has been formed by local people to operate the Red Hill and Florence American mines, the latter formerly known as the Florence Extension. The group adjoins the Florence and Goldfield Con. properties and is believed to contain the main Florence vein and other valuable ore bodies. Orders have been placed for a 50-hp. electric hoist and large compressor and developments will be carried on from the 800-ft. Florence American shaft. The Red Hill property has been opened to a depth of 400 ft. and contains large bodies of good quartz. A. H. Howe, of the Goldfield Con. Co., has been chosen secretary.

Black sulphides, closely resembling the pay ores found in the Goldfield Con., Jumbo Extension and other mines east of the Columbia Mountain fault, have been encountered at a depth of 200 ft. in the third drill hole going down on the Silver Pick. Crosscutting from the 1100-ft. level is advancing rapidly east and west, with ore indications showing steady improvement.

It is reported the 50-ton flotation plant that has been operated on Laguna gold-copper ore by the Goldfield Con. will be devoted to treatment of ore from the Atlanta mine shortly after the 1000-ton plant goes into commission. Vast quantities of copper-gold ore have been blocked out in the Atlanta, particularly between the 1450 and 1750 levels. The Atlanta is controlled by the Wingfield interests, chief owners of the Goldfield Con. group.

Gardnerville.

New York people have taken the Ruby Hill copper mine under bond, and operations have begun under the management of R. C. Walker. The Ruby Hill has been extensively prospected with drills and shafts and contains large deposits of good ore. It is reported a plant may be erected in the spring.

Rawhide.

From the 600 level of the Nevada New Mines group a winze has been sunk 120 ft. and shows the ore body strongly defined and about 16 ins. wide. It has been followed all the way from surface and is proving the most persistent vein ever found in the camp. Gold and silver occur; 25 tons of ore are milled daily at the Black Eagle plant. Preparations are being made to increase the working force and a heavier output will be maintained next spring.

Elko.

The plant for production of gasoline from the extensive beds of shale near Elko has been completed, but the manage-

ment has decided to wait until the spring before starting operations. Crosscutting from the 100 level of the shaft is going forward in shale said to contain considerable paraffin. Manager Robert Catlin has returned to New York for the winter but experiments will continue in charge of T. J. Hoover.

Jarbridge.

George Wingfield has again entered the Jarbridge camp, and this time has secured the Elmore claims. This property is situated on the ridge between the Long Hike and the Bourne mines. A. L. Rinearson had been prospecting on these claims for the past 2 years and had found a good vein in place. Wingfield's engineer, J. O. Greenan, has been opening this vein and has several feet of ore that pans well in free gold. Wingfield has a corps of three engineers in camp examining several other properties.

The Tacoma interests have bonded several groups of claims and have let contracts for considerable tunnel work. On the Legitimate a compressor outfit has been installed to push the crosscut tunnel to the vein.

The Elgoro Mines Co. has recently been incorporated to take over the numerous interests of Shoup and Sloss holdings in the camp. This company has been operating over a year, and most of the claims which were bonded on one year's time have now been fully paid for and the company has started patent proceedings on 24 claims, including the Long Hike mine.

NEW MEXICO.

Lordsburg.

This district, which has long been considered a one-mine camp, is rapidly waking up. There is a good demand by the smelters for these silicious ores and though the market is practically closed to small shippers of base ores, the difficulty in getting ores out of Mexico has placed a premium upon these silicious ores which has stimulated the mining industry here.

The "85" mine is continuing to ship its usual 10,000 tons per month, mostly to the A. S. & R. smelter at El Paso, though the C. & A. smelter at Douglas, Ariz., has been getting several thousand tons per month of surplus output. Development work continues, they having reached the 570-ft. level with a winze from the 450-ft. level. A station is being cut and a raise will be run to connect with the main shaft. It is reported that the ore bodies show greater width as depth is attained.

Warner and Yates of Beloit, Wis., were here to attend the annual stockholders' meeting, there being but eight stockholders in this company. The dividend rate has been 2% per month on a capitalization of \$1,000,000.

The Bonney Mines, recently purchased by David J. Evans and W. T. McCaskey of Chicago, who have organized the Western Mining & Development Co., to handle this property, is shipping steadily. The ores are the richest produced in the camp and the property gives promise of making a big producer. While development has hardly started, they shipped last month seventeen 50-ton cars to the Copper Queen smelter at Douglas. The ores are high grade, the ore bodies from 4 to 8 ft. wide and very well defined. It is an ideal concentrating proposition and tests are now being run to establish the advisability of erecting a 100-ton daily capacity mill, in which oil flotation will be a feature. Equipment has been standardized after competitive tests by selecting the "Waugh" stopers, drifters, pluggers and sharpening equipment. A rigid inspection has just been completed by the directors who have authorized extensive improvements to equipment. James P. Porteus is general superintendent and Wm. F. Carroll, assistant.

L. D. McClure of Miami, Ariz., has completed arrangements to take over about 20 mining claims lying between the Bonney and "85" properties. Franklin Wheaton Smith, M. E., has been here for a week examining and reporting upon the various properties, and some very favorable looking property has been secured. While there has been little development

upon these claims so far, there is every indication that valuable ore bodies will be opened up. The men backing the project were the organizers of the Old Dominion Extension Copper Co. of Miami. Claims owned by the following people have been taken over: Scarboro, Block, Reynolds, Trimble, Hayden, Fuller, Chase, Olney, Blackburn, Peterson and Sherer.

Wright Bros., who have the contract for putting down a 3-compartment shaft for the Octo Mining Co. at Lees Peake, are down 150 ft., having been hampered by an excessive flow of water. They are now using a 600-gal. Pierce pump, secured from the C. & A. at Warren, Ariz.

The new company is to be known as the "85" Extension Copper Mining & Development. It is the intention of the new company to begin development work soon.

The Green King, owned by D. W. Briel, Jesus Soto and J. W. Dunn, lying south of the "Happy Hooligan," shows a 3-ft. vein of rich copper sulphide opened at 65-ft. depth. The ore has high-grade sulphides, carrying some oxides. It is reported that an offer for \$50,000 is being considered for the property.

Thomas A. Lister, who owns the Barney Extension group of claims has opened a vein of \$36-ore on the Happy Hooligan at shallow depth. Several parties are after the property under lease and bond.

J. L. Wells, M. E., who has leased the Nellie Gray property, lying 600 ft. north of the Barney, has installed a steam hoist to open up new rich ore recently struck on the south side of the main shaft on the second level.

The Manilla and Mulberry claims, which carry the extension of one of the rich Bonney veins to the east, have been taken under lease and bond for \$25,000 by A. E. Shedoudy. Under the terms of the lease, 20 full shifts per month must be worked and a royalty of 15% is to be paid on all ore shipped. Some very fine ore is being taken out on the 85-ft. level.

A lease and bond has been taken upon the Farley and Kilebrough group of claims by Wright Bros. of Bisbee. The price was \$50,000. The property consists of six claims and three fractions, lying between the Bonney and the "85" properties. A double compartment shaft is now being sunk near the T. A. Lister claims on a 3-ft. vein, showing values in gold, silver and copper.

OREGON.

Riddle.

The Eldorado Copper Mining Co., capitalized for 2,000,000 shares at \$1 each, has been organized by Spokane and Oregon men to take over and operate the Banfield copper mine, 32 miles east of here, on the main line of the Southern Pacific Railway. The reported price is \$300,000, part cash and the remainder stock in the new corporation. The incorporators are Andrew Laidlaw and S. W. Miller, Spokane; C. P. Ritter, attorney of Indianapolis, Ind., and F. W. Beyer, banker, and Henry Banfield, one of the original owners of the property, both of Riddle. "The Banfield mine is one of the best known copper properties in southern Oregon, and many well posted mining men regard it as the largest high-grade copper deposit in the state," said Laidlaw. "The group first was located in 1900 by two half-breed Indians, Thomason and Cantile, and 2 years later Henry Banfield, a mining engineer, acquired an interest. Eventually he secured title to the entire holdings, comprising nine full claims, and incorporated the Douglas-Umpqua Mining Co. to operate them.

"Development has been continued during the last 14 years and six tunnels have been driven, one above the other, the lowest at the face being approximately 900 ft. below the surface. These tunnels and drifts aggregate fully a mile in length, and, conservatively speaking, there are now on the dumps and blocked out in the mine, more than 300,000 tons of ore that engineers estimate will average 4% in copper, besides some values in silver and gold. Only three of the nine known ore bodies have so far been opened, these being 50, 40 and 28 ft. in width. Ten feet of the ore body in the No. 1, or 50-ft. ledge, assays from 7 to 9% copper and 4 ft. of the No. 3, or 28-ft. ledge, shows even higher value. By

continuing the lower tunnel about 300 ft. farther, another big ledge, approximately 60 ft. in width, showing the same surface values as the other ledges, will be opened and approximately 2500 ft. farther south there is still another larger outcrop on which little work has been done, but which looks as promising as any on the property. The tunnel, when it reaches this ledge will have a vertical depth of more than 1500 ft. It is estimated that there are between 10,000 and 15,000 tons of ore on the dumps that carries from 2 to 20% copper, and the new company soon will begin shipping this to the smelter. Our concern is organized under the laws of Washington and the head offices will be maintained in Spokane."

SOUTH DAKOTA.

Lead.

Continuous operations are being maintained at Homestake's tungsten concentrating plant, with satisfactory results. Ore is being taken from the old dumps on the West Lead ground and the shoot in the mine is being developed, furnishing sufficient material to keep the 5-stamp mill working up to about capacity. A car of concentrates, amounting to 25 tons, was sent out the week ended Dec. 9. The grade was 60% or better.

As usual, work has been suspended at the Wasp No. 2. This is because there is no telling when weather conditions of the winter months will increase the production cost and on gold, the company operates with a small profit margin. Some good grade tungsten ore is in sight and work was continued on this after the mining of quartzite was discontinued Dec. 2. It was the intention to put this through the mill and probably make a shipment of high grade in the near future.

Custer City.

Plans for a mill at the Custer Peak, it is said, have been drawn up and construction will probably start in the spring. The water which was encountered while sinking the main shaft has subsided some. The shaft is now cutting formation heavy in pyrite and carrying good gold values. Samples from the copper struck on the 100 level show as high as 14%

Hill City.

The Consolidated Copper Co., recently formed by Pennsylvania interests, is progressing with the work of reopening the Golden Summit mine. Unwatering the main working shaft and workings connected with it is well under way. The water has been lowered to a depth of about 125 ft. From a depth of about 150 ft. on the shaft has been sunk on an incline, a depth of about 230 ft. in all being attained. A boiler and dynamos have arrived and are to be taken to the mine soon.

George Alton has been made manager of the Hill City Tungsten Co. and milling operations are under Supt. Jordan. As yet all of the motors for the mill have not arrived. A drift is being run from the main shaft along the course of the free milling vein that has been exposed on surface for 3000 ft. with an average width of 15 ft. This drift was started from the 100-ft. level of the shaft. It has reached 65 ft. from the station. It is all in ore and average assays show over \$6 gold. Some free-gold specimens have been taken from the vein. It is as strong at the face of the tunnel as when it was started on. The force of miners working will probably be increased shortly and work continued all winter.

UTAH.

Bingham.

The 100-ton sulphuric acid plant of the Garfield Chem. & Mfg. Co. started operations Dec. 1. It is backed by Utah Copper and American Smelting & Refining Co. The leaching plant of Utah Copper mill will not be ready until June 1, 1917. In the meantime Garfield Chemical expects to supply many leaching plants in Montana, Washington and Utah. The plant was constructed at the cost of more than \$500,000

and within a short time will be producing 150 tons a day. It has in connection a concentrating plant, which, with the original plant, will produce three grades of sulphuric acid.

Alta.

Power drills will supplant hand drills at the West Toledo in a few weeks. The most recent work has been in the old upper workings, where a small force of men is now clearing up in preparation for machine work. Lee Glockner will have charge of operations. The property is south of the Cardiff.

A 100-ft. tunnel driven on the Victor 400 ft. under the Tar Baby workings has encountered the lime footwall of the Cardiff. After striking the lime formation, the tunnel has been sent southeast, where it is expected to strike the contact where the fissure intersects. Mgr. Green believes he has struck the Cardiff contact, and says he will cut the Cardiff ore body, which is believed to continue along the contact into the Victor.

During the 9 days previous to Dec. 7 Michigan-Utah shipped 20 cars of \$30 ore. It was all gotten out by leasers. The assays showed 45 cts. gold, 15.15 ozs. silver, 6.15% lead, 3.075% copper, 25.85 insoluble and 13.2% iron. The ore is a mixture from the product from both the City Rocks and Grizzly workings. In the Copper Prince tunnel, the ore is 8 ft. thick, with silver, lead and copper values aggregating \$50. The company has developed this body more than 400 ft. from the Lavinia tunnel to the Copper Prince tunnel and as the ore is continuing to go down the prospect that the Michigan-Utah has of becoming one of the greatest producers of the district continues to grow brighter.

Work on a 55-ft. winze, sunk to develop a bedded vein of silver-lead at Alta Con., has been stopped. These men have been put to work drifting from the Copper Prince tunnel of the Michigan-Utah to get under the bottom of the winze at greater depth, when a raise will be sent up and connection made. General Manager Jacobson said: "This drift will be not more than 150 ft., while another drift that has been started from the same tunnel will be in Alta Con. ground inside of 75 ft. Both these drifts will cut into the low grade body at depth. One of them will be 500 ft. under ground." Arrangements have been made with Michigan-Utah to use its tramway at night to convey ore from the mine to Tanners Flat. It is expected to have 50 to 60 tons moving daily when the rail connection is made at Tanners Flat.

Milford.

Development tunnels in the Black Rock Mining & Milling Co.'s property are nearing mineral zones. The main shaft has been retimbered to the 190 level. A force of men is now sending a drift out to crosscut two fissures that outcrop prominently through the property. These fissures are in the limestone and show good values in copper as well as some gold and silver. They expect to reach the first of these fissures in about 60 days. The two are parallel and not more than 25 ft. apart.

Arrangements have been completed to start regular shipments of commercial ore from the Antelope Star on Jan. 15, 1917. The Creole has been put in shape. Power drills and a compressor are to be installed and regular shipments of 4 cars a week, started during this week. The company has taken over the ground from lessees who have taken out 80 cars netting about \$41,000. An ore body said to be 1880 ft. long, 300 ft. wide and known to be 285 ft. in depth, is reported to have been proved by the lessees. The company is securing its copper from two 20-in. streaks, which yield 23%, while the values in the faces of all the workings range from 3½ to 4% copper and some silver and gold.

Ogden.

Actual operations at the mines of the Wolf Mountain Copper Co. are to begin in a few weeks, says C. A. Harker, president of the company. Development has been steadily going forward within the last year. Mining will progress rapidly because of the proximity of an electric power transmission line, with the further advantage that the property contains a sufficient amount of timber for use as props, as well as an ample water supply. The work of installing a compressor and machine drills is about completed. Reports from the company's engineers are to the effect that 20,000

tons of ore are in sight and the company has not yet tunneled to the main body. Reports on trial shipments show 5.5% copper and 1.5 ozs. silver.

Park City.

At the property of the Three Kings Silver Mining Co. the winze has penetrated the 40-ft. of grey limestone and reached the shale contact. Here some silver and lead values are found. The winze is 130 ft. deep and is sunk from the floor of the 500 level. The winze was sunk on a fissure that strikes into both the Silver King Coalition, where ore is said to have been found, and into the Silver King Con. on the other side. A drift will be sent out southwest from the bottom of the winze into a mineralized section soon.

At the California-Comstock leasers are working on the 200 levels, from which good returns are being obtained. Silver King Con. has purchased the Silver Bell and at Beed's Peak a tunnel is being driven for a carbonate fissure vein. At the Iowa Copper ore is widening with depth in the incline winze. Two shifts are working and a compressor and drills have been ordered.

Eureka.

At Eureka King it is expected to start the new 2-compartment shaft before Jan. 1. It is the intention to sink to the 300 level and crosscut east. This should reach a porphyry dike in about 70 ft. The dike dips west and cuts the limestone. A boarding house for 18 miners is nearly complete and a blacksmith shop and shaft house will be started immediately.

Wages have been increased in the district again, by most of the companies, to the extent of 25 cts. The wages which prevailed after Dec. 1 were: Muckers, \$3.50; miners, \$3.75; machine men, \$4; shaft men, \$4.50.

The tunnel on the 1300 level of Iron Blossom, which was run west to cut a copper body, has failed. The management has now started another drift east and it is believed that work in that direction will result in a strike. It is stated that the copper deposit is 8 ft. wide on the 1200 and is so strong at that point that it cannot hardly fail to extend to the 1300. The mine has been shipping heavily during the past few weeks.

WASHINGTON.

Spokane.

The United Copper Mining Co., which owns and operates the United Copper mine and mill at Chewelah, on Dec. 5th declared the regular monthly dividend of 1 ct., or \$10,000, payable Jan. 15, to stock of record Jan. 1. United Copper resumed dividends last month after a suspension of 4 years. The January payment will increase the grand total to \$60,000, four payments of \$10,000 each having been made in 1912. Arrangements now are being made to list United Copper stock on the New York curb, and the issue probably will be called there in the next few weeks. President Conrad Wolfe states that conditions at the property are the best in its history and that there is every reason to believe that monthly dividends of not less than 1 ct. a share, and perhaps more, can be maintained indefinitely. The mill, remodelled and equipped with a modern flotation and separation system, now is effecting an exceptionally high percentage of saving, and the smelting contract has been renewed at a satisfactory rate. Directors have authorized sinking a 2-compartment shaft from the 1000 level, near the intersection of the crosscut tunnel with the vein, to the 1500 level. Diamond drill exploration has proven the ore for 400 ft. below the lowest workings, and the shaft will be sunk on this body. The shoot has been opened for 1300 ft. by drifts both ways from the crosscut, the vein ranging from 2 to 20 ft. in width and averaging 8. A station will be cut at the shaft collar and hoisting, actuated by electricity, will be installed soon after Jan. 1.

There is greater activity in the mines of the Republic region than ever before and the crude ore shipments from the different properties now are averaging about 200 tons daily, according to George S. Bailey, superintendent of mines for the Northport Smelting & Refining Co., controlled by the Day interests, which recently purchased the Lone Pine-Pearl-

Surprise group of gold claims from the Republic Con. Mines corporation for \$150,000. "We are producing a large part of the tonnage of the camp and extensive development of our holdings is under way," said Bailey. "The 3d, 4th and 5th levels of the Lone Pine claim, opened by an incline shaft, are being extended west on the vein, and a drift is being run north on the vein in the Pearl claim, at a depth of 300 ft. The shaft on the Surprise claim, which covers 2700 ft. of the Surprise vein, is being sunk to the 600 level, and it is probable that an upraise will be run from the 500 level to make the working vertical instead of incline. A 500-ft. shaft, being sunk by contract, now is down 65 ft. on the Last Chance mine, owned by the Lone Pine-Surprise Mining Co., of which Charles P. Robbins of Spokane is president and general manager. A new compressor plant and hoist have been installed at the property, which has a remarkably good showing, and it is believed that production can be inaugurated as soon as the shaft is down to the old workings, opened from the Insurgent claim, adjoining. Shipments are proceeding from the Knob Hill, Hope and Old Republic properties, the latter under the direction of the Rathfon Reduction Co. Production from the Hope, which is under lease, is being made from a new shaft 100 ft. north of the tunnel, in which a depth of 75 ft. has been attained. Production from the Old Republic is being made through the No. 3 tunnel. The Carey Mining Co. and the Adirondack Mining Co. are installing plants in the Sheridan district."

WISCONSIN-ILLINOIS.

Platteville.

Deliveries of zinc ore to smelters and local refining works for the week ending Dec. 9 were reported as follows: To Mineral Point Zinc Co., 49 cars, 1840 tons; Grasselli Chemical Co., 29 cars, 1096 tons; Wisconsin Zinc Co., 32 cars, 1258 tons; National Separators, 19 cars, 783 tons; American Zinc Co., 12 cars, 510 tons; Eagle-Picher Lead Co., 8 cars, 332 tons; scattering, 25 cars, 973 tons; total, 174 cars, 6,792 tons. Four cars of lead ore were shipped, 183 tons. Pyrites came from the reduction works of the Mineral Point Zinc Co., Linden Zinc Co. and National Separators, 770 tons in all. Splendid weather and road conditions, lessened tension in the labor demand not entirely ameliorated, constant power service regarded as fair, and continued high prices for ore combined to stimulate production, the recovery of mine-run ore for the week exceeding 6000 tons net shipments to smelters. The Mineral Point Zinc Co. shipped to smelter direct from its two separating plants to DePue, Ills., 18 cars top grade blende, 671 tons.

Local producers made a weak showing for the week, 1 car coming from the Klar-Piquette mine, 1 from the East End and 2 cars high grade from the Block House Mining Co. to Lanyon Zinc Co.

A faltering spelter market affected price offerings on zinc ore, the range on standard 60% and premium grades of zinc ore going from \$97 to \$105, while medium and second grades were shaded down to \$95 on grades as low as 50% zinc. Lead made new gains, going to \$97 per ton. Low grade shippers had a busy week.

Mifflin.

Grunow, Peacock, Peni, Lucky Six, B. M. & B., Biddick, Cokers, Senator and Big Tom companies figured in the shipments last week, 23 cars all told, 895 tons. The B. M. & B. is installing an aerial tram. The Biddick is milling 25 tons daily. The Senator mine is shut down for repairs, but mill feed is being stacked up at the rate of 100 tons daily. The Big Tom is engaged with drills, in exploration work. The Grunow has adopted the contract system. Peni Mining Co. has closed a deal with Grasselli Chemical for its entire reserve, estimated at 400 tons, 55% zinc. The Lucky Six continues drilling operations with a fair measure of reward. A new plant completed for the Vinegar Hill Zinc Co. on the Yewdall mine is handicapped for want of a sufficient water supply to keep the mill going full time. The Peacock Mining Co. after much underground development is again in mineralized areas and making 10 tons of high grade concentrate

daily. Drills are engaged for the New Jersey Zinc Co. on the Coker allotments and 50 tons of zinc concentrate are recovered daily. Water shortage for milling is reported.

Highland.

Only 1 car of carbonate ore cleared from this district last week. The Imhoff-Egan Co. has been re-organized and a new force of miners are working on the double shift. The Burrichter Co. made a rich strike of lead ore. The Red Jacket mine is operating steadily with fair returns. New Jersey Zinc Co. continues drilling operations in a quest for water to furnish a new 200-ton mill, complete and ready for service with the necessary supply to insure steady milling. Fifty men will be required as soon as a supply has been obtained. Saxe-Lampe Co. is working 40 miners on double shift and is in a strong deposit of bone and lead. Sphalerite in volume is coming in with indications of deposits in volume ahead. Two cars of ore are recovered weekly, but a much better showing it is said will be made.

Dodgeville.

This district is waking up and showing form. New shippers to report last week were the Guthrie Mining Co. and Pengelly Mining Co., the former with 2 cars of hand-cleaned jack and the latter with 1. Shipments of high grade zinc ore came from the O. P. David at Montfort last week, 44 tons. One car of lead ore was delivered to the Eagle-Picher Lead Co.

Cuba City.

The National Separating Works, running full time, turned out 5 cars of premium grade jack to Illinois Zinc Co. last week, 197 tons; 5 cars to American Zinc Co., 210 tons. The reduction works of the Linden Zinc Co. yielded 2 cars of premium grade delivered to American Metals Co., 76 tons. The G. O. P. Mining Co., made up of Platteville mining men and now operating the Big Eight mine, made its initial shipment to Benton Roasters, 1 car, 40 tons.

Benton.

Shipments last week reflected old time form, 70 cars of zinc ore going to track for a total of 5,734,000 lbs. The Wisconsin Zinc Co. took the lead on tonnage delivered, 15 cars, 618 tons, going to the Skinner Separating plant from the C. A. T. and Champion mines. New Jersey Zinc Co. came up strong with 13 cars from the Fox and Penna-Benton mines, 520 tons, to Mineral Point Reduction works. Frontier Mining Co. to Grasselli, 11 cars, 438 tons; Vinegar Hill Mining Co. from Blackstone, Martin and Kittoe mines, 9 cars, 380 tons; Fields Mining & Milling Co. to Grasselli under contract, 9 cars, 280 tons. Longhenry, Indian Mound and Sally Mining companies to separators, 1 car each. Benton Roasters, finished ore to Eagle-Picher Co., 50 tons; Wisconsin Zinc Co., all high grade to American Zinc Co., 4 cars, 170 tons; to Eagle-Picher Co., 5 cars, 200 tons. The Buchan Mining Co., incorporated earlier in the year, is down in ore through a shaft that entailed much labor, heavy pumping and much shooting. New equipment has been provided and the Buchan will soon be recognized in connection with shipments.

Shullsburg.

The Winskill mine, has increased its output of zinc ore and shipments last week were run up to 7 cars, 267 tons, to Skinner Separating plant. Welsh & Co. marketed 2 cars of sludge, 66 tons, and the Mulcahy mine delivered 5 cars of premium refinery ore to Edgar Zinc Co., 210 tons.

Hazel Green.

Improvement was shown in shipments of zinc ore from this district last week, the Kennedy mine sending its usual 4 cars, 160 tons; Cleveland Mining Co. to Grasselli, 2 cars, 80 tons; to Wisconsin Zinc roasters, 2 cars, 80 tons; Lawrence Mining Co. to Galena, 3 cars, 120 tons.

Galena.

The Black-Jack maintains its reputation as a producer, sending 6 cars crude ore to Mineral Point, 240 tons; the Birkbeck mine, a Wisconsin Zinc Co. development, has not been opened up to full advantage, but it figured in the shipments last week with 1 car. Graham and North Unity to Cuba, 5 cars, 195 tons. Only 2 cars of high grade refinery ore cleared for the week and were from the Wisconsin Zinc Co.'s Joplin works to American Zinc Co., Hillsboro, Ill., 90 tons.

WYOMING.

Lander.

A. E. Minium during the past year has opened up his asbestos property enough so that a good idea of its extent and quality can be determined. The fibre is good and it is selling for an average of \$125 a ton. Recently D. A. Dom, representing the Phillips-Carey Mfg. Co., Cincinnati, made an examination of the properties. If this is favorable, Phillips-Carey will probably purchase the property for a source of raw product for the company.

CANADA.

BRITISH COLUMBIA.**Trail.**

The Consolidated Mining & Smelting Co., which owns and operates the Trail plant and a number of mining properties in British Columbia and northern Washington, has declared its first quarterly dividend for 1917. The payment, to be distributed Jan. 2, to stockholders of record Dec. 31, will be at the rate of $2\frac{1}{2}\%$ on the issued capitalization, or \$210,867, and will increase the grand total to \$3,306,892. The share capitalization of the company was increased several weeks ago by 25%, the additional issue to be subscribed for by the old stockholders at par, \$25 a share, subscriptions to be limited to one share of the added stock to each four shares formerly held. All stock on which full payments have been made by Jan. 1 will participate in dividend declarations thereafter, according to the official announcement, and this leads to the belief that none of the new issue will be eligible for the disbursement Jan. 2.

Phoenix.

On a basis of 29-ct. copper, the Granby Con. Mining, Smelting & Power Co. is earning at the rate of \$66 a share annually, according to official report, and it is believed that the regular quarterly dividend, to be declared in February and paid in March, will be increased from \$2 to \$2.25. Disbursements were increased from \$1.50 quarterly to \$2 in June, 1916. Anyox production at the present time is a little less than 3,100,000 lbs. per month, or at the rate of 37,000,000 lbs. annually, while at Phoenix the output of about 1,275,000 lbs. per month is equal to about 15,300,000 lbs. annually. Total output of the company, therefore, is at the rate of over 52,000,000 lbs. of copper per annum. The cost of production at the Hidden Creek property is about 9 cts. compared with 15 at the Granby, or Phoenix property. Earnings at Hidden Creek, on 29-ct. basis, are at the rate of \$7,500,000 annually, and at Phoenix \$2,500,000, making Granby's earnings at the present time at the rate of \$10,000,000, or about \$66 per share on the 149,985 shares of outstanding capital stock. President E. P. Earle stated at the annual meeting in November that Granby had participated to a considerable extent in the 448,000,000-lb. order for copper placed during September for the allies. As this order was placed at around 26 cts., due allowance must be made, and as the annual report of the company for year ended June 30, 1916, showed a net surplus of over \$3,800,000, which is more than sufficient to take care of the outstanding bonds, Granby in the fiscal year to end June 30, 1917, should show net earnings of at least \$7,500,000, or \$50 per share.

Silverton.

The Standard Silver-Lead Mining Co. has declared the regular monthly dividend of $2\frac{1}{2}$ cts. a share on the total capitalization of 2,000,000 shares, making \$50,000 payable Dec. 10 to stockholders of record Dec. 1. This will make the payments for the current year \$600,000 and will increase the grand total to \$2,400,000, or \$1.20 the share paid to shareholders since disbursements were inaugurated in 1912.

Sandon.

Solid lead ore in a body of undetermined size has been struck in the property of the Slocan Star Mines, according to Oscar White, superintendent. The strike was made on the No. 3 level, where a greater part of the zinc ore has been

stoped in recent months. The announcement came close upon the strike, so little time for further investigation has elapsed. The No. 3 level is in the old workings at a depth of perhaps 500 ft. The zinc shoot at that horizon has a width of 18 to 20 ft. The new body is attractive in its speculative possibilities. One of the largest of these possibilities would be the succession of zinc by lead in a body of those dimensions.

ONTARIO.**Cobalt.**

At the Dominion Mines surface development is being done on a north-south vein and they will be developed underground when colder weather prohibits surface work. The vein strikes towards the high ridge in the Keewatin formation. The management is of the opinion that the vein will become a producer. It is from 1 to 2 ins. wide and the shoot has been proven on surface for 150 ft. Four or five other veins have been located but these do not contain high grade. About 2 tons of high grade have been sacked which, it is said, run 25 ozs.

At a recent meeting of the Gifford Cobalt Mines Co. it was decided to increase the capitalization from \$250,000 to \$1,000,000. Shares will be offered to stockholders at 5 cts. A new shaft house is now being considered. Work of cleaning the old workings was started in Jan., 1916. Since then a crosscut has been driven at the 200 level east for a distance of 238 ft. and a winze started on a quartz-calcite vein and continued to a depth of 110 ft. This vein dipped towards the granite at 59 ft. A $2\frac{1}{2}$ -in. calcite-cobalt vein and a mud-seam 4 ins. wide immediately came in here. In this section of the camp these veins do not carry high values at this depth. The winze, sunk 110 ft., has another narrow vein. These veins all dip to the east and are still in Keewatin. Calcite stringers appear frequently.

Porcupine.

At West Dome new machinery has been installed, a diamond drilling campaign is being pressed and it is expected that by March 1, 1917, the new shaft will be completed to the 300 level. The transformers have been set and a 12-drill compressor is being run by a 100-hp. motor in place of steam. The steam plant will be used in future as an auxiliary. The new hoist has been installed over the recently commenced shaft and to date 30 ft. of sinking has been done. There are 45 men working at the present time. In order to more rapidly sink the new shaft a crosscut is being run from the old No. 1 shaft. It will be continued for 1400 ft. when raising on the new shaft will be commenced.

By diamond drilling at the Porcupine-Keora it is proposed to cut the main vein at a depth of 1000 ft. On surface this vein has in places a width of 40 ft. carrying low grade milling ore. Several other veins uncovered on surface between the main vein and where the first diamond drill hole will be started should also be cut.

Matheson.

Diamond drilling is being done on the property of the Burton Gold Mines, Ltd., in Munro township. A short time ago a promising vein was found on the lot in a section burned clean by the fire. Visible gold was found in the vein and it is now proposed to drill this and the several other veins. Outside of a small amount done by the Croesus to locate a high grade vein at depth, that being done on the Burton is the first time that the diamond drill has been used in Munro township.

Boston Creek.

Diamond drilling on the Crawford-LaPalme claims has been satisfactory and now three shafts are to be sunk. These have been started by hand, but a plant is to soon be installed. The hole was drilled through a wide porphyry dyke which is cut by stringers and veins of quartz. One of these veins gave particularly good results, about 18 ins. showing considerable free gold.

It is being considered to install a compressor at the Boston Gold Leaf in the spring. About 4 men only will be kept during the winter and they will be confined to surface development work. The shaft on the property is down 73 ft. The vein looks good and the average grade is fair. The vein at the lowest point in the shaft is about 3 ft. wide, the walls being slightly irregular, but defined.

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Andrews, E. C.—*Notes on the Structural Relations of Australasia, New Guinea and New Zealand*. [On the correlation of the formation of these several neighboring islands].—Jnl. of Geol. Dec. 1916; p 751; p 26*; 75c.

Ball, Sydney H.—*The Lead Mines of Washington County, Missouri*. [A brief description of the geology of the deposits and operations and methods of working the deposits].—M. & S. P. Dec. 2 1916; p 807; pp 3¼*; 20c.

Johnston, John; Williamson, E. D.—*The Role of Inorganic Agencies in the Deposition of Calcium Carbonate*.—Jnl. of Geol. Dec. 1916; p 729; pp 22; 75c.

Lang, Herbert.—*Black Sand of the Pacific Coast*. [Tells of the mode of occurrence of these deposits which are not of large tonnages, and discusses the possibilities of more extensively working them].—M. & S. P. Dec. 2 1916; p 811; pp 2¼; 20c.

Loveman, M. H.—*The Geology of the Bawedwin Mines, Burma, Asia*. [Complete, detailed description of these lead-zinc sulphide deposits which have been worked since ancient times is given].—A. I. M. E. Bull. Dec. 1916; p 2119; pp 25*; 35c.

Ohren, D. W.; Garrett, R. E.—*Ponca City Oil and Gas Field, Oklahoma*. [The geology, production and other items related to the field are spoken of and it is contended that many of the wells thought dry are not].—Okla. Geol. Surv. Bull. 16; pp 30*.

Palmer, Leroy A.—*A Sedimentary Magnetite Deposit*. [The deposit is operated by the Rex Plaster Co., Bissell, Cal. About 45 tons are produced per day and shipped to Los Angeles. Method of mining is briefly described].—E. & M. J. Dec. 2 1916; p 965; pp 2¼*; 25c.

Schuchert, Charles.—*On Pre-Cambrian Nomenclature*. [A talk on the methods which should be employed in placing formations in various geologic ages].—Amer-

ican Jnl. of Sci. Dec. 1916; p 475; pp 12; 60c.

— *Geology of the Warren Mining District, Arizona*. [Discussion of a previous paper].—A. I. M. E. Bull. Dec. 1916; p 2164; pp 4; 35c.

Ore Genesis

Calkins, F. C.—*Molybdenite and Nickel Ore in San Diego County, California*. [Both ores are considered separately. The deposits to date are prospects, but worth future consideration].—U. S. G. S. Bull. 640-D; pp 10*.

Loveman, M. H.—*The Geology of the Bawedwin Mines, Burma, Asia*. [Complete, detailed description of these lead-zinc sulphide deposits which have been worked since ancient times is given].—A. I. M. E. Bull. Dec. 1916; p 2119; pp 25*; 35c.

Oinouye, Y.—*A Peculiar Process of Sulphur Deposition, Japan*. [Describes sublimation, impregnation and flow deposits and depositions in lakes].—Jnl. of Geol. Dec. 1916; p 806; pp 3*; 75c.

Sellards, E. H.—*Origin of Hard Rock Phosphates of Florida*. [The rock is found as large boulders in a formation of the Pliocene age].—Florida Geol. Surv. Fifth Annual Report; p 23; pp 58*.

Smith, C. H., Jr.—*Genesis of Pyrite Ores of St. Lawrence County, New York*. [The bodies here are widely disseminated, but occur only with rusty gneisses].—New York State Museum Bull. No. 158; pp 40*.

— *The Diastrophic Theory*. [Discussion of a paper by Marcel R. Daly with respect to the genesis of oil and gas deposits from an organic origin].—A. I. M. E. Bull. Dec. 1916; p 2204; pp 7; 35c.

Mineralogy and Petrography

Blake, John M.—*Plotting Crystal Zones on Paper*. [Describes a graphic method and its practical application].—American Jnl. of Sci. Dec. 1916; p 486; pp 7*; 60c.

Loveman, M. H.—*The Geology of the Bawedwin Mines, Burma, Asia*. [Complete, detailed description of these lead-zinc sulphide deposits which have been worked since ancient times is given].—A. I. M. E. Bull. Dec. 1916; p 2119; pp 25*; 35c.

Phillips, Alexander H.—*Some New Forms of Natrolite*. [Speaks of some new crystal shapes found in Ice Valley

district, British Columbia].—American Jnl. of Sci. Dec. 1916; p 473; pp 2½*; 60c.

Weinshenk, Ernst; Johannsen, Albert.—*The Fundamental Principles of Petrology*. [A translation of Weinshenk's book in German. But little is said with regard to the classification of rocks, but is more confined to the origin, present condition and decay of both igneous and sedimentary rocks].—McGraw-Hill Co.; book; pp 214*; \$2.50.

II. ORES AND METALS

(I) METALS AND ORES

Copper

Burch, H. Kenyon; Whiting, M. A.—*Automatic Electric Hoist at the Inspiration Mine, Arizona*. [Abstract of a paper read before the A. I. M. E. The hoist is driven by motors which are automatically driven].—M. & S. P. Dec. 2 1916; p 801; pp 5¼*; 20c.

Hanchett, F. B.—*Daily Sampling in Square-Set Mining, Arizona*. [A method used in the Clifton-Morenci district, whereby the metal content of a set can be told before it is mined out].—Mg. World Dec. 2 1916; p 949; pp 1¼*; 10c.

Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Utah in 1915*. [Separate reviews of operations and production of the different counties. Conditions of the industry in the state as a whole are given and each of the metals is reviewed separately].—Min. Res. of U. S. 1:15; pp 35.

Henderson, Charles W.—*Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1915*. [Both states are reviewed separately and separate reviews of the metals produced and operations by counties are included].—Min. Res. of U. S. 1:14; pp 27.

Shellshear, W.—*Flotation of Gold and Copper Ores at Mount Morgan Mine, Queensland, Australia*. [Abstract of a paper read before the Aust. Inst. of Mg. Eng. The testing of different oils and different methods of concentration are told of].—Mg. World Dec. 2 1916; p 947; pp 1½; 10c.

— *California Mineral Production*.

—E. & M. J. Dec. 2 1916; p 971; pp 1½; 25c.

— *Cost and Extraction in the Selection of a Mining Method.* [Discussion of a previously read paper].—A. I. M. E. Bull. Dec. 1916; p 2180; pp 1½; 35c.

— *Geology of the Warren Mining District, Arizona.* [Discussion of a previous paper].—A. I. M. E. Bull. Dec. 1916; p 2164; pp 4; 35c.

— *Hulett Unloader as Applied to the Handling of Copper Ore.* [An excavator to handle the leached sands from the tanks at the plant of the New Cornelia Copper Co., Ariz.].—Mg. World Dec. 2 1916; p 951; pp 1*; 10c.

— *Leaching Tests at New Cornelia Plant, Arizona.* [Discussion by members of a previous paper].—A. I. M. E. Bull. Dec. 1916; p 2151; pp 8; 35c.

— *Mine Fire Methods Employed by the United Verde Copper Co.* [Discussion of a paper by R. E. Tally; describes the methods used in the mines of the Anaconda Copper Co.].—A. I. M. E. Bull. Dec. 1916; p 2173; pp 7½; 35c.

— *Power Plant of the Burro Mountain Copper Co., New Mexico.* [Discussion of a paper by Chas. Legrand].—A. I. M. E. Bull. Dec. 1916; p 2181; pp 2½; 35c.

Gold Fields and Mining

Eames, Luther B.—*Countercurrent Decantation.* [This article is also in the Bulletin of the Canadian Mg. Inst. The results of many tests are plotted into curves, showing the effect of many of the variables in the process of its efficiency].—A. I. M. E. Bull. Dec. 1916; p 2087; pp 15*; 35c.

Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Utah in 1915.* [Separate reviews of operations and production of the different counties. Conditions of the industry in the state as a whole are given and each of the metals is reviewed separately].—Min. Res. of U. S. 1:15; pp 35.

Henderson, Charles W.—*Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1915.* [Both states are reviewed separately and separate reviews of the metals produced and operations by counties are included].—Min. Res. of U. S. 1:14; pp 27.

Lang, Herbert.—*Black Sand of the Pacific Coast.* [Tells of the mode of occurrence of these deposits which are not of large tonnages, and discusses the possibilities of more extensively working them].—M. & S. P. Dec. 2 1916; p 811; pp 2¾; 20c.

Shellshear, W.—*Flotation of Gold and Copper Ores at Mount Morgan Mine, Queensland, Australia.* [Abstract of a paper read before the Aust. Inst. of Mg. Engrs. The testing of different oils and different methods of concentration are told of].—Mg. World Dec. 2 1916; p 947; pp 1½; 10c.

— *California Mineral Production.*—E. & M. J. Dec. 2 1916; p 971; pp 1½; 25c.

— *Mining and Milling at the Santa Gertrudis, Mexico.* [The cyanide process is used here and the text is a discussion of a previous paper].—A. I. M. E. Bull. Dec. 1916; p 2197; pp 3; 35c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Iron and Steel

Comstock, George F.—*A Method of Distinguishing Sulphides from Oxides in*

the Metallography of Steel. [Points out places where many mistakes are today being made in the use of this art for minutely studying the structure of steel].—A. I. M. E. Bull. Dec. 1916; p 2103; pp 8*; 35c.

Pulsifer, H. B.—*The Determination of Sulphur in Iron and Steel.* [The many methods used in the past and today are briefly described and discussed and the bibliography of 285 articles on the subject is given].—Jnl. of Ind. & Engg. Chem. Dec. 1916; p 1115; pp 8½*; 60c.

Swindin, N.—*The Design of Acid-Resisting Iron Apparatus.* [Tells considerable about the making of castings and treatment of the iron to be used in the same].—Chem. Tr. Jnl. No. 59 1916; p 323; pp 2.

— *The Swedish Iron, Steel and Coal Industry in 1915.* [Some of the statistics, curves, etc., are taken from Jernkontoret's Annaler].—I. & C. Tr. Rev. Nov. 17 1916; p 614; pp 1*; 35c.

Lead

Ball, Sydney H.—*The Lead Mines of Washington County, Missouri.* [A brief description of the geology of the deposits and operations and methods of working the deposits].—M. & S. P. Dec. 2 1916; p 807; pp 3¼*; 20c.

Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Utah in 1915.* [Separate reviews of operations and production of the different counties. Conditions of the industry in the state as a whole are given and each of the metals is reviewed separately].—Min. Res. of U. S. 1:15; pp 35.

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Root, W. A.—*Aspen, Over the Range in Pitkin County, Colorado.* [The history of the camp and several of the companies operating in it are included in the description].—Mg. World Dec. 2 1916; p 943; pp 2¾*; 10c.

Scott, W. A.—*Sulphidizing Carbonate Tailings for Treatment by Oil Flotation.* [While being agitated the crushed ore as carbonate is changed to a metallic sulphide by the addition of sodium sulphide].—Mg. World Dec. 2 1916; p 946; pp 1; 10c.

— *California Mineral Production.*—E. & M. J. Dec. 2 1916; p 971; pp 1½; 25c.

Silver

Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Utah in 1915.* [Separate reviews of operations and production of the different counties. Conditions of the industry in the state as a whole are given and each of the metals is reviewed separately].—Min. Res. of U. S. 1:15; pp 35.

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Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Zinc

Bretherton, S. E.—*Electrolytic Practice.* [Correspondence speaking of previous penalizing for zinc in some ores and the doing away of this through the introduction of the electrolytic process developed by the Anaconda Co.].—M. & S. P. Dec. 2 1916; p 793; pp 2; 20c.

Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Utah in 1915.* [Separate reviews of operations and production of the different counties. Conditions of the industry in the state as a whole are given and each of the metals is reviewed separately].—Min. Res. U. S. 1:15; pp 35c.

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— *California Mineral Production.*—E. & M. J. Dec. 2 1916; p 971; pp 1½; 25c.

— *Statistical Position of Spelter.*—[Editorial review].—E. & M. J. Dec. 2 1916; p 993; pp 1; 25c.

(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Blake, A. F.—*A Graphic Chart for the Valuation of Coal.* [The chart is reproduced and from it the values can be obtained according to the water, ash and B. T. U. content of the coal in question].—Jnl. of Ind. & Engg. Chem. Dec. 1916; p 1140; pp 2¾; 60c.

Brown, J. F. K.—*Tenure of Coal Ages.* [Describes and discusses four systems for the acquisition and operating of coal lands].—Coal Age Dec. 2 1916; p 912; pp 3; 20c.

Campbell, F. W.—*Working Over an Old Mine.* A system being used by the Nay Aug Coal Co., Dunmore, Pa., by which it is mining ground mined and partially

robbed already].—Coal Age Dec. 2 1916; p 924; pp 134*; 20c.

Graham, Thomas.—*Gaseous Mines in the Crow's Nest Pass Coal Field, British Columbia*. [A paper read before the Mine Inspector's Inst. in which considerable is said of the mines of the district and methods of sampling the air].—Coal Age Dec. 2 1916; p 920; pp 3½*; 20c.

Pickup, William.—*Effects of Labor Movements and Legislation on the Economic Position of Coal Mining*. [A paper read before the Manchester Geol. and Mg. Soc., England].—I. & C. Tr. Rev. Nov. 17 1916; p 609; pp 1; 35c.

Pleschner, O. J.—*Design for Auxiliary Shaft*. [This auxiliary hoist shaft does away with the necessity of detouring the air from the shaft around the passages leading to the other shaft compartments].—Coal Age Dec. 2 1916; p 915; pp 1½*; 20c.

—*Stone Dusting in Steam Coal Collieries*. [Discussion before the South Wales Inst. of Eng.].—Colly Guard, Nov. 17 1916; p 953; pp 1½; 35c.

—*The Swedish Iron, Steel and Coal Industry in 1915*. [Some of the statistics, curves, etc., are taken from Jernkontoret's Annaler].—I. & C. Tr. Rev. Nov. 17 1916; p 614; pp 1*; 35c.

Petroleum

Kohbe, William H.—*Problems Connected with the Recovery of Petroleum from Unconsolidated Sands*. [Details for the opening up of such oil deposits are given in detail].—A. I. M. E. Bull. Dec. 1916; p 2253; pp 24*; 35c.

Egloff, G.; Twomey, T. J.; Moore, Robert J.—*The Effect of Temperature and the Time Factor in the Formation of Gasoline in the Gas Phase at Constant Pressure*. [The testing was mostly done with a Pennsylvania crude petroleum oil].—Jnl. of Ind. & Engg. Chem. Dec. 1916; p 1102; pp 3¼*; 60c.

McCoy, A. W.—*Some Effects of Capillarity on Oil Accumulation*. [A paper read before the Geologic Conference of Oklahoma. It deals with the porosity of rocks and the attended capillary attraction as affecting oil deposits].—Jnl. of Geol. Dec. 1916; p 798; pp 8*; 75c.

Ohren, D. W.; Garrett, R. E.—*Ponca City Oil and Gas Field, Oklahoma*. [The geology, production and other items related to the field are spoken of and it is contended that many of the wells thought dry are not].—Okla. Geol. Surv. Bull. 16; pp 30*.

—*The Diastrophic Theory*. [Discussion of a paper by Marcel R. Daly with respect to the genesis of oil and gas deposits from an organic origin].—A. I. M. E. Bull. Dec. 1916; p 2204; pp 7; 35c.

Natural Gas

Clapp, F. G.—*Principles of Natural Gas Leasehold Valuation*. [Discussion of a paper by S. S. Wyer].—A. I. M. E. Bull. Dec. 1916; p 2228; pp 3; 35c.

Ohren, D. W.; Garrett, R. E.—*Ponca City Oil and Gas Field, Oklahoma*. [The geology, production and other items related to the field are spoken of and it is contended that many of the wells thought dry are not].—Okla. Geol. Surv. Bull. 16; pp 30*.

—*The Diastrophic Theory*. [Discussion of a paper by Marcel R. Daly with respect to the genesis of oil and gas deposits from an organic origin].—A. I. M. E. Bull. Dec. 1916; p 2204; pp 7; 35c.

III. TECHNOLOGY

MINES AND MINING

Surveying and Drafting

Parsons, J. L.—*An Office Record System for Civil Engineers*. [Details of methods for filing surveys, literature, etc.].—Engg. & Cont. Nov. 29 1916; p 466; pp 4*; 20c.

Wuensch, C. Erb.—*The Scientific Numbering of Mine Workings*. [A systematic method of numbering mine stopes, drifts, crosscuts and other workings].—E. & M. J. Dec. 2 1916; p 977; pp 1¼*; 25c.

—*Cost Records of Drafting and Engineering*. [Forms and descriptions of the same for the distributing and keeping of costs on different jobs].—Engg. & Cont. Nov. 29 1916; p 472; pp 2*; 20c.

Ventilation

Lewis, W. K.—*Formulas for the Flow of Gases*. [Many formulas are given, derived and discussed which may be applied to work in mine ventilation].—Jnl. of Ind. & Engg. Chem. Dec. 1916; p 1133; pp 6½; 60c.

—*Equipment of the Valleyfield Colliery*. [Gives drawings and description of the steam-turbo and electric plants, besides a description of the coal washing plant and fan and boiler house].—Colly Guard, Nov. 17 1916; p 951; pp 2½*; 35c.

Lighting

—*Cap Lamp with New Feature*. [An electric lamp with a straight filament passing horizontally across the reflector].—Coal Age Dec. 2 1916; p 918; pp 1¼*; 20c.

—*G-E Miners' Lamp Approved by the U. S. Bureau of Mines*.—Mg. World Nov. 18 1916; p 869; pp 1¼*; 10c.

—*History of the Carbide Mine Lamp from the Earliest Days to the Present Time*.—Acetylene Jnl. Dec. 1916; p 303; pp 1½*; 20c.

Dredging

Payne, F. W.—*Dredging for Minerals*. [Deals with the past and present operation of dredges by different companies, pointing out causes for their failure and success].—Mg. & Engg. Rev. Oct. 5 1916; p 17; pp 1¼; 35c.

Sargeant, E. W.—*Centrifugal Pumps and Suction Dredges*. [Among the features of the book is the simple and non-technical manner in which all things are described].—Chas. Griffin & Co., London; book; pp 188*; \$3.

—*Gold Dredging in Yukon*. [Abstract of a paper published by the Minister of Interior, Canada. The doings and equipment of operating companies in the district are reviewed].—Canadian Mg. Jnl. Nov. 15 1916; p 535; pp 10¼*; 35c.

Power Shovels and Excavators

Dixon, C. Y.—*Plant and Method of Dry Excavation, Livingstone Channel, Detroit River, Michigan*. [From Professional Memoirs. Pumping, drilling, costs, equipment used, etc., are included in this review].—Engg. & Cont. Nov. 15 1916; p 425; pp 2*; 25c.

—*Hulett Unloader as Applied to the Handling of Copper Ore*. [An excavator to handle the leached sands from the tanks at the plant of the New Cornelia Copper Co., Ariz.].—Mg. World Dec. 2 1916; p 951; pp 1*; 10c.

Shafts and Shaft Sinking

Scott, W. A.—*The Tonopah Extension Mines in Nevada*.—Mg. World Nov. 11 1916; p 831; pp 1; 10c.

Accidents

Fay, Albert H.—*Accidents at Metallurgical Works in the United States*. [They are given for the greater part in tabulated form and include 1915 only].—U. S. Bur. of Mines Tech. Paper 164; pp 20; 15c.

Geismer, H. S.—*Explosion at the Besic Mine, Alabama*. [Thirty men are believed to have been killed in the explosion in a mine of the Sloss-Sheffield Steel & Iron Co.].—Coal Age Nov. 18 1916; p 835; pp 2¼*; 20c.

—*Coöperative Effort in Mining*. [Discussion by several of a paper by Joseph P. Hodgson].—A. I. M. E. Bull. Dec. 1916; p 2168; pp 4; 35c.

Safety

—*Cap Lamp with New Feature*. [An electric lamp with a straight filament passing horizontally across the reflector].—Coal Age Dec. 2 1916; p 918; pp 1¼*; 20c.

—*Coöperative Effort in Mining*. [Discussion by several of a paper by Joseph P. Hodgson].—A. I. M. E. Bull. Dec. 1916; p 2168; pp 4; 35c.

Rescue and First-Aid

Pettibone, C. E.—*Testing Mine Rescue Apparatus*. [Abstract of a paper read before the National Safety Council. Advocates testing breathing apparatus with 5 ozs. internal pressure].—Coal Age Nov. 25 1916; p 875; pp 2½*; 20c; E. & M. J. Dec. 2 1916; p 985; pp 2½*; 25c.

Labor and Management

Bain, H. Foster.—*Labor Problems in African Mines*. [Interclass struggles, sanitation, schooling, etc., are things being given considerable study].—Mg. Mag. Nov. 1916; p 261; pp 6; 50c.

Key, A. Cooper.—*Miners' Phthisis Prevention*. [From a report of a committee investigating the disease on the Rand, South Africa].—E. & M. J. Nov. 18 1916; p 898; pp 2; 25c.

Pickup, William.—*Effects of Labor Movements and Legislation on the Economic Position of Coal Mining*. [A paper read before the Manchester Geol. and Mg. Soc., England].—I. & C. Tr. Rev. Nov. 17 1916; p 609; pp 1; 35c.

—*Coöperative Effort in Mining*. [Discussion by several of a paper by Joseph P. Hodgson].—A. I. M. E. Bull. Dec. 1916; p 2168; pp 4; 35c.

Production

Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Utah in 1915*. [Separate reviews of operations and production of the different counties. Conditions of the industry in the state as a whole are given and each of the metals is reviewed separately].—Min. Res. U. S. I:15; pp 35.

Henderson, Charles W.—*Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1915*. [Both states are reviewed separately and separate reviews of the metals produced and operations by counties are included].—Min. Res. of U. S. I:14; pp 27.

Ohren, D. W.; Garrett, R. E.—*Ponca City Oil and Gas Field, Oklahoma*. [The geology, production and other items related to the field are spoken of and it is

contended that many of the wells thought dry are not].—Okla. Geol. Surv. Bull. 16; pp 30*.

—California Mineral Production. —E. & M. J. Dec. 9 1916; p 971; pp 1½; 25c.

—Statistical Position of Spelter. [Editorial review].—E. & M. J. Dec. 2 1916; p 993; pp 1; 25c.

—The Swedish Iron, Steel and Coal Industry in 1915. [Some of the statistics, curves, etc., are taken from Jern-Kontoret's Annaler].—I. & C. Tr. Rev. Nov. 17 1916; p 614; pp 1*; 35c.

Mining Miscellany

Ball, Sydney H.—*The Lead Mines of Washington County, Missouri*. [A brief description of the geology of the deposits and operations and methods of working the deposits].—M. & S. P. Dec. 2 1916; p 807; pp 3¼*; 20c.

Campbell, F. W.—*Working Over an Old Mine*. [A system being used by the Nay Aug Coal Co., Dunmore, Pa., by which it is mining ground mined and partially robbed already].—Coal Age Dec. 2 1916; p 924; pp 1¼*; 20c.

Guignon, F. A.—*The Valuation of Bedded Mineral Land*. [Formulas for figuring the value when the mineral is being used, where it is not being used, where mineral is used and land has surface value and where mineral is not being used, but surface has value].—E. & M. J. Dec. 2 1916; p 969; pp 2½; 25c.

Manning, Van H.—*What Can Uniform Mining Laws Hope to Accomplish*. [A paper read before the American Mg. Cong., Chicago].—E. & M. J. Dec. 2 1916; p 973; pp 3¼; 25c. M. & S. P. Dec. 2 1916; p 796; pp 5; 20c.

Robertson, J. A. T.—*An Engineer's Travels in Western China*. [A geographic review of the province of Sze-chuan, China, as related to the mining industries of the province, which are in their primitive stages still].—Mg. Mag. Nov. 1916; p 267; pp 13*; 50c.

Scott, Herbert K.—*Manganese Ores of Bulkwina*. [A paper read before the Iron and Steel Inst., London. Geology of the deposits, methods of mining, mining costs and selling prices and grades of the ore are among items considered].—E. & M. J. Nov. 25 1916; p 935; pp 3; 25c.

—*Cost and Extraction in the Selection of a Mining Method*. [Discussion of a previously read paper].—A. I. M. E. Bull. Dec. 1916; p 2180; pp 1½; 35c.

—*Mine Fire Methods Employed by the United Verde Copper Co.* [Discussion of a paper by R. E. Tally, telling considerable of methods used in the mines of the Anaconda Copper Co.].—A. I. M. E. Bull. Dec. 1916; p 2173; pp 7½; 35c.

MILL AND MILLING

Crushing, Grinding, Etc.

—*A Comparative Test of the Marathon, Chilean and Hardinge Mills*. [Discussion].—A. I. M. E. Bull. Dec. 1916; p 2184; pp 13½; 35c.

Flotation

Ralston, O. C.—*An Explanation of the Flotation Process*. [Discussion of a paper by A. F. Taggart and F. E. Beach].—A. I. M. E. Bull. Dec. 1916; p 2232; pp 2; 35c.

Ralston, O. C.—*The Flotation of Minerals*. [Discussion of a paper by R. J. Anderson].—A. I. M. E. Bull. Dec. 1916; p 2234; pp 2; 35c.

Scott, W. A.—*Sulphidizing Carbonate Tailings for Treatment by Oil Flotation*. [While being agitated the crushed ore as carbonate is changed to a metallic sulphide by the addition of sodium sulphide].—Mg. World Dec. 2 1916; p 946; pp 1; 10c.

Shellshear, W.—*Flotation of Gold and Copper Ores at Mount Morgan Mine, Queensland, Australia*. [Abstract of a paper read before the Aust. Inst. of Mg. Eng. The testing of different oils and different methods of concentration are told of].—Mg. World Dec. 2 1916; p 947; pp 1½; 10c.

Concentration: Sorting, Sizing, Washing

Root, W. A.—*Aspen, Over the Range in Pitkin County, Colorado*. [The history of the camp and several of the companies operating in it are included in the description].—Mg. World Dec. 2 1916; p 943; pp 2¾*; 10c.

Shellshear, W.—*Flotation of Gold and Copper Ores at Mount Morgan Mine, Queensland, Australia*. [Abstract of a paper read before the Aust. Inst. of Mg. Eng. The testing of different oils and different methods of concentration are told of].—Mg. World Dec. 2 1916; p 947; pp 1½; 10c.

Cyaniding

Eames, Luther B.—*Countercurrent Decantation*. [This article is also in the Bulletin of the Canadian Mg. Inst. The results of many tests are plotted into curves, showing the effect of many of the variables in the process on its efficiency].—A. I. M. E. Bull. Dec. 1916; p 2087; pp 15*; 35c.

—*Mining and Milling at the Santa Gertrudis, Mexico*. [The cyanide process is used here and the text is a discussion of a previous paper].—A. I. M. E. Bull. Dec. 1916; p 2197; pp 3; 35c.

Mill and Smelter Costs

Eames, Luther B.—*Countercurrent Decantation*. [This article is also in the Bulletin of the Canadian Mg. Inst. The results of many tests are plotted into curves, showing the effect of many of the variables in the process on its efficiency].—A. I. M. E. Bull. Dec. 1916; p 2087; pp 15*; 35c.

Shellshear, W.—*Flotation of Gold and Copper Ores at Mount Morgan Mine, Queensland, Australia*. [Abstract of a paper read before the Aust. Inst. of Mg. Eng. The testing of different oils and different methods of concentration are told of].—Mg. World Dec. 2 1916; p 947; pp 1½; 10c.

CHEMISTRY AND ASSAYING

Chemistry

Hallett, R. L.—*The Volumetric Determination of Tin*. [Discusses different volumetric methods, pointing out the advantages and disadvantages of each].—Jnl. Soc. Chem. Ind. Nov. 15 1916; p 1087; pp 3; 75c.

Pulsifer, H. B.—*The Determination of Sulphur in Iron and Steel*. [The many methods used in the past and today are briefly described and discussed and the bibliography of 285 articles on the subject is given].—Jnl. of Ind. & Engg. Chem. Dec. 1916; p 1115; pp 8½*; 60c.

Analysis

Hallett, R. L.—*The Volumetric Determination of Tin*. [Discusses different

volumetric methods, pointing out the advantages and disadvantages of each].—Jnl. Soc. Chem. Ind. Nov. 15 1916; p 1087; pp 3; 75c.

Pulsifer, H. B.—*The Determination of Sulphur in Iron and Steel*. [The many methods used in the past and today are briefly described and discussed and the bibliography of 285 articles on the subject is given].—Jnl. of Ind. & Engg. Chem. Dec. 1916; p 1115; pp 8½*; 60c.

Ralston, O. C.—*Graphic Studies of Ultimate Analyses of Coals*. [A graphic method described in detail by which coals are classified and studied according to their chemical contents].—U. S. Bur. of Mines Tech. Paper 93; pp 41*; 20c.

METALLURGY

Electrometallurgy

Bretherton, S. E.—*Electrolytic Practice*. [Correspondence speaking of previous penalizing for zinc in some ores and the doing away of this through the introduction of the electrolytic process developed by the Anaconda Co.].—M. & S. P. Dec. 2 1916; p 793; pp 2; 20c.

Refractories

Nesbit, C. E.; Bell, M. L.—*Testing Refractory Fire Brick*. [Abstract of a paper read before the American Soc. for Testing Materials].—E. & M. J. Dec. 2 1916; p 967; pp ¾; 25c.

—*Refractory Materials*. [A discussion by the Faraday Soc. The advantages and disadvantages of many materials used in the making of refractories are included].—I. & C. Tr. Rev. Nov. 17 1916; p 606; pp 2½; 35c.

Thermic Metallurgy

Addicks, Lawrence.—*Possibilities in the Wet Treatment of Copper Concentrates*. [A paper read before the A. I. M. E. Curves are reproduced and the results of tests in roasting, leaching and chloridizing are dealt with].—Met. & Chem. Engg. Dec. 1 1916; p 628; pp 3*; 35c.

Hydro-Metallurgy

Bretherton, S. E.—*Electrolytic Practice*. [Correspondence speaking of previous penalizing for zinc in some ores and the doing away of this through the introduction of the electrolytic process developed by the Anaconda Co.].—M. & S. P. Dec. 2 1916; p 793; pp 2; 20c.

Scott, W. A.—*Sulphidizing Carbonate Tailings for Treatment by Oil Flotation*. [While being agitated the crushed ore as carbonate is changed to a metallic sulphide by the addition of sodium sulphide].—Mg. World Dec. 2 1916; p 946; pp 1; 10c.

—*Hulett Unloader as Applied to the Handling of Copper Ore*. [An excavator to handle the leached sands from the tanks at the plant of the New Cornelia Copper Co., Ariz.].—Mg. World Dec. 2 1916; p 951; pp 1*; 10c.

—*Leaching Tests at New Cornelia Plant, Arizona*. [Discussion by members of a previous paper].—A. I. M. E. Bull. Dec. 1916; p 2151; pp 8; 35c.

Metallurgy General

Bretherton, S. E.—*Electrolytic Practice*. [Correspondence speaking of previous penalizing for zinc in some ores and the doing away of this through the introduction of the electrolytic process developed by the Anaconda Co.].—M. & S. P. Dec. 2 1916; p 793; pp 2; 20c.

POWER AND MACHINERY

Electricity

Burch, H. Kenyon; Whiting, M. A.—*Automatic Electric Hoist at the Inspiration Mine, Arizona*. [Abstract of a paper read before the A. I. M. E. The hoist is driven by motors which are automatically driven].—M. & S. P. Dec. 2 1916; p 801; pp 534*; 20c.

Norman, Fred.—*Cadogan Power Plant*. [A small, compact plant using pickable refuse for coal. Alternating current is generated and transformed into direct current].—Coal Age Dec. 2 1916; p 928; pp 374*; 20c.

Root, W. A.—*Aspen, Over the Range in Pitkin County, Colorado*. [The history of the camp and several of the companies operating in it are included in the description].—Mg. World Dec. 2 1916; p 943; pp 234*; 10c.

Thomson, Lesslie R.—*High-Tension Transmission Lines and Steel Towers*. [Deals with operating costs, loads on the towers, etc.].—Canadian Eng. Nov. 30 1916; p 445; pp 134; 35c.

—*Cap Lamp with New Feature*. [An electric lamp with a straight filament passing horizontally across the reflector].—Coal Age Dec. 2 1916; p 918; pp 174*; 20c.

—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Discussion of a paper by Herbert Haas].—A. I. M. E. Bull. 1916; p 2213; pp 9; 35c.

—*Equipment of the Valleyfield Colliery*. [Gives drawings and description of the steam-turbo and electric plants, besides a description of the coal washing plant and fan and boiler house].—Colly Guard. Nov. 17 1916; p 951; pp 214*; 35c.

Combustion Engines

—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Discussion of a paper by Herbert Haas].—A. I. M. E. Bull. 1916; p 2213; pp 9; 35c.

—*Power Plant of the Burro Mountain Copper Co., New Mexico*. [Discussion of a paper by Chas. Legrand].—A. I. M. E. Bull. Dec. 1916; p 2181; pp 212; 35c.

Gas Producers, Producer Gas

—*Wood-Gas Producer at the Hampden Mine*. [Drawings and description of a piece of equipment for the making of gas from wood].—Mg. Mag. Nov. 1916; p 280; pp 2*; 50c.

Steam and Steam Engines

Norman, Fred.—*Cadogan Power Plant*. [A small, compact plant using pickable refuse for fuel. Alternating current is generated and transformed into direct current].—Coal Age Dec. 2 1916; p 928; pp 374*; 20c.

Taggart, James M.—*Heat Distributions and Economics in a Steam Power Plant*. [Discusses steam generating plants from a thermal viewpoint].—Steam Dec. 1916; p 153; pp 214*; 35c.

—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Discussion of a paper by Herbert Haas].—A. I. M. E. Bull. 1916; p 2213; pp 9; 35c.

—*Equipment of the Valleyfield Colliery*. [Gives drawings and description of the steam-turbo and electric plants, besides a description of the coal washing plant and fan and boiler house].—Colly Guard. Nov. 17 1916; p 951; pp 214*; 35c.

IV. MISCELLANEOUS

MISCELLANEOUS

Miscellaneous Costs

Huac, A. J.—*Cost Accounting for the Clay Plant*. [Forms for use in connection with the system are reproduced and a description of their use in connection therewith is given].—B. & C. Rec. Dec. 5 1916; p 994; pp 312*; 35c.

Thomson, Lesslie R.—*High-Tension Transmission Lines and Steel Towers*. [Deals with operating costs, loads on the towers, etc.].—Canadian Eng. Nov. 30 1916; p 445; pp 134*; 35c.

—*Diesel Engines Versus Steam Turbines for Mine Power Plants*. [Discussion of a paper by Herbert Haas].—A. I. M. E. Bull. 1916; p 2213; pp 9; 35c.

—*Power Plant of the Burro Mountain Copper Co., New Mexico*. [Discussion of a paper by Chas. Legrand].—A. I. M. E. Bull. Dec. 1916; p 2181; pp 212; 35c.

Testing

Eames, Luther B.—*Countercurrent Decantation*. [This article is also in the Bulletin of the Canadian Mg. Inst. The results of many tests are plotted into curves, showing the effect of many of the variables in the process on its efficiency].—A. I. M. E. Bull. Dec. 1916; p 2087; pp 15*; 35c.

Egloff, G.; Twomey, T. J.; Moore, Robert J.—*The Effect of Temperature and the Time Factor in the Formation of Gasoline in the Gas Phase at Constant Pressure*. [The testing was mostly done with a Pennsylvania crude petroleum oil].—Jnl. of Ind. & Engg. Chem. Dec. 1916; p 1102; pp 374*; 60c.

Nesbit, C. E.; Bell, M. L.—*Testing Refractory Fire Brick*. [Abstract of a paper read before the American Soc. for Testing Materials].—E. & M. J. Dec. 2 1916; p 967; pp 34; 25c.

Pettibone, C. E.—*Testing Mine Rescue Apparatus*. [A paper read before the National Safety Council. It advises plugging breathing apparatus and testing it under a pressure of 5 ozs. before use].—E. & M. J. Dec. 2 1916; p 985; pp 214*; 25c.

Shellshear, W.—*Flotation of Gold and Copper Ores at Mount Morgan Mine, Queensland, Australia*. [Abstract of a paper read before the Aust. Inst. of Mg. Eng. The testing of different oils and different methods of concentration are told of].—Mg. World Dec. 2 1916; p 947; pp 112; 10c.

—*A Comparative Test of the Marathon, Chilean and Hardinge Mills*. [Discussion].—A. I. M. E. Bull. Dec. 1916; p 2184; pp 132; 35c.

—*Leaching Tests at New Cornelia Plant, Arizona*. [Discussion by members of a previous paper].—A. I. M. E. Bull. Dec. 1916; p 2151; pp 8; 35c.

Metallography

Comstock, George F.—*A Method of Distinguishing Sulphides from Oxides in the Metallography of Steel*. [Points out places where many mistakes are today being made in the use of this art for minutely studying the structure of steel].—A. I. M. E. Bull. Dec. 1916; p 2103; pp 8*; 35c.

Worthing, A. C.—*Tungsten-Molybdenum Equilibrium Diagram and System of*

Crystallization. [Discussion of a paper by Zay Jeffries].—A. I. M. E. Bull. Dec. 1916; p 2231; pp 1; 35c.

Waste: Slag, Tailings, Fumes, Etc.

Pawloff, M. A.—*Properties of Blast Furnace Slags and Methods of Calculating Charges*.—Rev. Mét. No. 13 1916; p 50; pp 11; \$1. Jnl. Soc. Chem. Ind. Nov. 15 1916; p 1111; pp 1; 75c.

Government Ownership

Smith, George Otis; Leshner, C. E.—*Expert's View on Cost of Coal*. [Met. & Chem. Engg. Dec. 1 1916; p 631; pp 474; 35c. A paper read before the American Mg. Cong. advocating that costs should be more accurately kept and speaking of government operation of the mines].—C. Tr. Bull. Dec. 1 1916; p 25; pp 4; 25c.

—*New South Wales Embarks on Coal Mining Enterprise*. [A state owned coal mine].—Mg. & Engg. Rev. Oct. 5 1916; p 13; pp 1; 35c.

Law, Legislation, Taxation

Hills, Victor G.—*The Antecedent Mineral Discovery Requirement*. [Discussion of a paper by E. D. Gardner, with respect to the location of claims].—A. I. M. E. Dec. 1916; p 2200; pp 3; 35c.

Manning, Van H.—*What Can Uniform Mining Laws Hope to Accomplish*. [A paper read before the American Mg. Cong., Chicago].—E. & M. J. Dec. 2 1916; p 973; pp 374; 25c. M. & S. P. Dec. 2 1916; p 796; pp 5; 20c.

—*Colorado Scientific Society on Mining Law Revision*.—E. & M. J. Dec. 2 1916; p 989; pp 1; 25c.

History

Root, W. A.—*Aspen, Over the Range in Pitkin County, Colorado*. [The history of the camp and several of the companies operating in it are included in the description].—Mg. World Dec. 2 1916; p 943; pp 234*; 10c.

—*History of the Carbide Mine Lamp from the Earliest Days to the Present Time*.—Acetylene Jnl. Dec. 1916; p 303; pp 112*; 20c.

Societies

—*American Mining Congress, Nineteenth Annual Meeting*. [Held in Chicago Nov. 13 to 16, 1916].—Mg. World Nov. 25 1916; p 903; pp 124; 10c.

—*Colorado Scientific Society on Mining Law Revision*.—E. & M. J. Dec. 2 1916; p 959; pp 1; 25c.

—*Canadian Society of Civil Engineers*. [Includes an address on "The Engineer in Canada"].—Canadian Eng. Nov. 30 1916; p 435; pp 2; 35c.

—*Midland Institute of Mining, Civil and Mechanical Engineers*. [Proceedings of the meeting held at Doncaster, England, Nov. 11 1916].—Colly Guard. Nov. 17 1916; p 955; pp 174; 35c.

—*National Association of Colliery Managers*. [Proceedings of the Scottish branch Nov. 4, 1916].—I. & C. Tr. Rev. Nov. 17 1916; p 616; pp 112; 35c.

—*Southern Fertilizer Association*. [Proceedings of the Tenth Annual Meeting at Atlanta, Ga.].—American Fertilizer Nov. 25 1916; p 21; pp 214*; 25c.

Financial

Guignon, F. A.—*The Valuation of Bedded Mineral Land*. [Formulas for figuring the value when the mineral is being used, where it is not being used, where mineral is used and land has surface value and where mineral is not being used, but surface has value].—E. & M. J. Dec. 2 1916; p 969; pp 212; 25c.

Ore and Metal Markets; Prices-Current

New York, Dec. 14, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Dec. 13 were as follows:

	New York. Cents.	London. Pence.
Dec. 7.....	75 3/4	36 1/4
8.....	75 1/4	36 15/16
9.....	75 1/4	36
11.....	75 1/4	36 1/4
12.....	76	36 3/8
13.....	76	35 5/8

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London Standard Oz.	
	1916	1915	1916	1915	
	High.	Low.	Avg.	Avg.	Avg.
January	57 1/2	55 1/2	56.775	48.890	26.875
February	57	56 1/2	56.755	48.477	27.000
March	60 1/2	56 1/2	57.935	49.926	27.080
April	73 1/2	60 1/2	64.416	50.034	31.375
May	77 1/2	68 1/2	74.27	49.915	34.182
June	68 1/2	62 1/2	65.02	49.072	31.038
July	65	60	62.94	47.519	29.870
August	67	64	65.50	47.178	31.25
September	69 1/2	67 1/2	68.515	48.68	32.18
October	69 1/2	67 1/2	67.855	49.385	32.21
November	74 3/8	68 1/8	71.60	51.713	34.1805
December .....	.....	.....	55.038	.....	26.232
Year .....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Developments in the copper market since our last report indicate that while a dull period is approaching the demand for copper holds to a good volume. Of course the business now appearing in the market consists of the odds and ends of covering operations by consumers, this being evidenced by the numerous small lot purchases. It is likely that by the 20th of the month the market will have finally reached a stage of inactivity. It may seem unusual, but copper factors are really welcoming the period of relief. What they have gone through since last August forms the basis for one of the most remarkable business records and, while it is manifest that along about next March another buying movement will set in, the exciting times that were had over the recent past will not be quickly forgotten. The orders are now written into the books. The business came voluntarily. It is now up to the sellers to make deliveries. Here is the real problem of the day. While it is certain that none of the producers oversold, it is conceded that they will have their hands full in making deliveries, unless by an unlooked for stroke of good fortune output of refined copper increases rapidly and attains what is now regarded dubiously, a total in excess of 200,000,000 lbs. a month.

The English government has made another ruling which to the uninformed, was likely to be misconstrued as being a bearish factor. The ruling is that all private buying of copper by English consumers must cease and that no copper shall hereafter be consumed in England except where permission has been granted. All this is simply a tightening of the regulations hitherto promulgated and instead of affecting the copper market will really benefit it, as buying of copper in England, instead of being conducted by many interests, will be wholly in the hands of the English government.

Trading in copper has become normal and no essential change has taken place in the price situation. Now that the end is approaching, it is noteworthy to state that there is a most unusual absence of bearish comment as to the situation. It would be indeed difficult, one may say impossible, to formulate a statement containing bearish observations on the copper situation, and while those interests who give vent to such comment at well-calculated moments in order to de-

press the market show great business acumen it is more than likely that they will now display shrewdness in maintaining silence at this time.

There have been some good sales of spot electrolytic at 35 1/2 to 36 cts., with January sold at 35 1/2 cts., and in one case 35 3/4 cts. was paid for January. For the first 3 months some blocks were sold for export at a flat price of 35 cts. f. a. s. New York, while domestic business was done at 34 1/2 cts. December ordinary lake sold at 34 1/2 cts., while some December casting fetched 34 1/4 cts. Second quarter electrolytic sold at 33 1/2 cts. No business for the third quarter has come to the surface in the past few days, with the quotation nominal at 32 1/2 cts.

With stricter government regulations the London market loses what little potency it had as a market factor. On Monday of this week, when the new regulations took effect, the prices were dropped £3 to as much as £4, and it is manifest that the quotations are wholly nominal and represent the levels at which the government will sell copper to private consumers.

Quotations for copper per pound at New York for the week ended Dec. 13 were as follows:

(For First Quarter Delivery.)

	Lake.	Electrolytic.	Casting.
Dec. 7.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
8.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
9.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
11.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
12.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4
13.....	34 1/2 @ 34 3/4	34 1/2 @ 34 3/4	34 @ 34 1/4

Quotations for copper per ton at London for the week ended Dec. 13 were as follows:

	Standard		Electrolytic	
	Spot.	Futures.	Spot.	Futures.
Dec. 7.....	£152 0 0	£143 0 0	£170 0 0	£167 0 0
8.....	151 0 0	142 10 0	171 0 0	168 0 0
9.....	151 0 0	142 10 0	171 0 0	168 0 0
11.....	148 0 0	.....	168 0 0	164 0 0
12.....	145 10 0	139 10 0	168 0 0	164 0 0
13.....	142 10 0	136 10 0	164 0 0	159 0 0

MONTHLY AVERAGE PRICES OF COPPER.

New York—Lake Superior.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.891
February	28.50	25.25	27.437	14.72
March	28.25	27.25	27.641	15.11
April	30.00	28.50	29.40	17.398
May	29.75	28.25	29.05	18.812
June	29.25	27.25	27.90	19.92
July	27.20	26.10	26.745	19.423
August	28.00	25.00	26.320	17.472
September	29.00	28.00	28.75	17.758
October	29 1/4	29.00	29.18	17.925
November	35.00	29.50	33.60	18.856
December .....	.....	.....	.....	20.375
Year .....	.....	.....	.....	17.647

New York—Electrolytic.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	25.50	23.00	24.101	13.707
February	28.50	25.25	27.462	14.572
March	28.25	27.25	27.410	14.86
April	30.50	28.25	29.65	17.057
May	29.75	28.00	28.967	18.601
June	29.25	27.25	27.90	19.173
July	27.20	26.10	26.745	19.08
August	28.00	25.00	26.320	17.222
September	29.00	28.00	28.75	17.705
October	29 1/4	29.00	29.18	17.859
November	35.00	29.50	33.60	18.826
December .....	.....	.....	.....	20.348
Year .....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	24.25	22.00	23.065	88.008	60.760
February	27.00	24.12½	26.031	102.760	63.392
March	27.75	25.50	26.210	106.185	66.235
April	23.00	26.75	27.70	103.681	77.461
May	27.75	26.00	26.692	104.794	77.360
June	25.25	24.00	24.38	94.316	82.350
July	24.00	23.25	23.80	101.30	74.807
August	25.50	24.75	24.90	111.100	67.350
September	27.00	25.50	26.40	116.10	68.560
October	23.50	27.00	27.31	117.25	72.677
November	34.00	28.50	32.70	137.10	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—Ever since the publication of the detailed tin statistics for November the market has been declining and the downward movement has been assisted by certain interests who are on the short side of the market, having made large future sales at prices 2 to 3 cts. below those now prevailing. Spot straits receded to 43¼ cts. and spot banka to 42½ cts. Very little business has been done either for spot or futures, with some spot holders eager to take profits.

Futures were quoted as follows: January arrival, 43 cts.; February, 42¼ cts.; March, 42½ cts.; April, 42½ cts., and June, 42½ cts. Limits from the east for April, May and June sailings were at 42½ cts. London and Singapore dropped £4 last week, with irregular markets this week. Arrivals of tin since the first of the month total 650 tons, while 6253 tons are afloat to this country.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended Dec. 13 were as follows:

Dec.	New York		London	Singapore
	Spot.	Dec.	Straits, spot.	shipments.
7.....	44c	43¾c	£186 10 0	£192 0 0
8.....	43½c	43¼c	185 15 0	190 0 0
9.....	43¼c	43c	185 15 0	190 0 0
11.....	43¼c	42c	185 0 0	190 10 0
12.....	42¾c	42¾c	184 15 0	189 5 0
13.....	42¾c	42¾c	184 5 0	188 10 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	46.25	50.48	48.934
April	56.00	49.50	52.27½	44.88
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	42.16	40.373
July	39.25	37.12½	38.24	37.498
August	39.50	37.75	38.58	34.886
September	39.50	33.00	39.00	33.13
October	44.00	39.37½	41.17	33.077
November	45.75	41.75	44.15½	39.375
December .....	.....	.....	.....	38.755
Year .....	.....	.....	.....	38.664

Lead.—This metal assumed great importance in the past week, with a very active demand and prices rising steadily. Practically all of the independent sellers are booked full for December and in some cases for January. The advance to 7.50 cts. by the A. S. & R. Co. did not put that interest up to the level of outside sellers. A few weeks ago it was stated in this report that predictions of 8-ct. lead before the end of the year were being made. Lead for December delivery has already sold at 8½ cts. New York, and January delivery has sold at 8 cts. Montreal. Predictions are now that 8½ cts. will be reached before the end of the year. Demand has been very active and, while a considerable business has been done, only a small part of the tonnage that buyers sought was satisfied. Demand has also been active for futures, some buyers being willing to take up to March delivery, but producers see a continued strong market and, while inclined to assist their regular customers, they are not letting metal get away from them in any too large quantities. The Australian situation is still commanding interest. While market factors are still dependent on mail advices from London, it is indicated that the situation down in Australia affecting the coal mines is serious.

As previously stated, spot lead sold at 8½ cts. New York. January advanced from 7¾ cts. to 8 cts. New York and February from 7.60 cts. to 7.90 cts. New York. Very

little spot is to be had from first hands, while resellers are seeking a stiff premium. At London the situation continues unchanged.

Quotations for lead per pound at New York and per ton at London for the week ended Dec. 13 were as follows:

Dec.	7.....	New York		Spot.	Futures.
		Indpts.	A. S. & R. Co.		
7.....	7.85c	7.50c	7.50c	£30 10 0	£29 10 0
8.....	7.90c	7.50c	7.50c	30 10 0	29 10 0
9.....	8.00c	7.50c	7.50c	30 10 0	29 10 0
11.....	8.12½c	7.50c	7.50c	30 10 0	29 10 0
12.....	8.12½c	7.50c	7.50c	30 10 0	29 10 0
13.....	7.90c	7.50c	7.50c	30 10 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	6.20	5.50	5.926	5.730	31.92
February	6.55	6.10	6.271	3.350	33.108
March	8.00	6.50	7.47	4.066	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	6.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August	6.70	5.95	6.32	4.760	30.260
September ..	7.10	6.70	6.88	4.627	31.25
October	7.10	7.00	7.05	4.612	30.20
November	7.40	7.02½	7.10½	5.152	30.10
December .....	.....	.....	.....	5.346	.....
Year .....	.....	.....	.....	4.675	.....

Lead Ore.—Lead took a jump in the Missouri-Kansas-Oklahoma district during the week ended Dec. 9 and prices ranged from \$87 to \$97. Shipments of 2,560,870 lbs. were a little less than during the previous week and brought the total for the year to 98,349,112 lbs., which two amounts had respective values of \$117,454 and \$4,101,288.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	81.00	70.00	73.15	47.00
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.50	48.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	78.35	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	48.25
October	87.00	70.50	79.875	51.80
November	90.00	82.00	86.5625	63.00
December .....	.....	.....	.....	71.875
Year .....	.....	.....	.....	53.34

Zinc Ore.—Contrary to lead, zinc took a slight drop of \$5 for the better grades and \$10 for the poorer grades. This made the price range during the week at from \$85 to \$100. Shipments made during the week amounted to 20,263,790 lbs., valued at \$949,390, and this brought the total for the year to 674,022,937 lbs., valued at \$27,316,176.

Calamine.—This ore also had a drop in its price and sold at from \$53 to \$55. The week's shipments amounted to 587,440 lbs. and were valued at \$14,590. The year's shipments to date were 36,932,490 lbs., valued at \$1,097,669.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	Average.
January	120.00	85.00	106.25	63.90
February	120.00	86.00	119.75	64.437
March	115.00	80.00	100.50	63.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	88.125	69.00
June	90.00	60.00	77.00	116.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	68.75	60.25
September	65.00	45.00	55.00	76.75
October	75.50	50.00	63.375	82.40
November	105.00	70.00	86.25	92.50
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Liquidation by speculative interests has caused a recession in values of spelter, but despite the reaction producing interests maintain their optimism and assert

that the metal will sell higher. Buying on the decline has not been very brisk; in fact, very few of the offerings were taken up, which served to stimulate concessions. When the market at first began to fall off the charge was made that efforts to influence ore prices prompted the reaction, but this was shown to be false by the fact that producers were not sellers. The ore market, however, has not been affected by the condition of the metal market, a breakdown in the power plant at Joplin suspending operations. Last week sales of ore at Joplin amounted to about 10,000 tons, a record-breaking figure, and the price averaged \$100 a ton. Spot prime western metal eased off to 12 cts. New York and 11½ cts. St. Louis, while first quarter dropped to 11½ cts. St. Louis. Spot brass special receded to 13½ cts. St. Louis. No business was done in second quarter delivery. London declined last week, moving off £1 10s in spot and £3 10s in futures.

Quotations for spelter per pound at New York and per ton at London for the week ended Dec. 13 were as follows:

	New York.		London	
	Spot.		Spot.	Futures.
Dec. 7.....	12.37½c		£58 0 0	£55 0 0
8.....	12.00c		58 0 0	54 10 0
9.....	12.00c		58 0 0	54 10 0
11.....	12.00c		58 0 0	54 10 0
12.....	12.00c		57 0 0	54 10 0
13.....	11.90c		57 0 0	53 0 0

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London		
	1916	1916	1915	1916	1916	1915
	High.	Low.	Avg.	Avg.	Avg.	Avg.
January	19.42½	17.30	18.801	6.619	89.840	30.819
February	21.17½	18.67½	20.094	8.866	97.840	39.437
March	20.50	16.50	18.40	10.125	100.720	44.278
April	19.37½	17.75	18.76	11.48	98.103	48.942
May	17.50	13.75	15.98	15.825	89.507	67.320
June	13.62½	11.25	12.72	22.625	67.410	100.320
July	10.75	8.75	9.80	20.803	53.00	98.150
August	9.75	8.37½	9.11½	16.110	56.00	68.250
September	9.70	8.12½	9.22	14.493	51.30	64.400
October	10.42½	9.42½	9.99	14.196	53.15	64.196
November	13.30	10.55	11.92	16.875	56.00	88.240
December .....	.....	.....	.....	16.675	.....	89.153
Year .....	.....	.....	.....	13.914*	.....	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—The market holds steady at \$80 per flask for spot virgin metal. Supplies do not appear to be plentiful. One buyer who was in the market for 75 flasks reported being unable to secure that amount from any of the leading sellers.

Antimony.—Inquiries from munition makers have given greater strength to this metal, active negotiations having started on several hundred tons for delivery over the first half of next year. Spot metal is quoted at 14½ cts., duty paid, this price being applied to both Chinese and domestic brands.

Aluminum.—There has been no essential change in the situation, demand being fair, with the market holding steady and unchanged at 63 to 64 cts. for spot virgin ingots. No. 1 remelted is quoted at 58 to 60 cts. and No. 12 alloy at 45 to 46 cts. Sheet aluminum on 1917 contracts remains at 40 cts.

Pig Iron.—Developments continue along sensational lines, foreign and domestic buying being very large, with prices continuing upwards. Foundry grades are especially coming in for activity, foreign buyers taking about 13,000 tons and domestic buyers about 50,000 tons. Sales of 35,000 tons bessemer iron have been made to Italy.

Ferro-Manganese.—Some domestic makers have made sales of ferro-manganese as low as \$155 delivered, but in the east the market appears to be firm at \$164 delivered. Foreign makers continue to quote \$165 seaboard, but are not obtaining any contracts.

Tungsten.—An advance to \$20 per unit has been announced by the leading producers of tungsten following the clearing up of spot supplies. Demand continues active.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06¼	to	.06¼
Nitric, 40 deg.....	.06¼	to	.07
Alcohol—U. S. P., gal., Grain, 190 proof.....	2.74	to	2.75
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.95	to	1.00
Denatured, bbl.....	.65	to	.70
Alum—Powdered, lb.....	.04½	to	.04½
Lump, lb.....	.04	to	.04½
Ground, 100 lbs.....	4.10	to	4.12½
Ammonia—			
Muriate, white grain, lb.....	.16	to	.17
Muriate, lump.....	.18	to	.19
Arsenic—White, lb.....	.07	to	.07½
Red, lb.....	.65	to	.70
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.16
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	6.50	to	6.75
Foundry.....	9.00	to	9.25
Copperas—Spot, bbl.....	1.25	to	1.50
Ferroallicon, 50%.....			100.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaubers Salts, bags.....	.60	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			5.95
Bessemer, Mesabi.....			5.70
Non-Bessemer, old range.....			5.20
Non-Bessemer, Mesabi.....			5.05
Lead—Granulated, lb.....	.14½	to	.16¼
Brown sugar.....	.11½	to	.11½
White crystals.....	.13	to	.13½
Broken, cakes.....	.12½	to	.13
Powdered.....	.13¼	to	.14
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.15
Cylinder, light, filtered, gal.....	.21	to	.25
Neutral, filtered, lemon, 29 gr.....	.37½	to	.38
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.08	to	.08½
Single.....	.11	to	.11½
Petroleum—			
Crude (Jobbing), gal.....	.15	to	.18
Platinum—Oz. ref.....	105.00	to	111.00
Potash Fertilizer Salts—			
Kaimit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	460.00	to	475.00
Refined, bbl.....			.12
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	450.00
Hard salt, man., 12.4% actual potash.....	Nominal		82.00
Potassium—			
Bichromate.....	.41	to	.42
Carbonate, cal. 96 to 98%.....	1.30	to	1.35
Cyanide, bulk, per 100%.....	.80	to	1.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.92½	to	.95
Prussiate, red.....	2.50	to	2.75
Salt peter—Crude, lb.....	.12	to	.14
Refined.....	.31	to	.35
Soda—Ash, 48% (43% basis), bbl.....	3.00	to	3.75
Strontia Nitrate, casks, lb.....	.28	to	.30
Sulphur—			
Crude, ton.....	28.60	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.15	to	.15½
Crystals, bbls., lb.....	.30½	to	.31
Oxide, lb.....	.50	to	.52
Zinc Chloride.....	.10¼	to	.11¼

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest						Paid in 1916	Total to date	Latest	
						Date	Amt.							Date	Amt.
Acacia, g. v.	Colo.	1,438,999	\$1	\$1,438,994	Dec. 25, '12	\$0.01	Golden Eagle, g.	Colo.	480,916	\$1	\$480,916	Sept. 1, '01	\$0.01		
Adams, s. l. c.	Colo.	80,000	10	778,000	Dec. 18, '09	.04	Golden Star, g.	Ariz.	400,000	6	120,000	Mar. 15, '10	.06		
Adventure, c.	Mich.	100,000	25	50,000	Oct. 20, '16	.50	Gold Com. Fra. g.	Nev.	922,000	1	92,111	Oct. 16, '09	.10		
Amheek, c.	Mich.	200,000	25	2,000,000	July 10, '16	.40	Goldfield Con.	Nev.	3,568,148	10	28,999,831	Oct. 31, '16	.10		
Alaska Goldfield, g.	Alaska	250,000	6	403,250	Jan. 10, '15	.16	Good Hope, g. s.	Colo.	600	100	941,250	Jan. 1, '08	.25		
Alaska Mexico, g.	Alaska	180,000	6	3,507,381	Nov. 25, '15	.10	Good Sp. Anchor, z.s.	Nev.	550,000	1	119,750	June 15, '16	.01		
Alaska Miner Sec.	U. S.	600,000	6	30,000	Nov. 1, '06	.50	Grand Central, g.	Utah	500,000	1	1,635,250	Oct. 25, '16	.04		
Alaska Trevelick, g.	Alaska	200,000	25	15,780,000	May 19, '16	.05	Grand Gulch, c. g.	Nev.	239,845	2.50	19,187	Sept. 6, '16	.03		
Alaska United, g.	Alaska	180,200	6	2,045,270	Feb. 28, '16	.30	Granite, g. c. s.	Alaska	430,000	10	17,200	May 10, '16	.02		
Alouez, c.	Mich.	100,000	25	700,000	Oct. 4, '16	2.50	Gwin, g.	Cal.	100,000	10	451,500	Feb. 1, '06	.25		
Amalgamated, c.	Mont.	1,538,829	100	103,444,983	Aug. 30, '16	3.77	Hazel, g.	Cal.	900,000	1	1,114,000	Jan. 5, '15	.01		
Am. Sm. & R. com.	U. S.	500,000	100	31,633,333	Sept. 1, '16	1.50	Hecia, s. l.	Idaho	1,000,000	0.25	5,155,000	Nov. 20, '16	.16		
Am. Sm. & R. pf.	U. S.	500,000	100	87,421,386	Sept. 1, '16	1.75	Hercules, g.	Idaho	1,000,000	1	13,200,000	Nov. 15, '16	.20		
Am. Sm. Sec. A pf.	U. S.	170,000	100	11,720,000	Oct. 2, '16	1.50	Hidden Treasure, g.	Cal.	30,000	10	457,452	Sept. 1, '00	.10		
Ar. Sm. Sec. B pf.	U. S.	300,000	100	17,010,000	Oct. 2, '16	1.25	Holy Terror, g.	S. D.	600,000	1	172,000	Jan. 1, '00	.01		
Ar. Zinc, c. & Sm.	Mo.	193,120	25	3,093,360	Nov. 1, '16	1.50	Homestake, g.	S. D.	251,160	100	7,750,750	Nov. 25, '16	.65		
Anaconda, c.	Mont.	2,381,250	60	16,318,750	Nov. 28, '16	2.00	Hope Dev.	Cal.	600,000	1	8,000	Dec. 31, '16	.01		
Annie Laurie, g.	Utah	25,000	100	439,661	Apr. 22, '05	.50	Horn Silver, l. s. z.	Utah	400,000	1	40,000	June 30, '16	.05		
Argonaut, g.	Cal.	200,000	6	1,685,000	Sept. 25, '16	.07%	Imperial, c.	Ariz.	500,000	10	300,000	June 24, '07	.20		
Arizona, c.	Ariz.	500,000	1	30,279,392	Nov. 1, '16	.05	Inspiration Con.	Ariz.	920,687	20	6,454,989	Oct. 31, '16	2.00		
Arizona, c. s. m.	Ariz.	2,500,000	1	130,000	Oct. 30, '16	.01	Intermountain, c.	Mont.	1,615,020	1	8,705	Oct. 31, '16	.00%		
Arizona United, g.	Ariz.	2,500,000	1	35,000	Oct. 2, '16	.01	Inter'l Nickel, com.	U. S.	1,673,384	25	7,948,574	Sept. 1, '16	1.60		
Atlantic, c.	Mich.	100,000	25	990,000	Feb. 21, '06	.50	Inter'l Nickel, pf.	U. S.	89,126	100	534,756	Nov. 1, '16	1.50		
Bagdad-Chase, g. pf.	Cal.	84,819	6	202,394	Jan. 1, '09	.10	Inter'l Sm. & Ref.	U. S.	100,000	100	4,100,000	May 2, '14	2.00		
Bald Butte, g. s.	Mont.	250,000	1	1,354,648	Nov. 1, '07	.04	Interstate Callahan	Idaho	464,990	10	2,092,455	Sept. 30, '16	1.50		
Baldic, c.	Mich.	100,000	25	7,960,000	Dec. 31, '13	2.00	Iowa, g. s. l.	Colo.	1,666,667	1	270,167	Dec. 31, '15	.00%		
Barnes-King, g.	Mont.	40,000	6	60,000	June 1, '16	.07	Iowa Tiger, g. s. l.	Colo.	3,000	1	25,179	Jan. 15, '15	.50		
Beck Tunnel Con.	Utah	1,000,000	0.10	940,000	Nov. 15, '07	.02	Iron Blossom, l. s. g.	Utah	1,000,000	1	2,850,000	Oct. 20, '16	.10		
Big Four Expl.	Utah	400,000	1	110,000	Sept. 4, '16	.05	Iron Cap pf. d.	Ariz.	33,481	10	29,903	July 1, '16	.35		
Board of Trade, t.	Wis.	120,000	1	73,000	Jan. 15, '11	.06	Iron Clad, g.	Colo.	1,000,000	1	50,000	Nov. 1, '06	.06		
Bonanza Dev.	Colo.	300,000	1	1,425,000	Oct. 28, '11	.20	Iron Silver, g.	Colo.	600,000	20	8,050,000	Dec. 31, '15	.10		
Booth (Reorganized)	Nev.	998,296	6	349,949	June 25, '16	.05	Isabella, g.	Colo.	2,250,000	1	742,500	Mar. 1, '01	.01		
Boss, g.	Nev.	15,000	10	49,020	Nov. 1, '16	.05	Iste Royale, c.	Mich.	150,000	25	450,000	Oct. 31, '16	2.00		
Boston & Mont. Con.	Mont.	100,000	25	63,225,000	May 15, '11	4.00	Jerusalem, c.	Cal.	390,000	10	375,000	Jan. 1, '11	.01		
Breece, l. s.	Colo.	200,000	25	220,000	Dec. 15, '13	.10	Jerry Johnson, g.	Colo.	2,600,000	10	187,500	Nov. 1, '00	.00%		
Brunswick Con. g.	Cal.	300,000	1	203,315	Sept. 15, '15	.06	Jim Butler, g.	Nev.	1,718,020	1	343,604	Aug. 1, '16	.10		
Bullion-B & Champ	Utah	100,000	10	2,768,400	July 11, '08	.10	Joplin Ore & Splitter	Mo.	400,000	5	62,000	July 22, '16	.04%		
Bunker Hill Con. g.	Cal.	200,000	1	875,000	Nov. 4, '16	.02%	Jumbo Ext. g.	Nev.	1,550,000	1	684,998	June 30, '16	.05		
Bunker Hill & Bull.	Idaho	327,000	10	18,326,250	Nov. 4, '16	.10	Kendall, g.	Mont.	500,000	6	1,655,000	Apr. 3, '16	.10		
Butte Alex Scott, c.	Mont.	76,000	10	1,054,119	Apr. 1, '16	10.60	Kennecott Zinc.	Mo.	200,000	1	60,000	June 20, '16	.10		
Butte-Ballaklava, c.	Mont.	250,000	10	125,000	Aug. 1, '10	.50	Kennecott, c.	Alas.	2,780,999	10	16,200,000	Sept. 30, '16	1.50		
Butte Coalition, c.	Mont.	1,000,000	15	4,700,000	Dec. 1, '11	.25	Kennedy, g.	Cal.	100,000	100	1,801,001	June 1, '00	.05		
Butte & Superior, s.	Mont.	272,087	10	13,196,758	Sept. 30, '16	6.26	King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. 2, '09	.12		
Caledonia, l. s. c.	Idaho	2,605,000	1	1,742,381	Nov. 3, '16	.03	Klar Piquet, z.	Wis.	20,000	1	157,500	Dec. 16, '12	.25		
Calumet & Ariz. c.	Ariz.	641,923	1	26,907,572	Sept. 25, '16	2.50	Knob Hill, g.	Wash.	1,000,000	1	70,000	Aug. 1, '13	.00%		
Calumet & Hecla, c.	Mich.	100,000	25	5,000,000	Sept. 22, '16	20.00	La Fontaine, g.	Ariz.	250,000	1	1,700,500	Oct. 1, '02	.01%		
Camp Bird, g. c.	Colo.	1,750,000	25	10,243,964	Jan. 1, '16	17%	Lake View, g.	Utah	500,000	.05	114,500	June 12, '16	.01		
Cardiff, s. l.	Utah	500,000	1	600,000	Sept. 19, '16	.25	Last Dollar, g.	Colo.	1,600,000	1	180,000	Feb. 23, '16	.02		
Carina, g. s. c.	Utah	600,000	25	60,000	Dec. 1, '06	.01	Liberty Bell, g.	Colo.	133,551	5	1,752,795	Jan. 31, '16	.06		
Centennial, c.	Mich.	1,000,000	1	100,000	Sept. 1, '16	1.00	Lightner, g.	Cal.	102,255	1	331,179	June 1, '06	.05		
Centennial Eureka.	Utah	100,000	25	100,000	Apr. 25, '16	1.00	Linden, z.	Wis.	1,020	10	11,200	Dec. 31, '15	3.00		
Center Creek, l. z.	Mo.	100,000	10	615,000	Dec. 1, '16	.10	Little Bell, s. l.	Utah	300,000	1	75,000	Apr. 22, '16	.05		
Central Eureka, g.	Cal.	100,000	1	799,159	Mar. 5, '06	.06	Little Florence.	Nev.	1,000,000	1	480,000	Jan. 1, '08	.03		
Century, g. s. l.	Utah	1,000,000	1	392,087	Feb. 15, '16	.06	Lost Packer.	Idaho	150,000	1	37,600	Oct. 23, '13	.25		
Cerro Gordo, l. s. z.	Cal.	1,000,000	1	25,000	Sept. 23, '16	.02%	Lower Mammoth.	Utah	1,000,000	1	67,000	Dec. 15, '15	.01		
Champion, c.	Mich.	100,000	25	17,920,000	Nov. 14, '16	6.40	MacNamara, g. s.	Nev.	734,576	1	46,500	Apr. 23, '05	.12		
Chief Con.	Utah	892,960	1	657,508	Nov. 14, '16	.05	Magma, c.	Ariz.	240,000	5.00	360,000	Sept. 30, '16	.50		
Chico Copper c.	N. M.	869,935	6	11,207,377	Sept. 30, '16	2.50	Mammoth, g. s. c.	Utah	400,000	10	2,380,000	Sept. 30, '16	.05		
C. K. & N. g.	Alaska	1,431,900	1	171,938	Nov. 4, '16	.01	Manhattan Bldg. & g.	Nev.	762,400	1	30,248	Aug. 15, '11	.02		
Chit. g.	Alaska	100,000	1	116,000	Feb. 5, '14	.05	Mar. McKinney, g.	Colo.	1,302,252	1	1,132,398	Nov. 28, '16	.01		
Chit. s. l.	Utah	300,000	10	90,000	Jan. 1, '13	.10	Mary Murphy, g. s. l.	Colo.	370,000	6	93,106	May 1, '17	.07		
Chit. g. s.	Colo.	1,000	100	60,000	Dec. 1, '03	.30	Mass Con. c.	Mich.	100,000	25	200,000	Nov. 15, '16	1.00		
Colo. O. Dredging.	Colo.	200,000	10	425,000	Feb. 23, '16	1.00	May Day, g.	Utah	800,000	0.25	284,000	May 26, '16	.02		
Colorado, s. l.	Utah	1,000,000	0.20	2,600,000	Mar. 15, '13	.03	Mexican, g. s.	Nev.	201,600	3	171,300	June 4, '14	.75		
Columbus Con. l. s. c.	Utah	283,540	6	212,623	Oct. 14, '07	.20	Miami, c.	Ariz.	747,114	5	9,986,784	Nov. 15, '16	1.50		
Combination, g.	Nev.	320,000	1	873,000	Dec. 1, '06	.15	Min. La Motte, l.	Mo.	300,000	10	300,000	Jan. 23, '04	.20		
Comstock-Phoenix.	Nev.	786,000	1	60,000	Nov. 11, '11	.05	Modoc, g. s.	Colo.	600,000	1	275,000	Oct. 20, '11	.01		
Con. Mercur, g.	Utah	1,000,000	1	1,265,000	June 15, '13	.05	Mogillon, g. s.	N. M.	355,682	1	130,000	Oct. 1, '16	.10		
Consolidated, c.	Colo.	2,500,000	1	380,000	Mar. 1, '02	.01	Mohawk, c.	Mich.	100,000	25	5,675,000	Aug. 1, '16	10.00		
Continental, s. x.	Mo.	22,000	25	1,900,000	July 1, '16	1.00	Moh'k Con. Lease.	Nev.	6						

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1918	Total to Date	Latest						Paid in 1918	Total to Date	Latest	
						Date	Amt.							Date	Amt.
Petro, g. s.	Utah	600,000	\$ 1	\$55,000	Ang. 9, '06	\$0.04	Success,	Ida.	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03	
Pharmacist, g.	Colo.	1,500,000	1	91,600	Feb. 1, '10	.00%	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Oct. 10, '16	1.00	
Phelps, Dodge & Co	U. S.	450,000	100	67,371,527	Sept. 30, '16	8.00	Superior & Pitts, c.	Ariz.	1,499,792	10	10,318,568	10,318,568	Dec. 21, '15	.35	
Pioneer, g.	Al'ska	5,000,000	1	2,041,525	Oct. 7, '11	.03	Tamarack, c.	Mich.	60,000	25	9,420,000	9,420,000	July 23, '07	4.00	
Pittsburg, l. z.	Mo.	1,000,000	1	20,000	July 15, '07	.02	Tamarack-Custer, ..	Idaho	2,000,000	1	71,060	71,060	Aug. 30, '16	.02	
Pittsburg-Idaho, l.	Ida.	1,000,000	1	42,500	Oct. 2, '16	.04	Tennessee, c.	Tenn.	200,000	25	300,000	5,206,250	Apr. 15, '16	.75	
Pitts Silver Peak, ..	Nev.	2,790,000	1	840,600	Dec. 1, '14	.02	Tightner,	Cal.	100	100	180,000	180,000	Jan. 3, '14	..	
Platteville, l. z.	Wis.	500	60	179,500	June 15, '07	.00	Tomboy, g. s.	Colo.	310,000	5	74,400	3,861,555	June 30, '16	.24	
Plumas Eureka, g.	Cal.	150,625	10	2,831,294	Apr. 3, '01	.06	Tom Reed, g.	Ariz.	909,555	1	2,555,534	2,555,534	Sept. 5, '15	.01	
Plymouth Con,	Cal.	240,000	5	259,300	Aug. 10, '16	.24	Ton-Belmont, g.	Nev.	1,500,000	1	750,000	8,393,927	Oct. 2, '16	.12%	
Portland,	Colo.	3,000,000	1	369,000	1,072,901	Oct. 20, '16	.33	Ton-Extension, g. s.	Nev.	1,272,501	1	604,580	1,591,775	Oct. 1, '16	.15
Prince Con, s. l.	Nev.	1,000,000	2	325,000	Oct. 5, '16	.02%	Tonopah, g. s.	Nev.	1,000,000	1	600,000	13,600,000	Oct. 21, '16	.16	
Quartette, g. s.	Nev.	100,000	10	375,000	July 31, '07	.20	Tonopah Midway, g	Nev.	1,000,000	1	250,000	250,000	Jan. 1, '07	.05%	
Quicksilver, pf.	Cal.	43,000	100	1,931,411	Apr. 8, '03	.50	Tremmis,	Cal.	200,000	2.50	234,000	234,000	Apr. 28, '15	.02	
Quilp, g.	Wash.	1,500,000	1	57,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	1,100,000	1,100,000	Oct. 30, '12	3.00	
Quincy, c.	Mich.	110,000	25	22,937,500	Sept. 25, '16	4.00	Tuolumne, c.	Mont.	600,000	1	495,625	495,625	Apr. 15, '13	.10	
Ray Con, c.	Ariz.	1,571,279	10	2,743,748	Sept. 30, '16	.75	Uncle Sam Con, s.	Utah	600,000	1	470,000	470,000	Sept. 20, '11	.06	
Red Metal, c.	Mont.	100,000	10	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	167,070	167,070	Nov. 15, '15	.10	
Red Top, g.	Nev.	1,000,000	1	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	50,000	100	1,600,000	1,600,000	Apr. 15, '07	3.00	
Republic, g.	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	6,125,000	6,125,000	Aug. 6, '07	1.76	
Richmond, g. s. l.	Nev.	54,000	1	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	211,527	211,527	Oct. 15, '07	.50	
Rocco-Home, l. s.	Nev.	300,000	1	152,600	Dec. 22, '05	.02	United Copper, c. s.	Wash.	1,000,000	1	40,000	40,000	Dec. 21, '12	.01	
Rochester Ld. & L.	Mo.	4,900	100	190,845	July 1, '12	.50	United (Crip, Ck) ..	Colo.	4,009,100	1	440,435	440,435	Jan. 1, '10	.04	
Round Mountain, g.	Nev.	889,018	1	353,964	Aug. 25, '13	.04	United Globe, c.	Ariz.	23,000	100	1,173,000	1,173,000	Sept. 30, '15	16.00	
Sacramento, g.	Utah	1,000,000	6	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	60,000	100	11,000,000	11,000,000	Sept. 30, '16	5.00	
St. Joseph, l.	Mo.	1,409,468	10	12,079,728	Sept. 30, '16	.75	United Verde, c.	Ariz.	300,000	10	3,600,000	3,600,000	Nov. 1, '16	.76	
St. Mary's M. L.	Mich.	160,000	25	7,810,000	Nov. 18, '16	2.10	United Verde Exi.	Ariz.	1,000,000	50	1,150,000	1,150,000	Nov. 1, '15	.60	
Schoenh'r-Wal'n, z. l	Mo.	10,000	10	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo.	68,188	100	414,078	414,078	Oct. 9, '03	1.00	
Scratch Gravel,	Cal.	1,000,000	1	20,000	Feb. 1, '16	.02	U. S. Red & R. pf.	Colo.	39,458	100	1,775,936	1,775,936	Oct. 1, '07	1.50	
Seven Tro. Cn, g. s.	Nev.	1,443,077	1	35,076	Apr. 1, '15	.02%	U. S. R. & M. com	USMx	351,115	50	1,316,681	7,941,880	Oct. 15, '16	1.00	
Shannon, c.	Ariz.	300,000	10	900,000	Nov. 15, '13	.50	U. S. R. & M. pf.	USMx	485,550	50	1,718,224	18,513,922	Oct. 15, '16	8.7%	
Shattuck-Ariz, c.	Ariz.	350,000	10	1,663,300	Oct. 20, '16	1.25	Utah, c.	Utah	1,624,490	10	13,808,165	46,530,062	Sept. 30, '16	3.00	
Silver Hill, g. s.	Nev.	108,000	1	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	528,200	6	396,154	462,179	Sept. 30, '16	.25	
*Silver King Coal'n	Utah	1,250,000	6	14,331,985	Oct. 1, '16	.15	Utah Con, c.	Utah	300,000	5	675,000	9,825,000	Sept. 30, '16	.75	
Silver King Con.	Utah	637,682	1	1,006,131	Oct. 22, '15	.10	Utah M. & T. f.	Utah	750,000	1	325,000	1,285,492	Aug. 15, '16	.60	
Silver Mines Expl.	N. Y.	10,000	100	1,500,000	June 15, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	10,000	May 29, '16	1.00	
Sloux Cons., l. s. c.	Cal.	745,339	1	872,165	July 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	207,500	207,500	Apr. 23, '10	.04	
Skidoo, g.	Cal.	1,000,000	6	365,000	Oct. 2, '14	.01	Victor, c.	Colo.	1,500,000	1	225,000	3,487,500	Oct. 25, '16	.06	
Smuggler, g. s. l. z.	Colo.	1,000,000	1	2,235,000	Nov. 22, '06	.03	Victor Con, g.	S. D.	600,000	1	100,000	649,465	May 15, '16	.02%	
Snowstorm, c.	Idaho	1,500,000	1	1,168,510	Oct. 10, '13	.01%	Wasp No. 2, g.	S. D.	600,000	1	100,000	1,250,000	Oct. 2, '16	.02	
Socorro,	N. M.	377,342	6	196,070	Sept. 1, '16	.05	Wellington, l. z.	Colo.	10,000,000	1	600,000	625,969	Oct. 24, '16	.06	
South Eureka, g.	Cal.	299,991	1	1,409,754	Aug. 15, '16	.07	West End Con.	Nev.	1,788,486	1	89,424	40,000	June 29, '16	.20	
South Hedra,	Ida.	600,000	1	39,450	Aug. 10, '16	.15	White Knob, g. pf.	Cal.	200,000	10	60,000	190,000	Aug. 25, '16	.10	
So. Swansea, g. s. l.	Utah	300,000	1	287,500	Apr. 3, '04	.01%	Wilbert,	Ida.	1,000,000	1	40,000	50,000	Nov. 15, '16	.01	
Spearsfish, g.	S. D.	1,500,000	1	165,500	Jan. 7, '05	.01	Wolverine, c.	Mich.	60,000	25	720,600	9,120,000	Oct. 2, '16	6.00	
Standard Con, g. s.	Cal.	178,394	10	5,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,674	16	53,403	53,403	Dec. 15, '15	.25	
Standard, c.	Ariz.	425,000	1	69,600	Sept. 8, '05	.05	Work, g.	Colo.	1,500,000	1	1,597,895	1,597,895	Apr. 31, '12	.02	
Stewart, l. z.	Idaho	1,238,362	1	2,043,297	Dec. 31, '15	.05	Yak,	Colo.	1,000,000	1	190,000	2,197,685	Sept. 30, '16	.07	
Stratton's Crisp. Ck.	Colo.	2,000,000	1	300,000	Sept. 5, '08	.02%	Yankee Con, g. s. l.	Utah	1,000,000	1	167,600	167,600	Jan. 1, '13	.01	
Stratton's Ind.	Colo.	1,000,000	5	6,025,568	Dec. 23, '06	.12	Yellow Aster, g.	Cal.	100,000	10	33,000	1,205,759	Nov. 6, '16	.06	
Str'n's Ind. (new) g.	Colo.	1,000,000	.33	591,250	Jan. 31, '16	.16	Yellow Pine, z. l. s.	Nev.	1,000,000	1	900,000	1,793,008	Nov. 25, '16	.10	
Strong, g.	Colo.	1,000,000	1	2,275,000	July 9, '05	.02	Yosemite Dredg.	Cal.	24,000	10	102,583	102,583	July 15, '14	.10	

Corrected to December 1, 1916

*Includes dividends paid by Silver King M. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY			Number Shares Issued	Par Val	Dividends on Issued Capitalization			
					Paid in 1916	Total to Date	Latest							Paid in 1916	Total to Date	Latest	
							Date	Amt.								Date	Amt.
Ajuchitlan,	Mex...	60,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Cabrillas,	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00		
Amistad y Concordia g s	Mex...	3,600	50		429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25		1,527,320	Dec. 15, '15	\$0.24		
Amparo, s. g.	Mex...	2,000,000	1	360,000	2,292,176	Nov. 10, '16	.05	Lucky Tiger,	Mex...	715,337	10	440,061	3,714,053	Nov. 20, '16	.10		
Bartolo de Medina Mill	Mex...	2,000	25		103,591	Aug. 1, '07	.50	McKinnley-Darragh-Sav.	Ont...	2,247,692	1	269,724	4,777,492	Oct. 2, '16	.03		
Batopilas, s.	Mex...	446,268	20		55,870	Dec. 31, '07	.12%	Mexican, l. pf.	Mex...	12,500	100		1,018,750	May 1, '12	3.50		
Beaver Con, s.	Ont...	2,000,000	1	60,000	710,000	Apr. 28, '16	.03	Mexico Con.	Mex...	240,000	10		660,000	Mar. 10, '08	.25		
Boleo, g.	Mex...	120,000	20		721,871	May 8, '11	6.00	Mexico Mines of El Oro	Mex...	180,000	5		4,478,500	June 26, '14	.96		
British Columbia, c.	B. C.	591,709	5		615,399	Jan. 6, '13	.15	Minas Pedrazzini, ..	Mex...	1,000,000	1		497,500	Jan. 23, '11	.06%		
Buena Tierra,	Mex...	330,000	5		160,380	Jan. 30, '16	.24	Mines Co. of Am.	Mex...	900,000	10		4,958,600	July 25, '13	.12%		
Buffalo, Ont.	Ont...	1,000,000	1		2,787,000	July 1, '14	.05	Mining Corp. of Canada	Can...	2,075,000	1	670,625	1,348,750	Sept. 30, '16	.15		
Canadian Goldfields	Can...	600,000	0.10		237,099	July 15, '14	.01%	Monteruma, l. pf.	Mex...	5,000	100		402,500	Nov. 15, '12	3.60		
Cananea Central, c.	Mex...	3,500,000	10		360,000	Mar. 1, '12	.60	Monteruma M. & Sm.	Mex...	600,000	1		100,000	July 20, '09	.04		
Cariboo-Cobalt,	Ont...	1,000,000	1		295,000	Sept. 1, '15	.09	Mother Lode,	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11		
Cariboo-McKinnay, g.	S. C.	1,250,000	1		56,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex...	100	300		3,190,000	Oct. 11, '09	\$283		
City of Cobalt,	Ont...	500,000	1		138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	260,000	10	300,000	4,050,000	Oct. 23, '16	.50		
Cobalt Central, s.	Ont...	4,761,500	1		192,845	Aug. 24, '09	.01	Nipissing, s.	Ont...	1,200,000	5	1,500,000	14,940,000	Oct. 20, '16	.50		
Cobalt Lake, s.	Ont...	3,000,000	1		465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1		533,000	Feb. 1, '10	.02		
Cobalt Silver Queen	Ont...	1,500,000	1		315,000	Dec. 1, '08	.03	Paloma, g.	Mex...				99,600	Dec. 1, '12	6.00		
Cobalt Township, s.	Ont...	199,282	5		1,042,258	Aug. 20, '14	.24	Panuco, g.	Mex...	30,000			7,465,000	Nov. 4, '08	5.00		
Coniagas, s.	Ont...	800,000	5	400,000	8,240,000	Aug. 5, '15	.25	Peneleos, s.	Mex...	120,000	20		6,451,687	Sept. 30, '13	.25		
Con. Mg. & Sm., g. s. c.	B. C.	55,050	100	631,204	2,951,341	Oct. 1, '15	.250	Peregriua, pf.	Mex...	10,000	100		328,656	Sept. 1, 10	3.50		
Crown Reserve, s.	Ont...	1,999,957	1		6,102,408	July 15, '15	.03	Peterson Lake,	Ont...	2,401,820	1	126,096	382,319	Oct. 2, '16	.01%		
Dolores,	Mex...	400,000	5		1,374,865	July 24, '11	.22%	Pinguic, pf.	Mex...	20,000	100		780,000	Apr. 15, '13	3.00		
Dome Mines, s.	Ont...	400,000	10	500,000	1,000,000	Sept. 1, '16	.50	Porcupine Crown	Ont...	2,000,000	1	240,000	660,000	Oct. 2, '16	.03		
Dos Estrellas, (El Oro)	Mex...	300,000	0.50		15,406,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex...	6,000	15		963,360	Apr. 1, '08	1.00		
El Favor,	Mex...	3,500,000	1		210,000	Apr. 30, '14	.01	Rambler-Cariboo, ..	B. C.	17,500	100	87,500	507,500	Nov. 15, '16	.01		
El Oro, g. s.	Mex...	1,147,600	5		9,136,842	July 11, '13	.24	Rea Mines, Leasing	Ont...	200,000	1	12,750	167,500	Feb. 20, '15	.06%		
El Rayo, g. s.	Mex...	260,020	2		140,410	Apr. 24, '11	.15	Right of Way	Ont...	1,685,500	1	25,221	569,090	Sept. 15, '16	.00%		
El Triunfo, c.	Mex...	2,000,000	1		20,000	Aug. 23, '11	.01	Rio Pato, s.	Mex...	374,918	5		345,744	Feb. 1, '13	.06		
Esperanza, s. g.	Mex...	450,000	1	12,621,250	Dec. 31, '16	.10	San Francisco Mill	Mex...	6,000	25		445,086	Oct. 15, '08	.100			
Granby Con, C. & G.	Mex...	149,985	100		6,650,781	N. Y. 1, '16	2.00	San Rafael,	Mex...	8,000	400	25	6,736,280	Jan. 1, '12	2.00		
Greene-Cananea, c.	Mex...	474,411	100	3,403,463	7,634,285	Nov. 28, '16	2.00	San Toy, s. l.	Mex...	5,000,000	1.00		540,000	July 24, '13	.01		
Oreene Con, c.	Mex...	1,000,000	10	3,600,000	13,544,000	Oct. 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex...	1,500,000	5	364,500	2,818,772	June 16, '15	.24		
Greene Gold-Silver, pf.	Mex...	300,000	10		194,871	Mar. 28, '07	.40	Sta. Gerty & Guadalupe, g. s.	Mex...	60,000			3,960,000	Mar. 27, '09	1.00		
Guanaquato Con,	Mex...	540,000	5		600,000	Oct. 8, '06	.07%	Sta. Maria del Par...	Mex...	9,600	12%		5,606,000	Jan. 2, '13	2.50		
Guanaquato Dev, pf.	Mex...	10,000	100		274,356	Jan. 1, '11	3.00	Seneca-Superior,	Ont...	478,844	1	967,750	1,878,902	Nov. 14, '16	.20		
Guggenheim Explorat.	Mex...	833,732	25	10,713,456	40,382,760	Apr. 3, '16	11.86	Soledad, s. l.	Mex...	960	20		4,439,840	Oct. 17, '11	8.00		
Hallebury, s.	Ont...	50,000	1		50,000	Apr. 5, '11	.50	Sorpresa, g. s.	Mex...	19,200	20		3,979,240	Jan. 5, '11	74.00		
Hedley,	B. C.	120,000	1	180,000	2,003,520	Sept. 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	550,000	2,350,000	Nov. 10, '16	.02%		
Hinds Con, g. s. l.	Mex...	5,000,000	1		88,000	Feb. 27, '08	.02	Temiscaming & Hud. Bay	Ont...	7,761	1		1,940,250	Nov. 10, '14	3.00		
Hollinger,	Mex...	6,000,000	1	1,720,000	9,785,000	Nov. 8, '16	.06	Temiskaming, s.	Ont...	2,500,000	1	150,000	1,609,156	Oct. 22, '16	.03		
Hunt, g.	Mex...	10,000	100		975,000	Feb. 27, '11	1.00	Tenipitlan,	Ont...	8,000	100		1,355,000	Jan. 1, '08	1.50		
Kerr Lake, s.	Ont...	600,000	5	450,000	5,670,000	Sept. 15, '16	.25	Tough-Oake, s.	Ont...	631,500	5	255,742	332,187	Oct. 2, '16	.02		
La Blanca,	Mex...	140,000	20		2,775,700	Mar. 31, '13	.90	Tretheway, s.	Ont...	1,000,000	1		1,061,988	July 15, '14	.05%		
La Republica, s.	Mex...	400,000	5		110,000	Aug. 15, '11	.05	Wettlaufer-Lorrain, s.	Ont...	1,416,590	1		656,385	Oct. 20, '13	.05		
La Rose Con, s.	Ont...	1,499,827	5	299,724	6,686,844	Oct. 20, '16	.05	Yukon, g.	Y. T.	3,500,000	5	757,500	8,370,510	Sept. 30, '16	.05		

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MINING WORLD

AND
ENGINEERING

DENVER

403 First National
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CHICAGO

December 23, 1916.

Minerals Separation Wins Supreme Court Decision Against Hyde

There is no doubt that the decision rendered by the U. S. Supreme Court in the flotation litigation is the most momentous ever rendered as concerns the world's mineral industry. The fact that the recent procedure of the court in giving out advance information of this kind was unusual, restrained our Washington representative from telegraphing the decision in time for last week's issue, under the belief that the printer's proofs were to undergo marked corrections.

The following is the official text of the decision given in its entirety, the incorrect version printed last week having been unauthorized:

In this suit the complainants, the first named as the owner and the other as general licensee, claim an infringement of United States letters patent No. 835120, issued on the 6th day of November, 1906, to Henry Livingstone Sulman, Hugh Fitzalis Kirkpatrick-Picard and John Ballot. The usual injunction, accounting and damages are prayed for. The District Court sustained the patent as to claims numbered 1, 2, 3, 5, 6, 7, 9, 10, 11 and 12; found that the defendant had infringed each of these claims, and granted the prayer of the petition. The Circuit Court of Appeals for the Ninth Circuit reversed the decree of the District Court and remanded the case with instructions to dismiss the bill. The case is here on writ of certiorari to review that decision.

As stated in the specification, the claimed discovery of the patent in the suit relates "to improvements in the process for the concentration of ores, the object being to separate metalliferous matter from gangue by means of oils, fatty acids, or other substances which have a preferential affinity for such metalliferous matter over gangue."

The answer denies all of the allegations of the bill and avers that in 25 designated United States and 5 British patents the process described in suit was "fully and clearly described and claimed," and it also avers that the claimed discovery was invented, known and used by many persons long prior to the time when the application was made for the patent in suit. Notwithstanding this elaboration of denial counsel for the defendant in the summarized conclusion to their brief rely upon only five of the many patents

referred to as showing that the patent in suit was anticipated and is therefore invalid for want of novelty and invention, viz: Everson (1886), Froment (Italy, 1902; Great Britain, 1903), Glagner (1903), Schwartz (applied for April 19, 1905, issued Dec. 19, 1905), and Kirby (applied for Oct. 17, 1903, issued Dec. 18, 1906). And the defendant, a man obviously experienced in the subject, says that, in his opinion, the whole basis of flotation concentration was disclosed in the Everson U. S. patent No. 348157 and in the Froment British patent.

It is clear that in the prior art, as it is developed in this record, it was well known that oil and oily substances had a selective affinity or attraction for, and would unite mechanically with, the minute particles of metal and metallic compounds found in crushed or powdered ores, but would not so unite with the quartz, or rocky non-metallic material, called "gangue." Haynes British patent (1860), and United States patents, Everson (1885), Robson (1897) and Elmore (1901). It was also well known that this selective property of oils and oily substances was increased when applied to some ores by the addition of a small amount of acid to the ore and water used in process of concentration. United States patents, Everson (1885), Elmore (1901), and Cattermole (1904).

Prior to the date of the patent in suit a number of patents had been granted in this and other countries for processes aiming to make practical use of this property of oil and of oil mixed with acid in the treatment of ores, all of which, speaking broadly, consisted in mixing finely crushed or powdered ore with water and oil, sometimes with acid added, and then in variously treating the mass—"the pulp"—thus formed so as to separate the oil, when it became impregnated or loaded with the metal and metal-bearing particles, from the valueless gangue. From the resulting concentrate the metals were recovered in various ways.

The processes, of this general character, described in the prior patents may be roughly divided into two classes. The process in the patents of the first class is called in the record the "Surface Flotation Process" and it depends for its usefulness on the oil used

being sufficient to collect and hold in mechanical suspension the small particles of metal and metalliferous compounds and by its buoyancy to carry them to the surface of the mixture of ore, water and oil, thus making it possible, by methods familiar to persons skilled in the art, to float off the concentrates thus obtained into any desired receptacle. The waste material, or gangue, not being affected by the oil, and being heavier than water, sinks to the bottom of the containing vessel and may be disposed of as desired.

The process of the other class, called in the record the "Metal Sinking Process," reverses the action of the Surface Flotation Process, and is illustrated by the Cattermole U. S. patent, No. 777273, in which oil is used to the extent of 4% to 6% to 10% of the weight of the metalliferous mineral matter, depending on the character of the ore, for the purpose of agglomerating the oil-coated concentrates into granules heavier than water, so that they will sink to the bottom of the containing vessel, permitting the gangue to be carried away by an upward flowing stream of water.

The process of the patent in suit, as described and practiced, consists in the use of an amount of oil which is "critical" and minute as compared with the amount used in prior processes, "amounting to a fraction of 1% on the ore," and in so impregnating with air the mass of ore and water used, by agitation—"by beating the air into the mass"—as to cause to rise to the surface of the mass, or pulp, a froth, peculiarly coherent and persistent in character, which is composed of air bubbles with only a trace of oil in them, which carry in mechanical suspension a very high percentage of the metal and metalliferous particles of ore which were contained in the mass of crushed ore subjected to treatment. This froth can be removed and the metal recovered by processes with which the patent is not concerned.

It is obvious that the process of the patent in suit, as we have described it, is not of the Metal Sinking class, and while it may, in terms, be described as a Surface Flotation Process, yet it differs so essentially from all prior processes in its character, in its simplicity of operation and in the resulting concentrates, that we are persuaded that it constitutes a new and patentable discovery.

The prior processes which we have described required the use of so much oil that they were too expensive to be used on lean ores, to which they were intended to have their chief application, and the efforts of investigators for several years prior to the discovery of the process in suit had been directed to the search for a means or method of reducing the amount of oil used, and it is clear from the record that approach was being made, slowly, but more and more nearly to the result which was reached by the patentees of the process in suit in March, 1905. The Froment Great Britain patent (1903) and the Kirby United States patent (applied for in 1903 and granted in 1906) are especially suggestive of the advance

which was being made toward the desired result, but the Froment process was little more than a laboratory experiment, and has never proved of value in practice, and the Kirby process, though approaching in some respects more nearly to the end attained by the process of the patent in suit, found its preferred application in the use of an amount of oil solution equal to one-fourth to three-fourths in weight of the ore treated, which was prohibitive in cost.

Into this field of investigation at this stage of its development came the patentees of the patent in suit. They were experienced metallurgists of London, of inventive genius and with financial resources, and they entered upon an investigation of the processes of oil concentration of ores which was continued through several years, and consisted of a very extended series of experiments in which the quantities of oil, of water and of acid used and the extent and character of the agitation of the mass under treatment resorted to, were varied to an almost unparalleled extent as to each factor, and the results were carefully tabulated and interpreted. It was while pursuing a comprehensive investigation of this character, having, as the evidence shows, the special purpose in mind at the time to trace the effect on the results of the process of a reduction to the vanishing point of the quantity of oil used, that the discovery embodied in the patent in suit was made. The experimenters were working on the Cattermole "Metal Sinking Process" as a basis, when it was discovered that the granulation on which the process depended, practically ceased when the oleic acid (oil) was reduced to about 5% "on the ore." It was observed, however, that, as the amount of oleic acid was further reduced and the granulation diminished, there was an increase in the amount of "float froth," which collected on the surface of the mass, and that the production of this froth reached its maximum when about 1% or slightly less "on the ore" of oleic acid was used. This froth, on collection, was found to consist of air bubbles modified by the presence of the minute amount of oil used and holding in mechanical suspension between 70 and 80% of the total mineral content of the mass treated. It was promptly recognized by the patentees that this froth was not due to the liberation of gas in the mass treated by the action of the dilute acid used, and its formation was at once attributed in large part to the presence of the air introduced into the mixture by the agitation which had been resorted to to mix the oil with the particles of crushed ore, which air, in bubbles, attached itself to the mineral particles, slightly coated as they were with what was necessarily an infinitesimal amount of oil, and floated them to the surface. The extent of the agitation of the mass had been increased as the experiments proceeded until the "series of Gabbett mixers, fitted with the usual baffles, were speeded at from 1000 to 1100 revolutions per minute."

A careful consideration of the record in this case

convinces us that the facts with respect to the process of the patent in suit are not overstated by the plaintiffs' witness, Adolph Liebmann, an expert of learning and experience, when he says in substance:

"The present invention differs essentially from all previous results. It is true that oil is one of the substances used, but it is used in quantities much smaller than was ever heard of, and it produces a result never obtained before. The minerals are obtained in a froth of a peculiar character, consisting of air bubbles, which in their covering film have the minerals embedded in such manner that they form a complete surface all over the bubbles. A remarkable fact with regard to this froth is that, although the very light and easily destructible air bubbles are covered with a heavy mineral, yet the froth is stable and utterly different from any froth known before, being so permanent in character that I have personally seen it stand for 24 hours without any change having taken place. The simplicity of the operation, as compared with the prior attempts, is startling. All that has to be done is to add a minute quantity of oil to the pulp to which acid may or may not be added, agitate for from 2½ to 10 minutes, and then after a few seconds collect from the surface the froth which will contain a large percentage of the minerals present in the ore."

It is not necessary for us to go into a detailed examination of the process in suit to distinguish it from the processes of the patents relied on as anticipations, convinced as we are that the small amount of oil used makes it impossible that the lifting force which separates the metallic particles of the pulp from the other substances of it is not to be found principally in the buoyancy of the oil used, as was the case in prior processes, but that this force is to be found, chiefly, in the buoyancy of the air bubbles introduced into the mixture by an agitation greater than and different from that which had been resorted to before and that this advance on the prior art and the resulting froth concentrates so different from the product of other processes make of it a patentable discovery as new and original as it has proved useful and economical. It results without more discussion that we fully agree with the decision of the House of Lords, arrived at upon a different record and with different witnesses, but when dealing with the equivalent of the patent in suit, in *Minerals Separations, Ltd., v. British Air Concentration Syndicate, Ltd.*, 27 R. P. C. 33. In this decision Lord Shaw, speaking for the court and distinguishing the process there in suit especially from the Elmore oil flotation process which had gone before, but which was typical of the then prior art, said: "They (the patentees of the Agitation Froth Process of the patent in suit) are not promoting a method of separation which had before been described, but they are engaged upon a new method of separation. Instead of relying upon the lesser specific gravity of oil in bulk they rely upon the production of a froth by means of an agitation, which not only assists the process of the minute quantities of oil reaching the minute particles of metal, but forms a multitude of air cells, the buoyancy of which air cells, forming around single particles of the metal, floats them to the surface of the liquid."

And Lord Atkinson said: "In their process this mysterious affinity of oil for the metallic particles

of the ore is availed of, yet the oil is used in such relatively infinitesimal quantities that the metallic particles are only coated with a thin film of it, and the lifting force is found not in the natural buoyancy of the mass of added oil, but in the buoyancy of air bubbles, which, introduced into the mixture by the more or less violent agitation of it, envelop or become attached to, the thinly oiled metallic particles, and raise them to the surface, where they are maintained by what is styled the surface tension of the water."

The record shows not only that the process in suit was promptly considered by the patentees as an original and important discovery, but that it was immediately generally accepted as so great an advance over any process known before that, without puffing or other business exploitation, it promptly came into extensive use for the concentration of ores in most, if not all, of the principal mining countries of the world, notably in the United States, Australia, Sweden, Chile and Cuba, and that, because of its economy and simplicity, it has largely replaced all earlier processes. This, of itself, is persuasive evidence of that invention which it is the purpose of the patent laws to reward and protect. *Diamond Rubber Co. v. Consolidated Tire Co.*, 220 U. S. 428; *Carnegie Steel Co. v. Cambria Iron Co.*, 185 U. S. 403, 429, 430; *The Barbed Wire Patent*, 143 U. S. 275; *Smith v. Good-year Dental Vulcanite Co.*, 93 U. S. 486.

The claim that the patentees of the patent in suit are not the original discoverers of the process patented, because an employe of theirs happened to make the analyses and observations which resulted immediately in the discovery, cannot be allowed. The record shows very clearly that the patentees planned the experiments in progress when the discovery was made; that they directed the investigations day by day, conducting them in large part personally, and that they interpreted the results. *Agawam Co. v. Jordan*, 7 Wall. 583-603, rules this claim against the defendant.

Equally untenable is the claim that the patent is invalid for the reason that the evidence shows that when different ores are treated preliminary tests must be made to determine the amount of oil and the extent of agitation necessary in order to obtain the best results. Such variation of treatment must be within the scope of the claims, and the certainty which the law requires in patents is not greater than is reasonable, having regard to their subject matter. The composition of ores varies infinitely, each one presenting its special problem, and it is obviously impossible to specify in a patent the precise treatment which would be most successful and economical in each case. The process is one for dealing with a large class of substances, and the range of treatment within the terms of the claims, while leaving something to the skill of persons applying the invention, is clearly sufficiently definite to guide those skilled in the art to its successful application, as the evidence abundantly shows.

This satisfies the law. *Lowry v. Whitney*, 14 Wall. 620; *Ives v. Hamilton*, 92 U. S. 426, and *Carnegie Steel Co. v. Cambria Iron Co.*, 185 U. S. 403, 436, 437.

The evidence of infringement is clear.

While we thus find in favor of the validity of the patent, we cannot agree with the District Court in regarding it valid as to all of the claims in suit. As we have pointed out in this opinion, there were many investigators at work in this field to which the process in suit relates when the patentees came into it, and it was while engaged in study of prior kindred processes that their discovery was made. While the evidence in the case makes it clear that they discovered the final step which converted experiment into solution, "turned failure into success," (*The Barbed Wire Patent*, 143 U. S. 275), yet the investigations preceding were so informing that this final step was not a long one, and the patent must be confined to the results obtained by the use of oil within the proportions often described in the testimony and in the claims of the patent as "critical proportions" "amounting to a fraction of 1% on the ore," and therefore the decree of this court will be that the patent is valid as to claims No. 1, 2, 3, 5, 6, 7 and 12, and that the defendant infringed these claims, but that it is invalid as to claims 9, 10 and 11. Claims No. 4, 8 and 13 were not considered in the decrees of the two lower courts and are not in issue in this proceeding.

The decision of the Circuit Court of Appeals will be reversed, and the decision of the District Court, modified to conform to the conclusions expressed in this opinion, will be affirmed.

Dredging in Victoria.

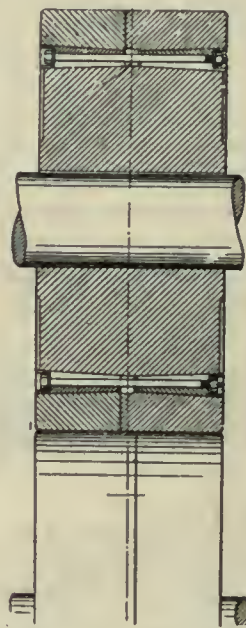
The quantity of material treated during the year 1915 by dredging and sluicing in Victoria was 11,788,247 cu. yds. as against 13,979,696 cu. yds. in 1914, and the amount of gold won was 50,152 ozs., as against 56,796 ozs. in 1914. The yield of gold per cu. yd. of material treated was 2.0 grains. The total area treated was 365.8 acres, the ground varying in depth from 7 ft. to 75 ft., and the number of men employed was 923. The dividends paid were £30,842, the wages and other expenses amounted to about £148,538, and the initial cost of the plants was approximately £272,547. The quantity of tin won during the year was 87½ tons, valued at £8640. The total number of bucket dredges in operation was 42, against 45 the previous year; 17 pump hydraulic sluicing plants were in operation, contrasted with 21; there were nine jet elevators, compared with 13; 68 dredging plants were worked, against 79, and five hydraulic sluicing plants operated, against six the previous year.

True conservation is described by Dr. L. D. Ricketts as being an improvement of processes and an avoidance of waste.

Long-Wearing Roll Shells.

In the design and construction of crushing rolls, economy demands that the shell surrounding the core of the roll shall be able to crush a maximum quantity of rock to the pound of steel used up. Under present conditions it appears to be impossible for any mill to roll a steel shell of 24-in face, thereby making it necessary, where capacity is the object sought, to employ cast steel shells which are inferior in crushing life to the preferred roll steel shell. In order, therefore, that roll steel may be availed of, a splitting of the shell is necessary, so that the shell composed of two sections, separating along a plane parallel to the plane of rotation of the roll.

In a new type of shell recently suggested by Wallace N. Tanner of Anaconda, Mont., the separating



LONG-WEARING ROLL SHELLS.

plane of joint between the shell sections is located to one side of the center line of the roll, the object of this arrangement being to reduce the wear at the joint by enabling a pair of rolls to be assembled without having their joint planes coincident.

He also proposes a simple means of securing the shell sections to the core. As will be seen by the diagram, the core consists of two truncated cones mounted on the shaft with their bases together. The two sections of the shell are bored out so that their interiors correspond in contour to the face of the core. In assembling, wedge-shaped rings are forced in between the core and shell sections and drawn up by bolts as shown.

Air drill hose is often affected unfavorably by miners pouring oil in the hose itself before connecting to the drill machines.

Any manufacturer who spends money to promote his name must protect his integrity.

Activity in Goodsprings District, Nevada

W. A. SCOTT.

The numerous mines of Goodsprings district, Nevada, are located in Spring Mountain range, 25 to 30 miles in length. Goodsprings, the supply center for that region, is 12 miles westerly from Jean, a station on Los Angeles-Salt Lake railroad. The formation of this range consists of limestone, having numerous intrusions of igneous rock. The ore occurs on the contacts of different kinds of lime—blue, yellow and white. The bedding planes of blue lime dip about 34° west. Ore shoots also occur along breaks in the blue lime and in adjacent bedding. The gangue in shoots and veins consists of chert and altered limestone. The ore comprises zinc carbonate, silicate of zinc and sulphide of zinc, nearly all of which are accompanied by lead. In some veins the zinc and lead are segregated from each other.

The Boss mine has a lode carrying platinum in association with copper carbonate and gold; also in

35 to 40% zinc and 3 to 4% lead. Close to this is the Copper Peak, on the same contact as that of Ninety-Nine. The Copper Peak is owned by P. S. and W. E. McClanahan, H. L. Smith and R. W. Andrus. Shipments this year amounted to about 400 tons, which sampled 17% copper. Workings are by tunnels, and the ore has to be transported 1½ miles by pack animals to the beginning of wagon haulage.

The Christmas, situated at the south end of the range, and controlled by Joseph Doran, Fred Hale, Erick Zenezn, and others, will soon have its mill, with Stebbins dry concentrators, ready for operation. The ore carries zinc and lead and is medium grade.

Monte Cristo, said to have been the earliest zinc producer in the Goodsprings district, is in the hands of lessees who are mining and shipping a car per month of high-grade ore.

Bullion mine, a mile south of Monte Cristo, is



THE TOWN OF GOODSPRINGS.



THE YELLOW PINE MILL.

large seams of plumbo-jarosite, containing palladium and gold.

The mill being erected is to put into effect a modified chlorination process, developed by R. J. Goodwin, metallurgist. The plant contains a crusher and rolls, and a Holt-Dern roaster, and has a daily capacity of 10 tons. Those in control of the property are S. E. Yount, O. J. Fisk, H. White, and others. The presence of platinum in Boss ores was discovered by Harry K. Riddall, assayer and metallurgist, now at Yellow Pine mine and mill. The Boss is about 10 miles from Goodsprings.

Ninety-Nine mine, owned by J. B. Jenson, is a copper producer. During 1916 the ore shipments have averaged 80 tons per month, running 6 to 24% copper. One stope yielded 1200 tons of ore sampling 15%. Most of the ore is oxidized, and is hoisted from a 400-ft. shaft.

The Contact mine, owned by A. L. Chaffin, Goodsprings, produces the zinc ores typical of the district. Ore shipments amount to 100 tons per month, running

owned by J. J. Daynes, C. E. Jenkins, and others, and is under the management of Thos. Varden. A mill of 35 tons capacity, equipped for crushing, pulverizing, and dry concentrating by Stebbins tables, is being operated. October shipments of concentrates consisted of 3 cars running 70% lead, and 3 cars sampling 40% zinc.

In this vicinity is the Anchor mine, operated under direction of Roy Moon. Included in the equipment is a half-mile tramway and a dry concentrating mill. Frank A. Keith, Los Angeles, is one of the owners.

The New Year, 12 miles south of Goodsprings, belongs to the Campbell estate, and has been worked profitably by leasers during last 2 years. One lease to Bert Whitney is producing 200 tons per month of zinc ore of good grade. A second lease to Springer & Frederickson has been producing 75 tons of zinc and 40 tons of lead ore per month.

The Yellow Pine Mining Co. produces about 2700 tons of ore per month, of which 900 tons are shipped

crude and 1800 tons are concentrated before shipping. This is not only a big producer, but a steady dividend payer. The mill is situated at Goodsprings, the mine is 4 miles to the southwest, and the two are connected by a narrow gauge railway for ore haulage. The mine is opened by a 900-ft. inclined shaft in which skips are operated. A Fairbanks-Morse 75-hp. semi-Diesel oil engine operates a generator, the current from which operates the hoist and air compressor. The mill is equipped with a crusher, rolls, jigs and tables. The mill heads run 31 to 33% zinc, and 12 to

ore of profitable grade is exposed all the way down.

The Sultan, 8 miles southwest, owned by Henry Robbins, Goodsprings, is a producer of zinc-lead ore. A mill equipped with Stebbins dry concentrators, having capacity of 30 tons per day, is operated chiefly to separate the lead from the zinc. The Mongolian group, near Sultan, belongs to the A. E. Thomas estate, and is under lease and bond to R. Puelz, who is shipping 20 tons per month of zinc carbonate, running 40% zinc.

The Bill Nye, owned by Wm. Allen, Goodsprings,



THE BULLION MILL.



THE SULTAN MILL.

17% lead. About one-third ounce silver is obtained from each 1% of lead. This ore comprises both sulphide and carbonate. The work here is not only a method of concentration but of separation by gravity. The president of the company is J. F. Kent; secretary Fred A. Hale, Jr.; S. E. Yount and R. B. Chapman are directors and stockholders. J. O. Kemple is mine superintendent, T. J. Renaux being in charge of the mill.

Keystone mine, 7 miles west of Goodsprings, is said to have been located in 1888, and it is claimed it has produced \$500,000 in ore. It is operated under lease by Geo. Rose, who is developing and building a mill for concentrating a lot of ore in an old dump. The shaft has a depth of 700 ft., and it is said oxidized

is a small, steady shipper of ore running 40% zinc. The Frederickson, owned by Munzburg & O'Kelly, is mining and dry-concentrating a small tonnage of zinc-lead ore. The Columbia Copper, Jos. Diederich, owner, has a 1200-ft. tramway, ore bins and a gasoline hoist, and is producing a small tonnage.

The Potosi, in northern part of district, was located in 1852, and is now operated by Empire Zinc Co., which produces about 1200 tons of zinc-lead ore per month. The ore is said to run 35 to 45% zinc. The mine is worked through tunnels, and ore is delivered to loading bins by a 2500-ft. tramway. The ore is shipped to Arden station. The Dawn, operated by A. Muncabrock, has shipped some zinc-lead ore, and has shown some molybdenite in the same vein. The Red

Cloud is opened by a 300-ft. shaft and has produced some gold that was extracted by cyanidation. It belongs to J. Armstrong and John Loup, of Long Beach. The Pilgrim is now active. It is owned by Henry Robbins and Harvey Hardy.

Yellow Pine Extension Co. owns the Alice copper and zinc mine, adjoining Yellow Pine mine on the south. It is being further developed from a 700-ft. inclined shaft. The company is controlled by A. J. Robbins, Geo. A. Fayle, Goodsprings, and E. B. Critchlow, Salt Lake, and M. M. Miles and A. J. McDermott, Los Angeles. About 100 tons per month of zinc ore is being shipped. The Prairie Flower, half a mile north of Yellow Pine, is being developed by Fred Hale, who has it under bond. Incidentally it is a small producer of zinc-lead ore. The Oro Amigo, $1\frac{1}{2}$ miles from the Boss mine, is owned and is being developed by S. E. Yount. High grade ore, carrying gold and platinum, has been found.

Other properties being developed comprise the



THE ANCHOR MILL.

Hoodoo, owned by Frank Williams, who has mined and shipped ore running 40% zinc and 60% lead; the Root Zinc Co., operating on Bonanza hill, is mining and shipping about 10 tons per day of zinc-lead ore, and will construct a 1700-ft. aerial tramway to carry the ore to the loading bins; the Singer, in the hands of lessees, is mining and shipping small lots of ore; the Whale has considerable low-grade ore developed, and has put in a gasoline-driven compressor for drill work; the Milford and Addison groups have been producing 4 years; the Ingomar, 30 miles from Goodsprings, and 16 miles from Roach station, is a steady producer of lead and zinc; the Green Monster, belonging to the Hearst estate, is active, under management of C. B. Neel.

The Goodsprings Sampling Co., managed by J. B. Jenson, has about completed a sampling plant of 20 tons capacity at Jean station. This plant has a Wheeling crusher, three sets of Traylor rolls, a 200-ft belt conveyor, a 28-hp. Western gas engine, 100-ton track scales, and a 225-ft. ore platform, as well as ore bins. This plant was expected to be ready for operating be-

fore Jan. 1. In the meantime, this company has contracted for the delivery of 5000 to 6000 tons of ore per month from the district, which includes both lead and zinc ores. A custom concentrating plant is also to be built at Goodsprings by those who control the sampler. It is to have a capacity of 50 tons per day, and will be equipped for wet concentration. This will facilitate the marketing of ores from Yellow Pine district,



THE COPPER PEAK MINE.

as it is stated on good authority that 70% of the ore available in the mines is of milling grade, and needs concentrating before shipping to market. Part of this is zinc carbonate that has been sorted from the lead ore. The zinc ore produced here is mostly carbonates, silicates and oxides. The lead ores are half carbonate and half sulphide.

During the first 6 months of 1916 the shipments of high-grade ores from the district averaged between



THE YELLOW PINE MINE.

5000 and 6000 tons per month, which did not include Potosi shipments and others from the north end of the district, amounting to 1200 to 1500 tons a month.

The supply of selenium is obtained almost wholly from working the residues of electrolytic copper plants and the flue dust in sulphuric acid chambers.

A special steel of great importance to the electrical industry is silicon steel, used in electrical transformer construction and all alternating-current apparatus.

Underground Electric Mine Lighting

· LETSON BALLIET.

Underground lighting in mines has been viewed from various angles, and at the present time there are several methods in use. There is the open oil lamp, the Davy lamp, the candle, the carbide lamp, and the electric battery lamp fitted to the miner's cap. Electric lights are now quite commonly used in underground lighting.

The particularly advantageous feature in wiring a mine to have it well lighted throughout is the safety it provides by having all parts of the mine permanently lighted, so that the workman may see where he is going, but the comparative value of electric lights over hand lights has never been extensively discussed.

There are a few who contend that electric lights will not give any indication of bad air, while a candle or an open flame will go out and warn the miner of the danger. This argument can be met with the answer that if you suspect bad air you can have an open flame for indicator.

"How much does it cost you for electric lights in the Buckeye mines?" I was asked.

Well, we will take one drift in this mine to give you some actual comparative figures. We have a long drift in one level that is 1200 ft. long, two upraises that are working from that level. From the station to the breast, and up the manway of the upraises, we have electric light globes, protected by wire guards, to within about 50 ft. of each face. There are 32 lights on this circuit, at varying distances from 50 to 75 ft. apart, depending on turns or conditions. The circuit is equipped with 40-watt incandescent tungsten globes. Each working crew is provided with an extension cord with a lamp on the end of the cord, also protected by wire screen guard. With this extension cord he makes a connection at the nearest light socket to where he wants to work, strings the cord back out of the way, and carries the globe to his working face and hangs it up behind him. In this way the entire working place is flooded with light. He is a two-handed man, and does not have to bother with his light again until he is through with his shift and ready to blast. Then he carries out his light and winds up his extension cord and puts it in a safe place. Altogether, there are thirty-eight 40-watt tungsten globes burning in this drift and the upraises. This consumes 1500 watts on the meter every hour, which costs us $4\frac{1}{2}$ cts. an hour, or 35 cts. per 8-hour shift for the drift. There are eight men employed in this drift on the working faces connected with it, including the trammers; thus the electric lights cost us $4\frac{1}{2}$ cts. per shift per man, in this drift. If we had 20 men working in this part of the mine the lights would cost us about 2 cts. per shift per man.

The efficiency of this method of lighting is shown in the fact that when a man walks through a drift he walks at his natural speed, and is not groping his way in the dark, or trying to protect his lights from draughts or wind. The lights never go out and no time is lost adjusting them or handling them. The man is two-handed and works with the same physical efficiency that he would work on the surface or in a factory that was well lighted, and the actual results obtained in this mine show that the men accomplish 33% more work when the mine is electric lighted throughout than when working with hand lamps.

The cost of the operations in this drift are at the present time \$2000 a month, including miners' wages, supplies and its proportion of the overhead expense. As the progress and actual results obtained in this drift are 33% more than they were with any form of hand light, we find that we accomplish exactly as much in 3 months as we previously accomplished in 4 months, and therefore we have saved the entire operating expense of one month every quarter of a year; or to continue the same basis, we accomplish exactly the same in 12 months as we did accomplish in 16 months with the hand lights. Therefore we find that \$2000 a month for 4 months, which we have saved, would aggregate \$8000, and show that by using electric lights throughout the working places in the mine that we save \$8000 a year over any form of hand lights that we know about. Other levels, crosscuts and drifts show the same proportionate saving, and these figures are carefully compiled every month and have been for the last 3 years.

You could not induce us to go back to hand lamps, nor do the miners working in the mine wish to go back to hand lamps. The hand-lamp method of lighting is just as obsolete from an efficiency standpoint as the hand drill is when compared to the pneumatic drill.

Our men always have a candle or two in their box somewheres near at hand, so that they can light it when they wish to "spit" their fuse, or if by any chance the wires should be broken and the lights go out they can find a candle to come out of the mine, or if they suspect any gas they can light a candle and test it, but they don't work by it, and don't want to work by it.

Iron combines with all non-metallic elements, generally forming two or more distant compounds with each. It is dissolved by all the mineral acids with which it forms well-known salts.

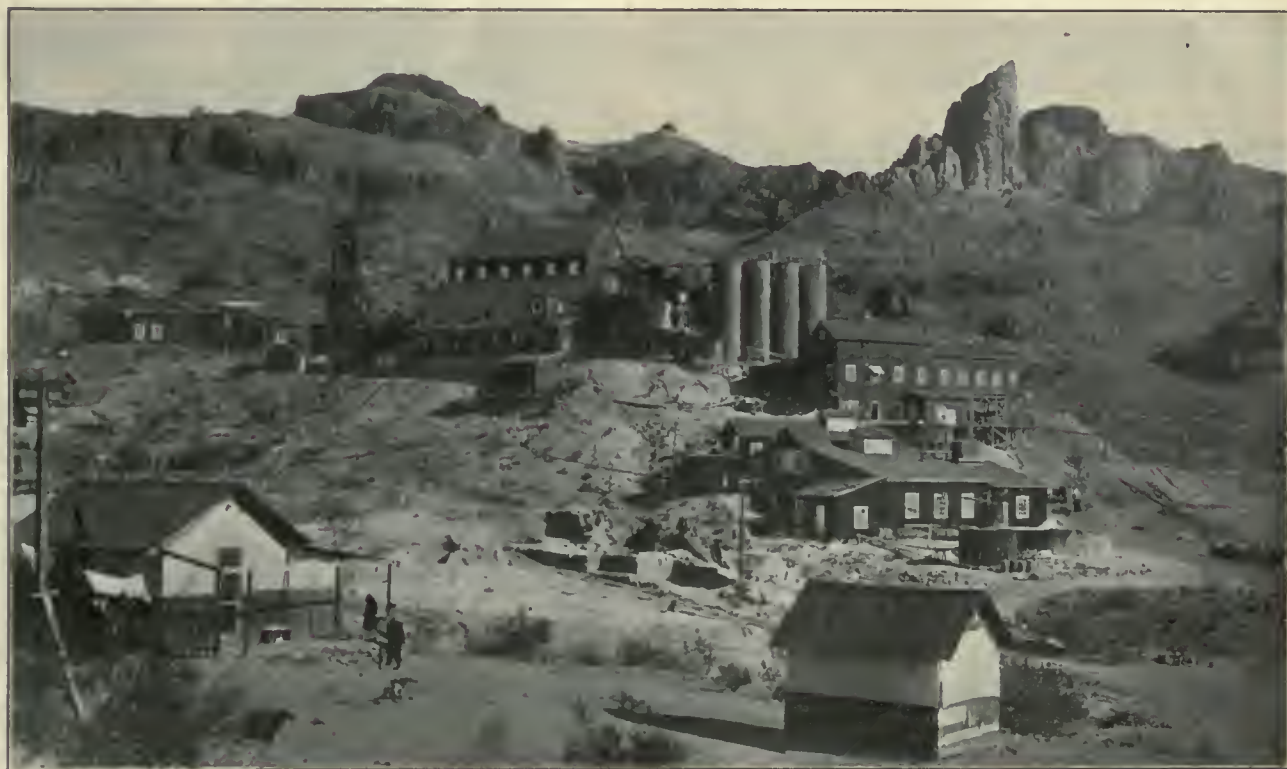
There are two general methods employed in the manufacture of sulphuric acid, namely, the "contact process" and the "lead-chamber" method.

Tom Reed Gold Mines Property, Arizona

C. F. SPILMAN.

The Tom Reed Gold Mines Co. has opened an entirely new mine in the southerly end of its extensive estate which bids fair to give forth a golden stream of bullion far in excess of the wonderful production of the past 7 years. Because development has not been carried far enough to determine the size and value of the big vein that has been opened through shafts on the Black Eagle, Bald Eagle and Aztec Center claims, the management until now has made no official report of conditions. That the work finally has been carried to a point that makes sure the existence of a huge deposit of gold ore is demonstrated by the action of

Reed is entering an era in its history that will long be remembered by the stockholders because of its production and high earnings. President Moerdyke states that the ore body has been proven from the Bald Eagle shaft in a southeasterly direction for 1100 ft. to a point well beyond the Aztec shaft. The Bald Eagle shaft workings at a depth of 200 ft. cut 33 ft. of vein matter of which 26 ft. is quartz assaying \$9 to \$10 per ton. Before this work was done a shaft was sunk on the Black Eagle claim 1500 ft. distant and a crosscut driven to the east, intersecting the vein in the Aztec Central S. E. claim. Here at a depth of 400



TOM REED GOLD MINING CO.'S SURFACE PLANT, OATMAN, ARIZ.

the directors, who have authorized Superintendent Rabb to start construction of an addition to the mill which will double the capacity of the present reduction works. The new unit, which will increase the capacity to 250 to 300 tons per day, will be completed in 6 months and the company will then be able to treat a large tonnage of ore averaging around \$12 to \$15 per ton at a handsome profit. Mine and mill costs in the old mill, which employs stamps in crushing, are under \$6, and this cost will be materially lessened with the new machinery in operation. In fact, it is not improbable that \$5 ore will be treated at a profit.

President Moerdyke and Vice-President Mushrush spent a week at the mine and examined all the workings. They left firm in the conviction that the Tom

ft. a drift was driven back toward the Bald Eagle shaft. This drift soon entered a shoot of good ore in a big, strong vein. A shaft was then started near the center of the Aztec Center claim, which sidelines the Bald Eagle, known as the Aztec shaft, which now is the center of operations. At a depth of 400 ft. a crosscut from the Aztec shaft entered the vein and was extended to the footwall through 18 ft. of ore. The first 12 ft. on the hanging wall side of the vein averaged \$8.50, the 6 ft. on the foot wall \$14.50. A drift was driven along the foot wall for 350 ft. face samples across the 6 ft. broken by the drills running as high as \$50 and the average well up into good mill values. Shaft sinking was resumed and the shaft is now well into the vein at 470 ft. The quartz is 10 ft. in

width and assays \$13.88. An ore bin has been built at the Aztec shaft and preparations made to transport the ore to the mill by auto trucks whenever it may be needed. Eventually an aerial tramway will be constructed.

The Aztec workings are about a mile southeast of the main working shaft and mill. Intervening between the Bald Eagle workings and the main workings is the Gray Eagle claim, which also has great possibilities.

In the older workings of the Tom Reed, conditions are excellent, and there is no difficulty in supplying the mill with 140 tons per day. What is known in Tom Reed nomenclature as the No. 3 ore-shoot has been opened on the 1400 level for a distance of 75 to 100 ft. and is being stoped for a width of 5 to 6 ft., producing ore of good mill value. Lenses of high-grade ore are not infrequently encountered in the mine, and the richer ore is fed in with that of lower grade, bringing the average mill feed up to about \$15 per ton. The mill is treating 140 tons per day.

The Tom Reed mine has had a spectacular career, and for the past 7 years has produced an average of \$750,000 gold yearly. The company has produced \$5,833,702 from the start of operations up to April 1, 1916, and has paid dividends aggregating \$2,528,648, or \$2.75 per share. The bullion production for the fiscal year ending March 31, was \$658,848 from which the directors paid dividends of \$163,719. This left \$197,786 cash on hand April 1, insuring ample funds for the construction of the new addition to the mill. As the company probably is earning more than \$1000 per day, the treasury may not be greatly depleted by the cost of new construction, and dividends may be resumed at a very early date.

A significant feature of Tom Reed development is the fact that the ore bodies have not been exhausted at 1400 ft., proving that the big veins of the Oatman district are deep-seated. There are lean places, it is true, and places where the ore channel contracts, but the average size and average values are unusual and found in few gold fields anywhere.

An Exhaustive Study of Zinc.—Recognizing that there is an insufficient knowledge of the properties of zinc, the U. S. Bureau of Standards has undertaken an investigation which it proposes to have carried out with thoroughness. Specimens have been prepared for tests of the metal in tension, torsion, transverse, cold bend, compression, shearing and hardness. Considerable progress has also been made in the investigation of testing methods for galvanized materials, which has been carried out in co-operation with the American Society for Testing Materials, several manufacturers furnishing the samples.

Good health is one of the first requisites for the efficiency of labor, for more and better work can be done by strong, well men than by those who are sickly.

Weston Portable Electro-Dynamo-meter Voltmeters.

Problems hitherto considered impossible of solution have been solved in the designing of these Weston instruments. They are instruments of precision adapted to use on A. C. or D. C. circuits. Guaranteed to an accuracy of one-fourth of 1% full scale value, of any frequency to 133 cycles per second, and any commercial frequency even as high as 500 cycles per second with very slight error. Double ranges are furnished in all instruments of this model.

Their movable systems have an extremely low moment of inertia and are very effectively damped.



MODEL 341.

Indications are independent of room temperature, the heating effect of current passing through the windings, and the instruments are shielded from external magnetic influences.

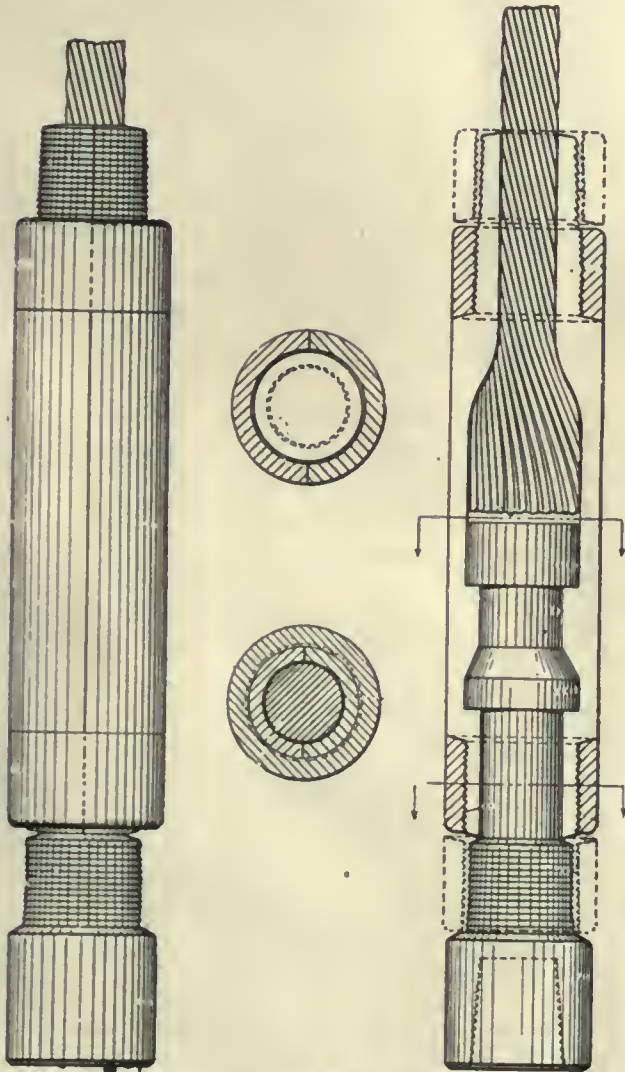
The scales are $5\frac{1}{4}$ in. long. Owing to the principle of operation these instruments cannot be made with scales that are uniform throughout their entire length, but the upper four-fifths portion of the scale is remarkably legible and uniform. Each scale is hand-calibrated and is provided with a mirror over which the knife-edge pointer travels and the pointers are equipped with a simple zero setting device.

Railroad's Use of Fuel Oil.—It is estimated consumption of fuel oil by railroads of Texas and Louisiana for 1916 will run close to 11,200,000 barrels, compared with 11,020,259 for 1915. The greatest consumer of this fuel in the two states is Southern Pacific. Last year its system in Texas and Louisiana used 4,454,899 barrels and this year consumption will be nearly 5,000,000 barrels, it is stated. Santa Fe was the second largest consumer of fuel oil, it having burned 2,357,460 barrels last year. Southern Pacific's subsidiary steamship line, operating between Galveston and New York, used 307,542 barrels of heavy Mexican oil for fuel last year. Southern Pacific is obtaining a considerable supply of fuel oil from its subsidiary, the East Coast Oil Co., which has extensive oil producing holdings in the Tampico region. It is reported Santa Fe plans to enter the Mexico oil producing fields when conditions in that country become more settled.

Swivel Connection for Oil Well Ropes. New Northwest Station of the Bureau of Mines.

Oil well pumps are operated by means of a wire rope extending to the bottom of the well. A swivel is inserted at a point near the weights, used for holding the rope taut, to permit the latter to twist freely. As the usual diameter of the swivel socket is only about $1\frac{5}{8}$ ins. it is difficult to obtain sufficient wearing surface for the different parts of the swivel, and as a consequence the latter wears out rapidly due to the heavy pressure on these small surfaces.

Henry B. Walker, Lancaster, O., has invented a



SWIVEL CONNECTION FOR OIL WELL ROPES.

swivel socket which is shown in the illustration. This has a number of bearing surfaces in series, which between them absorb the pressure and give free movement and a long life to the socket.

At the lower end is seen a mandrel and coupling. Above this is the rope end, enlarged in the usual manner. Surrounding both mandrel and rope end is a split shell, its upper interior bowled out to receive the rope end and its lower interior formed with bearing surfaces to fit the shoulders on the mandrel. Nuts on each end hold the two halves of the shell together.

The mining and metallurgical experiment station for the Pacific northwest states and the coast regions of Alaska, which was recently established at the College of Mines, University of Washington, Seattle, by Secretary of the Interior Franklin K. Lane, will be opened on Jan. 1, 1917. Dorsey A. Lyon, who has been superintendent of the Salt Lake station, spent Dec. 6 and 7 at Seattle making preparations for the opening of the station.

The principal investigations of the new station, for the immediate future, will be in electro-metallurgy, which is the specialty of Mr. Lyon, the superintendent. He will be assisted by two other experts in the subject and a junior chemist. The electric furnaces will be located in the present College of Mines laboratories and all work will be done in co-operation with the college. Coal washing and mining



BUILDING DONATED TO THE BUREAU OF MINES, SEATTLE.

will be in the hands of a mining engineer, George Watkin Evans, of Seattle. The whole staff, to be assigned to the station in the near future, will number 9 men.

The Bureau of Mines station will be housed in a building of its own, which will serve as headquarters for all operations of the Bureau within the Pacific northwestern states and the coast regions of Alaska. The Bureau has maintained a mines rescue station at the College of Mines since 1910, where nearly 800 men have been trained. Co-operative work will be carried on by the Bureau with the Oregon State Bureau of Mines at Corvallis and the University of Idaho at Moscow.

Money invested in fresh air, good light, pure water and generally clean conditions will return good interest in the shape of increased labor efficiency.

The maintenance of working conditions such as will not menace the health of the worker is to be desired in all occupations.

What the Mining Companies are Doing

American Smelting & Refining.

Earnings on American Smelting & Refining common for six months ending Dec. 31 are expected to amount to fully \$20 a share. That would bring common share earnings for the year to about \$37 a share, earnings for first half year having been over \$16.

These large earnings for current half year are due to higher prices for copper and greater volume of metal turned out from smelters and refineries.

Capacity is booked up for first half of 1917, including additional refinery capacity to be brought in next month. Indications are, therefore, that in six months to June 30 next American Smelting will earn between \$25 and \$30 a share for the common. Continuance of the war through next year would probably result in earnings for the common for the 12 months of between \$50 and \$60 a share, making common share earnings for this year and next year combined between \$87 and \$97 a share.

Chile Copper Co.

The Chile Copper Co. produced 4,098,000 lbs. of copper in November. We compare production for 1916 (in pounds) as follows:

January	2,066,782
February	3,144,480
March	3,536,796
April	3,702,327
May	3,664,000
June	3,610,000
July	3,574,000
August	3,020,000
September	4,038,000
October	4,542,000
November	4,098,000

Arizona Copper Co.

Arizona Copper Co. produced 4,380,000 lbs. of copper in November, which compares with previous months as follows:

	1916.	1915.	1914.	1913.
January	3,632,000	3,474,000	3,100,000	
February	3,200,000	3,062,000	3,000,000	
March	3,510,000	3,284,000	3,200,000	
April	5,140,840	4,200,000	3,570,000	3,100,000
May	4,900,000	3,516,000	3,092,000	3,200,000
June	4,800,000	3,674,000	3,742,000	3,000,000
July	4,400,000	3,390,000	3,300,000	2,600,000
August	4,800,000	3,600,000	3,738,000	1,800,000
September	4,180,000	*1,552,000	2,408,000	1,880,000
October	4,900,000	†	2,406,000	3,550,000
November	4,380,000	†	2,402,000	
December		†		

*Idle because of strike. †Closed.

Butte & Superior.

The Butte & Superior Mining Co. mined during the month of November 54,312 tons of ore and milled during the same month 53,880 tons from which 14,300 tons of concentrates were realized. The concentrates assayed 53% in zinc. The recoveries were 93.7%. The total amount of zinc in concentrates estimated was 15,158,000 lbs. In October the total amount of ore mined was 54,450 tons with an assay of zinc in concentrates of 52.72% and recoveries of 92.5%. The total zinc in concentrates realized in October was 15,694,000 lbs.

The November showing was relatively a little better than that of October as the month had one less day in it and in addition had election day and Thanksgiving Day.

The month was one of the best in the history of the company and the advancing price of spelter promises to make the last quarter of 1916 one that will roll up good earnings. Butte & Superior Co. is selling its concentrates now direct to the smelting companies with the exception of a small part that it sells as spelter.

The production of silver for the month amounted to 312,000 ozs. or slightly less than that for October. With silver

selling above 75 cts. an oz., the silver production has become quite an item in the monthly earnings.

The production of spelter by the Butte & Superior Co. for the third quarter of this year was greatly curtailed by the accident at the Black Rock mine and its profits were also greatly reduced by the low average price of spelter which was about 8½ cts. per lb.

Granby Con. Co., B. C.

Granby Con. Mining, Smelting & Power Co. is earning at the rate of about \$66 per share. This is on the basis of 29-ct. copper. It is expected, therefore, that Granby will increase its present quarterly dividend rate from 2 per cent to 2¼% at its meeting December.

Anyox production at the present time is a little less than 3,100,000 lbs. per month, or at the rate of 37,000,000 lbs. annually, while at Phoenix the output of about 1,275,000 lbs. per month is equal to about 15,300,000 lbs. annually. Total output of the company, therefore, is at the rate of over 52,000,000 lbs. of copper per annum.

The cost of production at the Hidden Creek property is about 9 cts. per pound compared with 15 cts. at the "Old Granby" or Phoenix property. Earnings at Hidden Creek, on 29-ct. basis, are at the rate of \$7,500,000 annually and at Phoenix \$2,500,000, making Granby's earnings at the present time at the rate of \$10,000,000, or above \$66 per share on the 149,985 shares of outstanding capital stock.

Utah Metal & Tunnel, Utah.

The Utah Metal & Tunnel Co. for the 9 months ending Oct. 1, 1916, earned profits of \$567,737. The company's bonded indebtedness has been reduced \$145,000, leaving outstanding \$229,500.

The combined statement of the company and the Bingham-New Haven for the above period shows as follows:

Income—	
Gross value ore mined.....	\$1,262,752.09
Income from other sources.....	37,161.57
Total income	\$1,299,913.66
Expenses—	
Smelting charge	\$ 315,282.09
Mining	194,325.55
Development	106,532.90
Hauling	6,283.24
Lease ore	18,150.95
Milling	46,497.65
Selling, administration and general expense.....	45,044.17
Total expenses	\$ 732,176.55
Operating profit	567,737.11
Current cash assets—	
Cash	\$ 497,677.38
Due from ore.....	176,104.21
Due for water.....	6,284.42
Total cash assets.....	\$ 680,066.01
Dividend	342,472.50
Details of Production—	

	Average price received.	Gross value.
Gold	\$19.50 per oz.	\$319,334.34
Silver	61.05 cts. per oz.	204,545.08
Copper	26.40 cts. per lb.	393,630.70
Lead	6.90 cts. per lb.	345,241.47
Average Costs—		
Mining		\$2.42 per ton
Milling		1.01 per ton

Standard Silver-Lead, B. C.

According to a statement issued by the company there was an operating loss in October of \$1,111 as compared with an actual operating profit of \$17,785 in September, \$137,637 in March, \$88,008 in April and \$40,968 in May. There was an actual operating loss of \$12,738 in February.

Among other things the loss results from a reduction in the receipts on preliminary shipments, which were \$26,386 in October as compared with \$33,055 in September, and a reduction in the zinc sales which were \$8503 in October as compared with \$17,137 in September.

The surplus at the end of October was \$202,669 as com-

pared with \$264,319 at the end of September. The receipts for October were \$46,670 as compared with \$61,149 in September, \$18,824 in February, \$180,943 in March, \$131,309 in April and \$88,227 in May.

The disbursements for production, tramming, milling, power, shipping and selling, taxes, insurance, casualty insurance, salaries and general expenses were \$37,114. They differ little from those of any other month except February, for which they were less. These figures show a relative operating profit of \$9555 in October as compared with \$24,188 in September, \$143,065 in March, \$93,542 in April and \$55,443 in May. There was a relative operating loss of \$8743 in February.

Disbursements in October for development, construction, work in the Aylard and No. 7 tunnels and store supplies were \$10,867, which is higher than some months and lower than others of the current year.

At the last regular monthly meeting the directors decided to pay all future dividends quarterly on account of the long distance from the transfer office and the great amount of detail connected with monthly disbursements.

Shannon Copper, Ariz.

Shannon November output of 926,000 lbs. of copper compares as follows with previous months:

November	926,000	June	994,570
October	757,000	May	1,072,000
September	744,000	April	982,000
August	925,000	March (24 days)	682,000
July	968,000	February (16 days) ..	666,000

Miscellaneous Reports.

The September report of the Iron Cap Copper Co. shows as follows: Receipts, \$14,192; expenses, \$21,938; loss, \$7746. A new hoist paid for was included in the expenses.

Plans have been tentatively outlined by the management of Consolidated Nevada Utah Mines & Smelters Corporation to offer holders of the \$500,000 outstanding 6% first mortgage bonds preferred stock, dollar for dollar, with a bonus of common stock. This would eliminate a fixed charge of \$30,000 per annum. Earnings are said to be running at the rate of \$15,000 monthly, or between \$150,000 and \$200,000 net per annum.

Ohio Copper Co. of Utah has taken over all properties of the Ohio Copper Mining Co. through transfer of deeds to new company. The Ohio Co. of Utah has paid all debts and liabilities of its predecessor company, totaling over \$1,500,000. Acting under order of the U. S. District Court, trustees in bankruptcy of the Ohio Copper Mining Co. have surrendered to the Empire Trust Co. all books and deeds of the company. Stockholders can now obtain transfer of their stock.

The Shannon Copper Co. recently sold 300,000 lbs. of copper for April, May and June delivery at 34 cts. a pound. This is a full 7 cents a pound more than the average price secured by Shannon for its copper in the first 10 months of this year, the average to the end of October being about 27 cts. a pound. About three-quarters of Shannon's production is now sold up to the end of June and 50% sold up through July, August and September. It has also sold some copper for delivery as far ahead as next October, November and December at highly satisfactory prices.

The Calumet & Arizona Mining Co. has secured favorable options on 70% of the stock of the Gadsden Copper Co. in the Jerome field, Arizona. The Gadsden Co. is a new corporation, organized under the laws of Delaware with an authorized capitalization of a million shares, par value \$1; 300,000 shares are issued to pay for the property, the balance being optioned to the Calumet & Arizona Co. The properties cover approximately 25 claims, some patented and others unpatented, on the southern extension of the fault upon which the United Verde's ore body is found and immediately adjoining the property of the United Verde. The obligation of the Calumet & Arizona, under its option, is the sinking of one shaft and doing other exploratory work which is to be done

under the direction of the company and for which the company receives stock in the Gadsden Copper Co. These expenditures will approximate about \$10,000 per month, the Calumet & Arizona being obligated to spend \$100,000 in the explorations, with the right to discontinue work at any time after that amount is expended if, in the opinion of their engineers, further expenditures would be wasted.

The St. John Del Rey, the deepest metal mine in the world, continues to do well. The bottom remains at 5826 ft. vertically below the surface. The company has just issued its 85th annual report. During the year ended February, 1916, the mine produced 192,500 tons of ore yielding £475,134 worth of gold, or £2 9s. 4 d. per ton, earning a profit of £160,733. Owing to the step-like succession of shafts and levels, the poor ventilation is an obstacle to deeper exploration. The temperature at the bottom is 104° F. George Chalmers, manager, intends to use a cooling and drying equipment for improving the air, expecting thereby to render conditions more comfortable for the miners underground.

An increase from \$6 to \$8 annual basis is expected next month when directors of the Miami Copper Co. meet for action on the first dividend to be paid in 1917. Such a step would be conservative as Miami's earnings, even on a 9-ct. average cost, would be almost double the dividend requirements at the new rate. The company's production in November, a 30-day month, was on the basis of better than 5,100,000 lbs. for a 31-day period, and was proportionately greater than the October yield of 5,054,153 lbs., which was a record. The coming year has much in store for Miami, as with the consummation of plans in mind the output toward the end of 1917 will have been increased to a basis of about 70,000,000 lbs. of copper.

The Superior & Boston Copper Co. reports for the year ending Sept. 30, 1916 as follows: Receipts, \$283,531, plus balance Oct. 1, 1915, \$29,529; total, \$313,060; expenditures, \$136,953; balance on hand Oct. 1, 1916, \$176,107. President Rice says in part: Development and mining operations are going forward at and above the 800 level and the grade of the ore and tonnage being mined show steady improvement so that it is the belief of our superintendent that we will soon have openings enough in ore, in the upper levels, to maintain a production that will meet our regular mine expenses, and with the development of sulphide ores on the 1300 and 1400 levels, our mining operations will assume a substantial and profitable basis.

With practically unchanged tonnage of ore treated, except for the drop occasioned by one less day than in October, the production of Inspiration Con. Copper during November receded to 10,600,000 lbs. of copper. Slightly lower copper values in the ores treated last month caused the smaller output of copper as the management mines the ore as it comes and makes no selection whatsoever. A production of between 10,500,000 and 11,000,000 lbs. of copper a month represents normal conditions at Inspiration with its present facilities. A higher grade of ore with a big tonnage treated forced the Inspiration yield up to 11,850,000 lbs. of copper last September. The two new units of the concentrator, now being installed, will increase the tonnage to around 18,000 daily. There should then be no difficulty in maintaining a monthly output of 12,000,000 lbs. of copper.

At a meeting of the board of directors of the Tamarack Mining Co. on Friday of last week President Eugene V. R. Thayer resigned and was succeeded by Charles S. Smith, president of the Old Dominion and Arizona Commercial mining companies. Mr. Thayer is understood to have taken the position only as a courtesy to the Calumet & Hecla interests at the time they retired from all representation on the board. Mr. Thayer still continues on the board of directors. Charles H. Altmiller has been elected secretary and treasurer. Incidentally, it is of interest to note that Mr. Altmiller, who started with the Bigelow copper interests 30 years ago, for many years worked on the books of the Tamarack Mining Co. before the management was turned over to the Calumet & Hecla people. The main offices of the Tamarack Co. have been removed to 50 Congress street.



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*Illustrated.

Flotation Patents Decision is Won by Minerals Separation, Ltd.

On another page we give the official text of the decision handed down by the U. S. Supreme Court in the case of the Minerals Separation, Ltd., against Jas. M. Hyde. The suit is based on the installation of the flotation process at the Butte & Superior Co.'s mill at Butte, Mont., which the complainant claimed was an infringement of its patent rights.

With the U. S. Supreme Court's decision back of them, the Minerals Separation North American Corporation, the newly organized company formed to handle the business of the Minerals Separation, Ltd., in North America, and to control the patents of the parent company in this continent, it is expected that injunction proceedings will be started. These will be against various companies in the United States that are claimed to have been infringing its patents. Actual shut-downs, it is expected, will be the first step to be attempted, to be followed by a demand for an accounting for profits and damages in each individual case.

The contention of the Minerals Separation interests will probably be that all profits accruing, to each of the companies using flotation and not operating under its license, from the use of flotation itself will be regarded as its own. If the plaintiff does not regard the profits as sufficient, damages will be asked for.

It has been figured that out of an approximate production of 35,000,000 tons of ore produced in 1916 and in which production flotation was used, possibly 8,000,000 tons paid royalty, leaving more than 25,000,000 tons on which royalty is expected to be collected.

Of the companies working under a royalty basis are Anaconda, Inspiration, Greene-Canea, and affiliated companies, paying the low rate of 4 cts. per ton royalty. It is not expected that other companies operating flotation processes can secure such a low rate at this time. Among these are Utah Copper, Chino, Ray Con., Miami and Butte & Superior.

The Minerals Separation patents in the United States now number 45, while applications are pending for 32 more. These patents cover every conceivable feature of flotation and the uses of ingredients.

The Effect of Peace Proposals on the Copper Market.

In the parlance of Wall street, war, at first, was a bear argument. Later it proved to be a strong bull card. Peace, for some time, has appeared to be a bear argument. What if it should prove to be a bullish development? There is no need to throw aside all semblance of acumen and adopt the narrow view point that a cycle of prosperity can stop instantaneously. The past gives us the knowledge that the change from depression to prosperity is gradual, and that likewise the transition from prosperity to depression is gradual, probably more gradual than the

upward movement "because of the greater resistance that prosperity creates. From all signs, peace is not far off. The financial situation, notably the trend of foreign exchange, furnishes a barometer of proven reliability. Slightly more than 2 years of war has changed our prosperity from a foundation built on Europe's misfortune to one erected upon internal wealth. Therefore, the cessation of hostilities abroad should be welcomed and not feared. Europe will still be a good customer, especially for copper.

Developments of a nature that would violently unsettle the most strongly established market failed to exert more than a slight disturbance in the copper situation. The German peace proposals induced free offerings by speculative holders of copper, but with producers protected by a veritable bulwark of orders taking up 95 per cent. of their first half output, this momentous announcement, which may prove to be the initial step in bringing Europe's woes to an end, furnished adequate proof to substantiate the remark made several weeks ago in these columns, that the copper market was no longer dependent on the continuation of the war for the maintenance of its prosperous condition. Interests who were waiting for 40 cent copper were greatly excited by the prospect of peace, and began offering their holdings at concessions, and some consumers who failed to secure full coverage over the first half, were in the market, taking up this cheap metal.

Naturally, there cannot be very much of this copper for the market to absorb and, even if the German invitation results in a termination of hostilities, the copper producers have accumulated a back log that will serve to sustain the market until the period of readjustment from war to peace has passed. By the time that the shock has passed the producers will be ready to re-enter the market and name their prices. What business is now on their books is solid. There are no open or "bellows" contracts, nor are the obligations of the buyers such that they can cancel their orders if they become alarmed at the turn of events. It is fair to assume that Germany will make strong endeavors to promote peace, and with this state of affairs in mind it behooves the consumer of copper to maintain a level head. If they have contracted for their first half needs at high prices they are not enmeshed in a deal that will result in losses.

Every copper consumer can rest assured that his competitor will not obtain his raw supplies at lower prices, for the simple reason that producers have no more metal to sell, while the infinitesimal amounts that are available from second hands cut no figure.

What Will Further Development Bring Forth in the Jerome District?

The conviction prevails generally among mining men familiar with the geological conditions around Jerome, Ariz., that copper ore bodies of value are

distributed generally throughout a wide area in the Verde district, and that depth and development will disclose deposits of copper well beyond the confines of the "pay" belt as at present recognized, equal in value to those opened in the United Verde, United Verde Extension, Copper Chief, and other mines. This conviction is based upon geological conditions similar to those prevailing in the immediate vicinity of Jerome, where are located the United Verde and United Verde Extension mines; and the fact that commercial copper ore is being shipped regularly from the Copper Chief mine, located well to the south of the properties mentioned.

Out on the Verde north fault, beyond the Arkansas & Arizona and Jerome Victor Extension properties, the mineral conditions at surface are identical with those nearer Jerome, and hold forth promise of similar opportunities to mine at a profit. The same limestone and iron capping, iron-stained porphyry and monzonite which overlies the rich copper ores in the immediate vicinity of Jerome, and which were the guides to their location, can be traced for several miles beyond the A. & A. ground, across the properties of the Jerome-Superior, Jerome Daisy and Verde Copper Development companies.

To the south of Jerome similar mining conditions prevail at surface on the Michigan-Verde, United Verde Con., Boston & Jerome and other companies that are operating within the territory lying beyond the United Verde mine and this side of the Copper Chief mine. By reason of these unusual surface showings the belief is spreading that the United Verde copper belt is very extensive.

In a recent editorial item on "Over-estimating the Value of Mine Machinery," reference was made to the old D-21 stopper drill, with a question as to whether our correspondent's remarks applied to what seems to be now designated as the DA21. On the latter point, another correspondent takes exception to the reference, saying that the present DA-21 drill has been for a number of years one of the standard stopping drills used extensively in all parts of the country. Companies in the Colorado field using it include the Portland and the Tomboy. Probably our original informant's remarks applied particularly to the D-21. We shall be glad to hear further from any of our readers having experiences with these or other stoppers, or comparative data which will be valuable to operators.

As a result of the depletion of so-called floating stocks and the continued demand for minting purposes the strength of the silver market will now be maintained. The present price of bar silver 75½ cts. compares with 67⅜ cts. Oct. 30, and is only 3 cts. away from the high of many decades, attained last May. The decline at that time was attributed to profit-taking by speculators, and control of the silver buying for minting purposes by the allies. The most important factor, however, was the actual and speculative selling in the Indian bazaars and from China.

PERSONAL.

J. Ralph Scott of Hardington, Ont., is visiting at Calumet, Mich.

Joseph MacDonald of Guanajuato, Mexico, is in Los Angeles, Calif.

G. A. Gibbon, mining engineer, has returned to the United States from Péru.

H. W. Fesing of Houghton, Mich., has gone to Los Angeles, Calif., on professional business.

T. W. Mather, Guayaquil, Ecuador, has left that city permanently and is now in Pacific Grove, Calif.

D. Thomas has accepted the position of general manager of the Davidson mines at South Porcupine, Ont.

J. F. Cowan, general manager of the Tucson-Arizona Copper Co., Tucson, Ariz., is in Salt Lake City, Utah.

D. MacGavin of the Canadian Mining Corporation, Toronto, Ont., is spending the holidays in San Francisco, Calif.

H. D. Richardson, superintendent of the Boise-Rochester Co., Atlanta, Idaho, has resigned and left for Los Angeles, Calif.

M. C. H. Little, mining engineer, is leaving Canada to become an officer of the English tunnelling engineering force in France.

E. Gybbon Spilsbury, consulting mining and metallurgical engineer, New York, has returned from a professional trip to Cuba.

C. F. Sturtevant, Salt Lake City, Utah, has left for Jerome, Ariz., where he will take charge of the Jerome-Pacific mines.

James MacNaughton, general manager of the Calumet & Hecla Co., Houghton, Mich., has recently made Boston, Mass., his headquarters.

C. Chynoweth, mining engineer, New York, and secretary of the Wolverine & Arizona Co., Bisbee, Ariz., has been inspecting the company's property.

Newton W. Emmens, mining engineer, Vancouver, B. C., is in the Coeur d'Alene district, Idaho, in the interest of the Kula smelter, British Columbia.

C. L. Parsons, U. S. Bureau of Mines, is returning to this country from Europe where he has been studying methods of manufacturing nitrogen.

Frank M. Leland, consulting engineer for the Empire Copper Co., Mackay, Idaho, has resigned and F. L. Valhenskamp has been appointed to fill the vacancy.

Henry F. Collins has been made consulting engineer of the Huelva Copper & Sulphur Mines, Ltd., Cueva de la Mora, Valdelamusa, Spain. He was formerly general manager of the company.

H. J. Wallace, field engineer for the Anaconda Copper Co., at Great Falls, Mont., has been made superintendent of construction, which position was made vacant by the recent resignation of F. J. Brule.

H. M. Wolflin has been designated by the U. S. Bureau of Mines to succeed Edwin Higgins, in charge of the California co-operative work of the Bureau and the Industrial Accident Commission. Mr. Wolflin had charge of this work from January, 1914, to January, 1916, during which time he made a preliminary survey of mine-safety conditions in the state and assisted in drafting the mine safety rules. When Mr. Higgins' resignation as chief mine inspector became effective, Mr. Wolflin made a request of the Bureau of Mines that he

again be assigned to take charge of the work. The Industrial Accident Commission has appointed Mr. Wolflin chief mine inspector.

A. D. Cox has resigned as superintendent of the Union Hill mine, Grass Valley, Calif., to enter the employ of G. S. Johnson & Co. The vacancy will be filled by E. MacBoyle, formerly general manager of the company operating the mine.

C. E. Van Barneveld, formerly at the head of the Mines Department at the Panama-Pacific International Exposition, San Francisco, has accepted a position as supervising engineer and metallurgist for the U. S. Bureau of Mines, at Tuscon, Ariz.

OBITUARY.

Joseph Carson, superintendent of the Gold Hunter Mining & Milling Co., Mullan, Idaho, died at that place on Dec. 10.

Jesse W. Davis, a pioneer prospector of the southwest, passed away in Silver City, N. M., on Dec. 6 from pneumonia. In the early prospecting days he was closely associated with James S. Douglas in the country around Prescott, Ariz.

Oscar C. Steele, at one time operator of the Burning Moscow, Andes, West Con., Virginia and other mines on the Comstock, passed away on Dec. 10 at Virginia City, Nev. He was born in Ohio in 1838 and migrated to this country in 1859 and later became interested in various mining enterprises of this district.

SCHOOLS AND SOCIETIES.

American Institute of Mining Engineers.—The Utah section of the Institute held a postponed meeting at the Hotel Utah, Salt Lake City, Utah, on Dec. 16. Officers were elected, after which an interesting paper was read by J. M. Callow, "Notes on Flotation in 1916," and a second by Erwin Wilke, "Manufacture and Use of Sulphuric Acid."

American Institute of Mining Engineers.—The Chicago section met on Dec. 22 at the Chicago Engineers' Club. After dinner, Alonzo G. Kinyon of the Powdered Coal Engineering & Equipment Co. read a paper on "Burning Powdered Coal" in which the application of this class of fuel in the reverberatories at Anaconda was discussed. H. B. Pulsifer, Armour Institute, addressed the meeting on the "Metallurgical Plants About Chicago: The Greatest Metallurgical Center on Earth."

University of Utah.—For miners and prospectors a course of 4 weeks in length, beginning Jan. 8, will be given. It will comprise 36 lectures and 20 laboratory periods. Prof. F. J. Pack and Prof. Schneider will have charge of the geology and mineralogy; Prof. Lewis of mining and milling, and Prof. Bradford of metallurgy. A nominal registry fee of \$1 only is required. In addition Prof. Bradford will conduct a course in industrial science. Lectures will be given on the mining, milling and smelting methods in general as practiced around Utah and neighboring states.

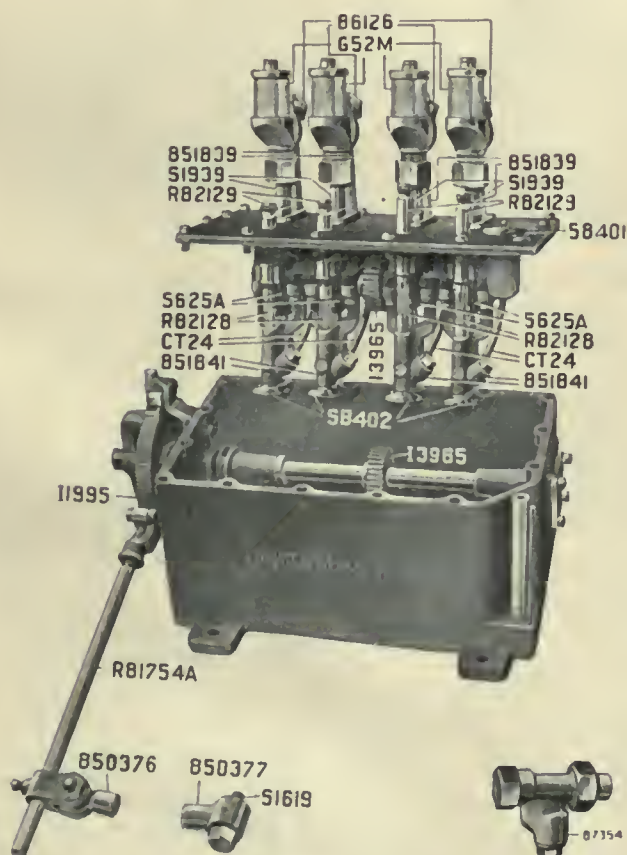
University of Illinois.—The senior mining engineering students, under the direction of Professors H. H. Stock and E. A. Holbrook, have completed their annual inspection trip. This year the trip included an inspection of the State Mine Rescue Station at Springfield, Ill., the lead smelter at Collinsville, Ill., and the Laclede byproduct coking plant at St. Louis, Mo. From here the party established headquarters in Flat River, Mo., and spent several days visiting the lead mines and mills in the district. A side trip was made to the old Mine La Motte, which is being rejuvenated by modern methods. Afterwards several of the large coal mines in southern Illinois were inspected.

Progress Made in the Manufacturing Industries

A New Design of Mechanical Oil Pump.

The oil pump herewith shown was designed for the lubrication of stationary and portable steam or Diesel oil engines and air compressor cylinders.

The operation is as follows: Engine Link B-50377 is attached to eccentric rod or other moving part of engine and connected to link B-50376 by a rod of proper length. Line check B-7354, threaded for 1/8-in. pipe, is furnished for every oil outlet on pump and is attached as close to the steam pipe as possible. The position of the link B-50376 on rod RB1754A, governs the arc of travel of ratchet wheel I-1995. Gear I-3965, devolving with ratchet wheel I-1995, imparts motion to pump plungers through the mediums of gear I-3965 on eccentric shaft and eccentrics S-625A. Auxiliary plungers



NEW MECHANICAL OIL PUMP.

being suitably connected with force pump plungers, move in unison therewith. On the upstroke of auxiliary plungers, oil is drawn through strainers in bottom of holders SB-402, into auxiliary cylinders B-51841, from where it is forced on downward stroke through tubes CT-24 and passage in parts B-51839 to sight-feeds G-52M. As the oil drops through the sight-feeds, it is drawn into force pump cylinder on the downward stroke of the plungers S-1939, from where it is forced upon the upward stroke through unions B-6126 to the cylinders to be lubricated. The quantity of oil desired fed is regulated outside the body by auxiliary pump plunger extension stems RB-2129.

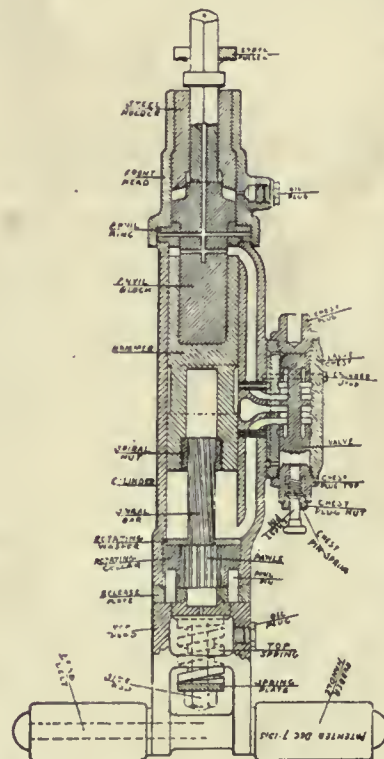
Regardless of the level of oil in reservoir, the lubrication of such parts within the body constantly requiring same, is automatically taken care of by an arrangement provided at the bottom of the force pump plunger. The pump operates only while the engine is running, and automatically feeds more or less oil according to the speed of the engine, consequently there is no waste of oil. Every outlet is provided with a sight-feed. These sight-feeds are large, will not be-

come oil splashed and the dropping oil can be plainly seen from a distance. Independent feed regulation for each outlet is also provided. They can readily be adjusted without the use of tools or the removal of any of the parts. The filling hole is quite large for convenience in filling. A sliding cap, to prevent dirt from entering, is provided, and within the opening is a bronze strainer which can readily be removed for cleansing. The pump can be had with from one to four feeds—the one-feed having a capacity of one quart or half-gallon, the two-feed, half-gallon or one gallon, and the three and four-feed, one gallon. The Lunkenheimer Co., Cincinnati, Ohio, are the manufacturers.

New Type of Hammer Drill.

A special feature of the Wood hammer drill is, that the piston does not strike directly on the shank of the drill steel. The drill steel fits into the steel turner, or rotators, which is mechanically turned by the anvil block on which the piston strikes, and this anvil block is fitted with a collar to eliminate any possibility of the piston getting wedged.

Another feature is, that the chest is fitted with a pin for holding down the valve and allowing the full pressure of the



THE WOOD HAMMER DRILL.

motive power to rush through the hole in the drill steel to the cutting point and blowing the hole free of cuttings, etc. The supply hose can be attached to either side of the chest.

There are oil reservoirs in the tophead, side of the cylinder and fronthead, which will run the machine for half a day on one filling, when the drill is operated with air. However, when the drill is operated with steam, an oiler is furnished, to be attached to the supply the same as for a piston machine.

Special Cars for Ecuador.

A development of interest to mining men is the design of special dump cars for ore and other heavy corrosive material. The illustration shows one of a lot recently

shipped by the Orenstein-Arthur Koppel Co. of Koppel, Pa., to Marengo & Parodi at Quito, Ecuador.

To resist corrosive action the bodies of these cars are built of oak heavily reinforced by galvanized bars. In other



DUMP CARS FOR ECUADOR.

respects the cars are of the maker's standard cradle type with round buffer frames, spring bumpers, continuous draw bars and roller bearings. The cars are constructed to dump clear of the rails and under-frame, thus facilitating the work and avoiding any delay.

TRADE PUBLICATIONS.

Mine Cars and Wheels for Mine Cars. Hockensmith Wheel & Mine Car Co., Penn Station, Pa. Booklet; pp. 32; illustrated.

Several of the company's various types of wheels, their construction and advantages are described. Mine cars of both wood and steel construction are illustrated and briefly described with some of the accessories used in underground haulage.

Motor Trucks. General Motors Truck Co., Pontiac, Mich. Booklets; illustrated.

Each of the three booklets treats on different types of trucks. In one a 1500-lb. truck is described; another 1½ to 2-ton trucks are described which use chain drive; in the third trucks for handling loads of from 3½ to 5 tons are dealt with. In each of the three the truck under consideration is described as regards its construction and half-tones showing the truck in use are included.

Gas Engines. The Bruce-Macbeth Engine Co., Cleveland, Ohio. Booklet; pp. 20; illustrated.

Is confined to information and talks regarding the company's experience with its engine in operation rather than its construction. Besides bringing out the advantages of this engine in operation at various plants considerable of the contents is comparative with respect to steam as a prime mover and special mention is given as regards costs. Engineering data of value is given in the concluding pages of the booklet.

Duplex Compressors, Steam, Belt and Motor Driven. Chicago Pneumatic Tool Co., Chicago. Bulletin 34-M; pp. 35; illustrated.

A general description of class "O" compressors is given as well as detailed descriptions of the separate parts making up this class of compressor. Eight different types are made in this class and among the more noted things in their construction is the use of Simplate flat disc valves. The several types includes types for driving by steam, motors or belts and have varying capacities of 511 cu. ins. per minute to 4424.

INDUSTRIAL AND TRADE NOTES.

The Magnesite Refractories Co., Portersville, Calif., recently incorporated with a capitalization of \$200,000, proposes to build one of the largest magnesite manufacturing plants in the country, reducing crude magnesite for shipment to the east, and manufacturing refractory brick and plastic materials.

The Utah Karns Tunneling Machine Co., of Salt Lake, has taken a contract in one of the Utah districts to extend a 4080-ft. tunnel 500 ft. further. Over 400 ft. has previously been driven very successfully, breaking 15 ft. in one shift with about 100 lbs. of powder. In this 7 by 7-ft. tunnel it is using its heading machine, which cuts a 13-in. hole. This is drilled in 15 ft., and while that is being done, two small air drills are being operated to drill the holes that are broken to the heading machine hole.

President McGregor, of the Union Iron Works, the Pacific coast shipbuilding subsidiary of Bethlehem Steel Corporation, says his company now has contracts that will mean employment of 11,000 men for 2 years. At the Alameda plant 2000 additional men are being put to work, and at San Francisco 750. Contracts already closed, or practically closed, aggregate around \$65,000,000. In addition the company is a bidder on submarines and cruisers for the United States navy, and it is hoped that part of the naval construction contracts will be placed with it.

NEW PUBLICATIONS.

Manufacture and Uses of Alloy Steels. By Henry D. Hibbard. Washington, D. C., U. S. Bureau of Mines. Bulletin 100; pp 77.

The various kinds of alloy steels are considered separately. Each is taken up in a similar manner, the method of making the same being first given and followed by an account of the peculiarities and properties of the alloy and uses to which it is most adaptable.

Gold, Silver, Copper and Lead in South Dakota and Wyoming. By Charles W. Henderson. Washington, D. C., U. S. Geological Survey. Mineral Resources of U. S. 1:13; pp 14.

Both states are treated separately in general and by counties. In reviewing the state as a whole production and market conditions are the principal features, while in the review of counties the operation and production of the various properties and companies are considered.

Chemical Study of Illinois Coals. By S. W. Parr. Urbana, Ills., State Geological Survey. Bulletin 3; pp 86; illustrated.

Although sufficient description of methods employed is given these descriptions are more in the form of discussion on the suitability of the various methods and further discussion of the results of analyses on various coals in the state. Among methods reviewed are those used in field sampling and determining ash and moisture contents.

The Flotation Process. By Herbert A. McGraw. McGraw-Hill Book Co., New York. Book: pp 249; illustrated. For sale by Mining World Co., \$2.50.

The first few pages take up a description of the more important flotation machines which have been and are now being used, with information on patent literature. The nature and uses of oils is dealt with in a separate chapter followed by a chapter on various flotation systems and machines of more recent date. Methods for testing ores to be subjected to flotation are brought out with the necessary details and the remaining, about one-half of the book, describes operations and plants of several companies using the process.

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Atlin.

At the Engineer mine operations and production have been steady throughout the summer. Supt. Alexander has had 26 men busy most of the time, and now is increasing the number of machine men underground. Operations will continue throughout the winter.

Telegraph creek is also coming up again and many proprietors have been looking over the ground and developments being carried on in several localities are showing up good. It is further rumored that some capitalists from Wrangell are on their way in to look over some of the ground.

Seward.

"Free use permits" to mine in the Matanuska and Bering River fields in the parts of those fields which have not been set aside for leasing purposes are now obtainable. The Commissioner of the Land Office has informed the Land Department of the Engineering Commission to this effect.

Skeen and Charles Emsweiler are operating at Porcupine bay. Specimens were not taken from the ledge itself but were found immediately beneath the ledge on shelves. They carry over 30% copper and the ore is the same class as the ore at Latouche, which, however, carries only about 16%. The ledge is located behind a glacier and can be seen up above but is in a position where it cannot be reached conveniently. The discoverers figure it is about 20 ft. wide and they can trace it distinctly for 100 ft. or so from below. The prospectors took ladders but even with this aid they were unable to reach the spot exactly although they found plenty of pieces of float below on shelves of the steep incline.

Sulzer.

At the Florence mine of the Alaska Tidewater Copper Co. on Prince of Wales island, a body of grey copper has been opened which contains some gold. The ore is said to run \$23.60 in gold, \$1.30 in silver and 5.5% copper, or a total value of about \$52. The company is now preparing to fully equip the property. The ore occurs in a schist with blebs of calcite and quartz. The new find is on the coast about 10 miles from here, and it is the company's intention for the future to construct a wharf, for shipping, at the mine. The company is being financed by H. E. Wills Co., Seattle. W. E. Hall, Seattle, is president; C. P. Catron, Seattle, is vice-president, and with R. C. Hill, Seattle, are the executive officers. The company is a \$1,000,000 corporation.

The Alaska Industrial Co. is operating the Jumbo mine under the management of Senator Charles E. Sulzer. Shipments are being made at regular monthly intervals and new development work has been accomplished this fall, disclosing several new ore bodies of copper, which are said to average 7%. These ore bodies are contact deposits of chalcopryite.

Seward.

The Tolovana district which was only in a prospect stage during 1915 produced \$60,000 in gold during that year. In 1916, however, the district has proven to be a real producer and has shipped gold valued at about \$600,000, the production having been mostly made from Livengood creek.

Ketchikan.

The Seaboard Copper Co., Seattle, Wash., has recently been formed to operate properties at View Cove on Prince of Wales island and it is said some of its showings run 20% copper.

San Francisco and Portland capitalists have recently formed the South Eastern Alaska Copper Co., a \$3,000,000

concern which has taken over the Big Harbor mine on the west coast of the island. This company's holdings constitute a group of 16 mining claims, part of which are now undergoing development. The property is equipped with a 2400-ft. aerial tram which connects the main workings with the company's wharf. On the Northland No. 1 an adit has been driven 120 ft. to the hanging wall of the lode. An inclined shaft connects the drifts from the adit to surface, while the vein has been crosscut in several places. Last summer several small shipments of chalcopryite were made to the Tacoma smelter which netted better than 7% and carried some silver and gold. The company expects to be in a position to resume regular shipments to Tacoma within 90 days. To increase the present tonnage from this mine the shaft on the Northland No. 2 is being continued to the 400 level, as this shaft is being sunk on ore. Returns from assays made on the 200 show a good grade of shipping ore.

ARIZONA.

Miami.

The Globe Bullion Co., a recently organized corporation, has opened offices here and are operating south of the city. A road has been completed to the mines, where 14 men are now working, and sinking has been started. At present 3 faces are in good ore, it is said.

At the mines of the Inspiration Con. Co. considerable is being done with respect to the efficiency of tramming. A sufficient number of sidetracks and a signalling system have been installed. It is expected that delivery will shortly be made on two compressed air locomotives at present being built by H. K. Porter Co., Pittsburgh, Pa. These will bring the total number of air locomotives in the mine to 11. There will always be nine in operation, one being held in reserve and one under repair.

The water supply tank has been moved from its former location south of the Scorpion shaft to the hill north of the main shaft. Work has been commenced on the piping connecting this tank with the mine pumps which are on the 6th level. At the inclined shaft stations, on the 3rd, 4th and 6th levels preparations are under way for the installation of steel drawbridges to replace the wooden structures. These bridges are used for the transfer of supplies from the tunnel on 3rd level to the 4th and 6th levels. Without the bridges it would be necessary to transfer the supplies from the third level cars to the skips, and then to the cars on the level. By the use of the drawbridge the original car into which the supplies are loaded can be hitched to the rear end of the skip and lowered directly to the required level, landed, and run into the working place without handling more than to load and unload. The Door thickener tank, 200 ft. in diameter, will be completed in two months and construction on the laboratory at the mill is being rushed. The latter structure is a 2-story building of concrete.

Globe.

The Old Dominion Extension, adjoining and dovetailed into the Old Dominion, is attracting considerable attention because of the fact that its formation and surface ore occurrence is identical with the adjoining older property. Several thousand dollars' worth of ore is exposed in its workings, which consist of two 100-ft. shafts, about 500 ft. of drifts and tunnels and several winzes. The company's management plans to sink its main shaft at a point 300 yds. from the main tracks of the Arizona Eastern railroad, contiguous to the See Bird shaft where the latter enters the

apex of an oxide vein along which a drift has been driven for 200 ft., and from which picked samples running as high 25.15% copper and 13.84 ozs. silver have been taken. Every hundred feet in depth a prospect drift will be driven into this vein until sufficient depth in the shaft has been reached to drive a drift along the vein to the point of its intersection with the great Pinal fault, wherein and contiguous thereto the Old Dominion vein encounters such rich smelting ore. A force of 25 men has been employed building a road to the Iron Mask workings of the Old Dominion Extension higher on the mountain with the object of hauling diamond drill equipment to that portion of the property to determine the dip of the heavily mineralized fault between the quartzite and lime, whose surface has been slightly developed by shallow workings to the extent of showing about \$20,000 worth of argentiferous copper ore. No shipments of surface ores will be attempted, the management's intention being to develop the property upon a conservative scale for the ore bodies they believe it contains.

Oatman.

Among the numerous prospective mines of Oatman which are being developed interest just now centers on the Crescent, Nellie and Adams in the Black Range section, and the Ivanhoe, which lies between the Times mine and the Crown City property of the Tom Reed Gold Mines Co., all of which have reached interesting points in their underground workings.

The Nellie mine has entered the vein in the shaft at 375 ft. and purposes to continue sinking, passing through the vein and to the 500 level where a crosscut will be driven to cut the vein again. On the 300 level considerable drifting was done and some good ore encountered, but it was not uniform. It is the belief that a depth of 500 ft. will disclose a body of good ore. It is the plan of development to drive a shaft to the east, where three veins appear to form a junction.

At the Crescent the tunnel has cut the vein exposing 10 ft. of fine looking quartz characteristic of the Black Range section. Crosscutting will be continued to the hanging wall and a drift then will be driven southeast toward a known ore shoot.

The Adams shaft was sunk to a depth of 425 ft. and a station cut at 400 from whence a crosscut is to be driven to the vein, which should be cut within 50 ft. The company is now installing an 80-hp. engine and large pumps and making provision to handle a heavy flow of water, which is expected. The Adams has a fine surface showing and the acquisition of the property was recommended by C. H. Palmer, Jr., upon whose report Frank Keith, Seeley W. Mudd and their associates undertook the development of the United Eastern mine. E. H. Newlands of Los Angeles is president of the Adams Mining Co. and H. A. D'Arcy, known among Nevada mining men, is manager. These two and Mr. Palmer form the board of directors.

Considerable interest was aroused this week by the visit of Horace V. Winchell, the noted mining engineer, who spent the week in examination of the Big Jim and Ivanhoe mines. These properties are under the same management. The Ivanhoe recently cut a promising vein on the 500 level after passing through a fault and is now drifting on the hanging wall of the big dike.

At the Big Jim preparations are being made to resume sinking from the 500 level and by the time the proposed 400-ton mill is under construction two or more levels will have been opened below the 500. Supt. Keating places the tonnage already developed on and above the 500 level at 250,000 tons of an average value of \$12 to \$15. He estimates mine and mill costs at under \$5 per ton. It will take 2 or 3 months to complete mill plans and actual construction of the big mill will not commence until next spring.

Development work will continue on the easterly end of the Tom Reed properties, and an immense body of good ore has been opened through the Aztec shaft at a depth of 500 ft. What relation the vein bears to the Big Jim has not been established but in dimensions and structure it bears a strong resemblance, both veins having an average width of 30 ft. The Aztec ore shoot is said to average \$20 to \$50 for a considerable distance in one of the drifts. E. M. Rabb, superintendent of the Tom Reed mine, is busy placing orders

for a new unit to the mill, which will increase the capacity from 175 to 350 tons per day. He expects to have this unit finished and in operation by July 1, next, in spite of the difficulty in getting machinery.

While the exact date on which the United Eastern mill is to start has not been definitely decided, it will be some time before the 1st. Practically all the construction work has been completed and everything is about in readiness to start the machinery. The No. 2 shaft of three compartments has been fitted with ore pockets on the 4th, 5th and 6th levels, an electric flash-light signal system installed and electric lights strung along the crosscuts which connect with the vein. This underground work having been finished and everything put in readiness for stopping ore, shaft sinking has been resumed in No. 2 shaft, which is down 60 ft. below the 665 level. According to the dip of the vein on the levels above the shaft should cut the hanging wall at about 950 ft. Developed ore between the 300 and 665 levels is estimated at 200,000 tons, valued at \$5,000,000, all of which has been opened up since March, 1915. The vein is 25 to 50 ft. in width, and with the exception of an occasional "horse" of country rock, is solid ore throughout. Some very rich ore has been encountered in the drifts and crosscuts, and the vein on the 400 level averaged \$22.93 across 25 ft. The mill will have a capacity of 200 tons per day and is expected to make an extraction of 97% at a cost of less than \$2 per ton.

Active preparations are being made for the construction of a mill at the Gold Ore mine near the Gold Road. For 3 months the Gold Ore milled its ore at the Gold Road mill. It is said that the average returns of the company were \$30 per ton. The money received from this source will be added to by subscription from several wealthy eastern stockholders and the mill will be built early in 1917.

The success of the Big Jim, United Eastern, Tom Reed, Gold Ore and other companies, has brought about renewed activity throughout the Oatman district, and there are now between 40 and 50 properties operating besides those doing annual assessment work.

Paradise.

The strike made recently at the Hill Top mines has been confirmed. It is said that several prominent mining engineers representing large eastern capital have examined the mine within the past few weeks and that their reports are without exception most favorable. During the past two years the company has driven a tunnel from the westerly side of the Chiricahua mountains through to the easterly side, and built a road from the portal of the tunnel to Paradise, for the purpose of hauling out ore. R. O. Fife, the Hill Top superintendent, is now busy installing a new 500-hp. plant and the necessary buildings to house it along with other buildings, and getting things shaped up to handle a large production. The board of directors consist of John Hands, who with his brother Frank formerly owned the property, and a Mr. Kastrup, a well known banking man of Chicago.

Jerome.

Another property for which extensive development work is being planned is that owned by the Verde Central Mines, Inc., which will be placed in effect Jan. 1. The property—formerly the Verde King—comprises 308 acres of patented mineral ground located in the immediate vicinity of the productive area of the district. It adjoins and is almost surrounded by holdings of the United Verde Copper Co. and of the Hull Copper and Cleopatra Copper companies, which recently passed to the control of the W. A. Clark interests. Adjoining on the west are holdings of the United Verde Extension Co. and the Boston & Jerome Copper Co., while to the east the claims of the Verde Apex Co. sideline.

Chloride.

The Silver Hill offers to finance half a dozen sets of leasers on its property until its new mill is in operation.

Ruby silver ore showing in quantities in both Midnight and Keystone mines.

The question of title to town property is causing considerable agitation in Chloride. The camp is filling with people who refuse to be bound by the watchful waiting

policy of old residents and an attempt is to be made to have the government act.

Several men have been put to work on the property of the Rainbow Mining Co.

Four feet of the best ore ever found on the property was cut by shaft at the Georgia at a depth of 135 ft.

New shaft has been started on Rattlesnake group to cut ore at a greater depth.

The Home, Pastime and the Golden Star groups were taken over last week by the Holmes interests of Salt Lake.

F. M. Manson, head of the Western Ore Purchasing Co., of Reno, Nev., has men at work sampling the principal properties of the district. It is fairly certain that his company will establish a sampling works here.

The Georgia has encountered more water, and the company planning to install heavier hoist machinery and pumps; country rock is highly mineralized, principally copper-stains.

Silver Hill just sent out carload of ore to Selby and expects to ship another soon.

The Keystone Con. Mining Co.'s property is located in the Cerbat range. The Tennessee mine lies nearby. The Goleonda mine, also a well-known property on the southeast, is now mining its ores on the 1200-ft. level. There are many other mining properties in the vicinity under operation with large developed ore bodies down to the 500-ft. level. In this particular district some 30 years ago nearly all of these properties were trenced on the surface and produced native silver. When approximately 100 ft. depth was reached the ores turned into sulphides, which were worthless in those days and the work ceased.

The Keystone property was particularly rich and productive, shipping many thousands of dollars in native silver. It was taken with ox teams to the river, where it was placed on barges and towed to the ocean and shipped by a sailing boat to Wales. When the sulphide ores were reached the work ceased and no work has been done until the present corporation took over this property about a year ago. At a depth of 150 ft. there are great bodies of copper sulphides. At 200, 250 and 300 ft. depth the ores are again producing very rich silver, which can easily be detected with the eye, mixed, combined with gold and copper. This vein has been drifted on for 700 ft. in length and still in ore. The property is being equipped with a flotation plant of 150 tons capacity, which will be completed and in operation within 30 days. Electric power, railroad and every other favorable facility is afforded.

Kelvin.

Pinal Development Co. has attained a depth of 500 ft. by driving a 1500-ft. tunnel. An order has been given for a gasoline hoist and air compressor, and the proposed new shaft, 1000 ft. down the mountain side below the tunnel entrance, is being started. This work is close to Erman station. J. C. Devine, president and manager, has his office in Phoenix. C. T. Carpenter, secretary, is in Los Angeles, in connection with financing the project.

CALIFORNIA.

Goldstone.

The United Goldstone group is developing well. On the Gold Ring Extension claim a 3-ft. ledge of good ore has been opened by H. Smith, and shipments have begun to the custom mill. The Blue Bird claim has been taken under lease by Los Angeles capitalists and operations commenced. Considerable work is also being carried forward on the Gold Ring and other claims by the company.

Bars of gold bullion have been shipped recently by the Goldstone, Redbridge, and United Goldstone companies. The custom mill is running at full capacity and it is reported it may be increased in the near future. At present most of the ore milled is coming from the three leading companies.

Richard Mansfield has acquired the McDonald claim, adjoining the townsite, and is arranging for operations. A. A. Turner has taken an option on the Copper Queen and

will form a company for operation of the mine. Work is going on at the Three C. group, and the owners of the Honey Bee have arranged for developments. Several other properties are active, and large numbers of leasers are coming into the district.

A hoist and compressor are being installed on the Goldstone group, and Manager Greenwalt plans to commence extensive shaft work in the immediate future. Gerome Craite, leasing a block of Goldstone ground, is installing a gasoline hoist preparatory to sinking on the vein recently intersected.

Porterville.

The Magnesite Refractories Co. has been formed with a paid-up capital of \$200,000 to operate in this field. The holdings consist of 73 acres in the Zante hills, 4 miles north of town. It is claimed that 110,000 tons of high-grade ore have been developed. The company has arranged for the construction of a calcining plant with a daily capacity of 125 tons. Harry L. Doyle is manager.

Grass Valley.

At a depth of 1100 ft. a shoot of rich ore has been encountered in the Sultana mine. It is stated to range from \$50 to \$300 per ton and appears to be developing into a large vein. Albert Crase is superintendent.

Unwatering of the Allison Ranch mine has been completed and Manager C. K. Brockington expects to have the property in shape for production before the end of December. Hoisting and pumping equipment have been installed and construction of the mill building is making good progress.

Oroville.

A 4-ft. ledge of \$30 ore has been intersected on the 400 level of the Banner mine. It is widening steadily and is showing considerable free gold as work advances. The management has arranged to place 10 stamps in operation, and construction of the 4-mile power line rushed; 25 men are employed and this force is to be increased. In addition to the rich quartz on the 400 level, large quantities of profitable ore have been opened at other points in the lower workings. The Banner is one of the oldest quartz mines in this district and has produced much rich ore. Richard Phillips is managing owner.

The Butterfly gravel mine has been taken under bond and lease by the Morris Ravine Leasing Co., composed of W. T. Baldwin, Charles Belding, Charles Bills, R. S. Kitrick, Edward James, Harry Mengler, Fred Tegrunde, Gordon Nesbitt, Dan James and H. H. Tegrunde. A station has been established in the main tunnel and a hoist installed to facilitate extensive prospecting of a series of highly promising gravel channels.

W. T. Baldwin is installing a 3-stamp mill on the Mascot mine, located above the Banner group. A large tonnage of \$15 ore has been blocked out and arrangements made for much new work underground. At the Hedges property Baldwin has erected a 5-stamp mill and plans to commence milling \$15 ore within 10 days.

Georgetown.

The Woodside mine has been taken under bond from the Woodside-Eureka Mining Co. by a concern represented locally by R. H. Shannon. Operations will be under the management of A. E. Westover. Unwatering and development of the property will commence at once. The Woodside has produced much good ore but has been idle several years.

Placerville.

The Lemon quartz mine has been acquired by the Holly Quartz Mining Co., and developments will be prosecuted under the management of C. E. Stovall. The mine has produced considerable rich ore and with deeper work is expected to yield a heavy tonnage of profitable quartz.

Copper City.

Driving of the main tunnel will be resumed immediately at the Shasta-Belmont copper property. Within a short distance the management expects to strike the main ore body, when shipments will be made to the Thompson smelter. Considerable shipping ore is blocked out in the upper workings. The ore also contains considerable zinc, gold and cop-

per, and it is probable the zinc product will be sent to the electrolytic zinc plant the Mammoth Copper Co. is erecting near Kennett. Orders have been placed for an engine and blower. Operations will be in charge of William Arps. W. E. Casson, Carson City, Nev., is manager.

Sutter Creek.

At a point 650 ft. west of the 1800-ft. station of the Central Eureka mine a large vein of low-grade ore has been encountered. North and south drifts are being run on the vein in hopes of intersecting pay ore. Sinking of the shaft to the 3400-ft. point is proceeding, and from both levels drifts will be thrown out to seek the main vein.

Huge concrete piers for the headframe have been completed at the shaft of the Old Eureka mine, and construction of the hoisting works will begin shortly. The steel-and-timber headframe will rise to a height of 92 ft. above the concrete foundations. The shaft collar will be brought to a level with the timber shed and compressor room by the filling in of the low ground between the shaft and wagon road, greatly simplifying transportation. Unwatering and retimbering of the shaft has progressed to the 1000-ft. point. The workings below the 800 level were found in splendid condition, and the management is confident of its ability to commence active mining before the end of January.

Caliente.

Five tons of high-grade antimony ore is going out daily from the Big Fifty mine, located about 15 miles from Caliente. A considerable tonnage of shipping product is stated to be exposed. A mill may be erected to treat the lower-class ore.

Glenville.

Rand Minerals Co., San Francisco, has developed a tungsten mine at Glenville, 47 miles northeast of Bakersfield, and has constructed a concentrating mill of 100-tons capacity, which is to be in operation before Jan. 1. Main features of the mill are crusher, rolls and Wilfley tables, all machinery being driven by gasoline engines. The ore consists of Scheelite and pyrrhotite in a siliceous gangue, accompanied by some garnet. Much of the scheelite is crystallized. The mine is developed through tunnels and shafts. It is expected the mill product will run 60% WO₃. F. R. Heinick and associates control the company.

COLORADO.

Rico.

Snyder & Wiggins have leased the upper workings of Rico Argentine, while the lower tunnel is being driven, with recently installed power drills, by the company. A shipment is now ready and it is said that the ore runs 11% copper and 12 ozs. silver. The ore is coming out of one of the old stopes that has not been worked for many years. The deeper workings here are under water. With a view to unwatering these workings and to tap some of the known ore shoots at greater depth, the company is running the new lower tunnel. A short time ago the face struck a bed of heavy iron sulphides under metamorphosed limestone. This lime is generally found associated with the ore. The new drifts out from the main tunnel are reported showing some ore. At a point 300 ft. from the portal a body of ore was penetrated that sampled from 4.7 to 5.25 ozs. silver, 7.1 to 9.8% lead, 9.92 to 18.38% zinc and .87 to 4.55% copper.

Breckenridge.

The overhauling of the mill of the Pioneer Con. Mines Co., and addition of equipment has been completed and ore is being stoped from the Extension vein in the Deadwood tunnel. This tunnel is being driven to crosscut veins under the Jumbo workings. Contractors are making headway in driving the new main tunnel, the portal of which is at the lowest point on the company's property. This tunnel will be the means of cutting the network of Gibson Hill veins at a depth much lower than has been the case in former development. The tunnel will not only enable the cutting of the Extension vein at depth, but will make it

possible to get under the Jumbo deposits and eventually the Little Corporal can be made more accessible, though it is likely that special development plans concerning the latter property will be made.

Machinery is being shipped to the placer ground of the Lee Mining Co. It will arrange to commence as soon as equipment can be placed on the ground the sinking of a shaft. Previous prospecting found not only good gold values but lead and silver nuggets. Men have been testing the ground with a drill, with a view to dredging it, but huge boulders have impeded success.

The new Wellington shaft is being projected to open the Oro vein at a deeper point and is proceeding in a satisfactory manner. Preparations are also under way for the resumption of sinking in the main shaft which will go down from the 5th level.

Aspen.

At the Smuggler mine where fires have smouldered in the deepest part, preventing operation, a flood of water has developed which is expected effectually to end the burning. The 18th level was flooded so quickly that the water had risen to the necks of some of the miners before they could reach the cage to be hoisted. Arrangements have been made for installing extra pumps to assist the electricians in lowering the water when the desired time comes. Draining of the newly flooded area will not be undertaken, it is planned, until the fires are completely quenched.

Idaho Springs.

At the Gem mine the Newton mill is going to install a flotation plant in addition to its present concentration. The change will be made about the first of the year.

Under Captain Ripley, the French Flag is being systematically developed. In a drift which is being driven west 160 ft. from the shaft, on the 315 level, a 2½-ft. vein was broken into which returned a value of \$55, principally copper and gold. Ripley says they have about 100 ft. of this ore blocked.

Work is progressing on the 2000 level of the Seaton mine under H. E. Machol. In a raise, 18 ft. from the tunnel level of the Newhouse, a streak of high-grade lead has been opened. The raise was started on a small streak that has been getting better. A shipment was made of about 8 tons that returned better than \$90.

Denver.

The Mammoth-Virgin Mining Co. has been incorporated with \$50,000 capitalization and 50,000 shares, and the Broderick Mining & Milling Co., with \$100,000 capitalization and 100,000 shares. Both companies have a term of existence of 20 years and have their main offices in this city.

Greenville.

The Lulu group, about 2 miles from Clark postoffice, Routt county, has recently been equipped with machinery by J. E. Davidson, who is financing the development and actively engaged in the management. Davidson won favorable comment over his achievement in building the Midland Terminal railway, as contractor. This railway has served the Cripple Creek district for many years. The Lulu group is owned by George and Will Franz, both of whom interested Davidson in the property, which, it is stated, has a good vein showing, from which it is expected to eventually ship a commercial ore carrying copper, lead and silver.

GEORGIA.

Dahlonega.

After receiving the November report of A. H. Head, metallurgical engineer of the Crown Mountain Co., W. D. McGinnis, general manager, began work immediately installing a 5-ton agitating cyanide plant to handle the sulphide ore of the Wallace vein which assays from \$20 to \$100. Only a small percentage of the gold can be saved by amalgamation. The tests show that from 85 to 92% of the values can be recovered with cyanide in 3 hours' agitation. The plant will also be used to handle concentrates from the sand vein, and a larger plant installed as soon as the small

plant has been proven a success. G. C. Thornton, mechanical engineer, has charge of the installation.

John F. Sargent is pushing the work of building the dam across the Chestatee river at the Pyrite mine to furnish power to work the property on an extensive scale. A survey has also been made and the railroad from Brookton will be extended to the mine. This will bring the railroad within 6 miles of Dahlonega. Engineers who have drilled and examined the property estimate that there is over 14,000,000 tons of ore in sight with an average value of over \$15, including the sulphur, copper, gold and iron contents.

At the Toledo mine operated by Tonson and Cowan good ore is showing in four places. High grade has been milled from the Smith shaft, which, owing to the sulphide, only yields a small percentage by amalgamation. The tailings have been treated by Cowan in connection with other laboratory tests and results obtained by a combined progress of cyanide and concentration.

IDAHO.

Wallace.

The O. W. R. & N. Co. has awarded the contract for construction of its new Beaver creek branch in the Coeur d'Alenes to Twohy Bros., railway construction contractors of Spokane and Portland, Ore., according to announcement made by Robert Twohy, and work will begin as soon as crews can be recruited and machinery assembled. The contract price is said to be approximately \$200,000, and it is probable that the 10-mile line will be completed and ready to operate in the next six months. The new line will connect with the Murray branch of the O. W. R. & N. at Idora spur, and will provide transportation facilities for the Consolidated Interstate-Callahan, the Ray-Jefferson, Idora, Tuscumbia, Virginia, Sunset, Toughnut, Friend and several other properties in the region.

Osborne.

A 30-day run of the Silverado Mining Co.'s new 100-ton mill has demonstrated that the plant is effecting a good saving, according to C. D. Muxen, secretary. "The mill was designed and construction supervised by W. L. Ziegler, who devised the treatment system especially for our ores," said Muxen. "The plant has been treating only the output of the Nellie mine, and has been running but 8 hours a day, treating about 30 tons each period. Assays of the tailings show from a trace to four-tenths of an ounce of silver. We expect to begin receiving ore from our own property in a few days, when the plant will be operated two, and possibly three, shifts."

Mullan.

The milling capacity of the Morning mine, at Mullan, the principal producer of the Federal Mining & Smelting Co., will be increased from 1500 to 2000 tons daily by Feb. 1, according to official announcement. This will give the Morning the most extensive treatment facilities of any property in the Coeur d'Alenes, with the possible exception of the Bunker Hill & Sullivan plants at Kellogg, and the equipment is of the most modern type. Extensive alterations to the Mammoth mill at Wallace now are under way by the Federal, and when the betterments are completed the plant will be placed in service as an adjunct to the Morning concentrator, probably in the next 60 days.

Kellogg.

The Kellogg United Mines Co., capitalized for 2,000,000 shares at 25 cts. each, has been organized by Spokane and Coeur d'Alene men to take over and operate three groups of claims in the Pine creek district. The incorporators are Samuel A. McCoy, J. A. McEachran, George H. Wilson and G. W. Sommer, all of Spokane, and Theodore Brown of Kellogg. "The new corporation practically is a consolidation of the Brown Leasing Co., the Kellogg-Sunnyside Mining Co. and the Coeur d'Alene Atlas Mining Co.," said McCoy. "The Brown has a lease on the Great Western group of claims, which it has been working for some time, concentrating its ores at the Sweeny mill, which is the property of the Federal Mining Co. There are 250 acres of ground

belonging to the Sunnyside and adjoining the property of the Lombardy Mining Co. The Atlas adjoins the Constitution on Pine creek and has 120 acres of ground."

Construction of the Bunker Hill Co.'s new \$1,000,000 smelter is progressing rapidly, according to General Manager Stanly A. Easton, and the plant probably will be completed and operating within the time originally set, some time in March, 1917. The superstructures for the furnace and refinery buildings already are well under way, the main stack is rising fast and construction in other departments of the mammoth reduction works is being rushed. The payrolls show that 275 to 300 men are employed in the work, and the force probably will be increased as the installation of the equipment progresses.

LAKE SUPERIOR.

COPPER.

Houghton.

Calumet and Hecla is milling daily about 10,800 tons, and is using all its stamps, reserving one stamp in each of its two mills in case of accidents. Osceola will have a monthly output of about 112,000 tons.

Hancock made an output of 23,927 tons last month, and will be increasing this figure considerably from this time on; the past month some openings had to be made more in the line of dead work.

Victoria will, it is thought, begin to pay a 50-ct. quarterly dividend, as with the November earnings which will be about \$30,000, it has with the copper being delivered about \$200,000 ahead.

Franklin has put its intensive system of mining into commission on the 30th level, making its second installation, the first being on the 29th. The two are sending up about 600 tons of the 1170 that are being hoisted. The last of the month the third installation will be made. A well-known engineer, who very recently inspected the two levels thus equipped, says that it is a great success, and is likely to be adopted in many mines here. The fact is known that a somewhat similar system is being perfected, and will be put into operation at another property within a short time.

Houghton Copper has made arrangements with the Copper Range railroad so that the track leading from Superior through the Atlantic subsidiary of the Copper Range, will be put in condition, so that its rock can be shipped to the Winona mill without the long detour that it now has to make. This step is thought to forecast a decision by the directors to further sink the shaft.

Adventure has made its first shipment of rock this week to the Winona mill which will handle it until such time as the company will put its own mill in repair. The rock is coming from the three upper levels, and for the greater part from the Butler lode, and is surprising all those who have seen it by its richness. The quantity will be gradually increased as fast as possible, and the unwatering will be kept up steadily until all the levels are completely drained.

Osceola's daily tonnage is about to the limit of its mill, about 4700 daily.

LaSalle's find on the 32nd level of the Osceola, extended into it for about 540 ft., will probably soon be sought for by a still lower level of the Osceola. It cannot be reached by any level higher than the 39th, as all those above on the Osceola have caved in.

New Baltic has entered the ledge with a fine showing of copper at the depth of about 65 ft. on the New Arcadian lode with extremely good amygdaloidal characteristics. Just as soon as possible the drilling will be begun.

Tamarack has been visited by its new president, State Senator Chas. S. Smith, of Massachusetts, who is also president of the Old Dominion and the Arizona Commercial mines.

Isle Royale has been inspected by Director F. L. Whitcomb, who has had stock and faith in the company for a long time, and is enthusiastic of its present and future. He

states that the policy of the management of enlarging the surplus by putting an amount equal to the dividends in the treasury, and that of opening up 2 ft. of copper ground for every foot taken out will be maintained, and that the tonnage will be considerably increased.

New Arcadian is putting down the rails from the 1250 to the 1500 level, and is able to run its hoist considerably now. The crusher is about in and the rockhouse engine will soon be installed. The rockhouse will be in commission about New Year's and then the normal quantity of work can be done.

Seneca's second option was secured by Tucker, Hayes & Bartholomew, who have the financial backing of the Lewisohn Brothers. W. F. Bartholomew has been for the past week in the Copper Country making plans for the opening of the mine.

IRON.

Ishpeming, Mich.

Considerable activity is being started to open iron-ore deposits in Sleepy Hollow adjoining the Lake Angeline which was purchased some time ago by Cleveland-Cliffs. The deposits which were located by drills during the summer are being stripped by Hoose & Person and production from this open pit will start next summer. Another Cleveland-Cliffs pit will be put in operation. This latter pit is at the extreme east end of the Lake Angeline.

The Cleveland-Cliffs Iron company has shipped about 3,365,000 tons of ore from its various mines and has about 5000 tons more to send out to complete its contracts of ore sold for this season's delivery.

Crystal Falls, Mich.

The small plant, with which the Amasa-Porter was developed and produced 50,000 tons during the past year, is to be replaced, according to General Manager Richards of the Judson Mining Co. It is intended now to install a larger plant and produce around 200,000 tons next year.

Ironwood, Mich.

A lease has been taken on the old Norrie iron mine and a company is being promoted by L. C. Brewer, mine operator, and George Rupp, mining engineer. Brewer states that they expect to start development work at once. It is the plan at present to open up the old Townsite shaft and make a thorough exploration of the property. The Townsite shaft, after being sunk to a depth of 400 ft., was abandoned during the existence of the Metropolitan Iron Co., and was never opened by the Oliver Co. while it was in control of the lease of the Norrie. Contracts have been let for modern electric hoists and other machinery, and it is expected that delivery will be made this month. Local contractors have been awarded the construction of the buildings on surface. The lease of the property for a period of 20 years has been filed with the register of deeds.

MISSOURI-KANSAS.

Joplin, Mo.

Owing to the general unsettled conditions in the spelter market prices of zinc blende receded to \$75 to \$95 per ton for the week closing Dec. 16th. On the other hand, lead ores advanced \$5 per ton, bringing from \$90 to \$100, the reasons assigned being purely local. This week's shipments also showed a remarkable turn-in based on the previous week's sales rather than this week's sales. For three weeks this month shipments have averaged 10,000 tons, which means that the annual output will break all previous records, both in tonnage and values.

A strike of ore accidentally made while drilling a water-well southwest of Joplin promises to inaugurate a prospecting campaign in a horizon hitherto not considered generally ore-bearing. The well was sunk upon the Renzenhauser farm south of Fillmore's bridge, southwest of Joplin, at which point the Grant Fall chert member of the Mississippian rocks outcrop. This member is the usual horizon in which ores are found in this field. The ore was found at

a depth of 153 or 157 ft. or 100 ft. below the usual horizon. The ore assays from 12% to 15% zinc blende.

Smith, Moore & Co. have made a bonanza strike on their tract of the O'Keefe land, near Twenty-eighth street. Miners who have mined in the South Joplin district declare the ore is the richest they have seen from the tract since the famous Octo, Brookfield and others operated there years ago. When the strike was first encountered, the dirt averaged about 10%, but the latest taken out will exceed 20%, it is believed. Those interested in the company are A. L. Moore, Steve Smith, John C. Emerson, Wm. Saylor, C. W. Smith and Leonard Vaughn of Joplin, and Herbert Wilson of Miami, Okla.

A rich strike was recently made by the Big Sandy Mining Co. The dirt averaged 12% and better, large boulders of free ore are being taken out, while the fine ore has considerable jack. About 100 tons of dirt were taken out last week.

The Independence Mining & Milling Co., situated on a 20-acre lease of the Old Wysbrod land in the East Hollow district north of Bell Center, is just developing a good face of ore in a shaft 102 ft. in depth. The company went into the ore last week and will have its first milling from the new strike this week, which is expected to be in the neighborhood of a carload. The company has its own mill of 150 tons capacity.

A good strike was made on virgin ground by the Chief Mining Co., situated on a tract of the Lee Taylor land, south of Tuckahoe. The orebody is just being developed and about 100 tons of good ore has been taken from the mine. Those interested are Bert McCall, Anton Danhakl; Walter, Charles and J. M. Neff; J. Barton and Joe Milligan.

John Good and sons have opened a good prospect on a lease of the Rader & Seals land in the Turkey Creek camp north of Joplin. Operation is being carried on at the 50-ft. level. The ore lies in disseminated ground and requires considerable shooting to break it. D. D. Adams is president of the company; E. D. Hicks is superintendent.

Leonard.

Dr. S. T. Carl, W. S. and J. C. Buchanan of Kansas, who own the Mamie S. Mine, which has first lease on 80 acres of the Empire Zinc Co.'s ground lying south of Twenty-sixth St., and east of Maiden Land, is opening a good property in old workings that were developed several years ago. This company has a 150-ton mill in operation and is pulling dirt from two shafts. Good ore bodies are being worked at the 85 level. The dirt averages about 9% zinc.

A seven-foot face of good lead dirt was struck at Saginaw by Charles Eads, Rolley Martin and J. B. Morsman. Several good mines, mostly silicate propositions, have been opened in the Saginaw camp within the last 3 or 4 years.

The Missouri Mining Co. are installing a new 150-ton concentrating plant at Thomas Station, including all modern equipment.

The Culbert Mining Co. at Four Corners have developed a rich mine; four faces of pay dirt averaging about 8% have been developed within the last few days. Operation is being carried on the 70-ft. level. A large derrick and 160-ton hopper is to be erected over the shaft from which dirt is being pulled, this week.

Webb City, Mo.

The Osage Zinc Co. of Webb City has taken out incorporation papers with a capital stock of \$30,000. The following are interested in the company: E. E. Fugitt, J. W. Ellis of Webb City, A. A. DeGraff, A. J. Mann and Fred C. Hill, Montrose, Mo.

MONTANA.

Butte.

The Butte Columbia Copper Mining Co. is getting under headway with its tunnel through the backbone of the continental divide, south of Columbia gardens. The company's property, approximately 600 acres, is equipped with a complete surface plant and the tunnel is now in a distance of

about 850 ft. It is the belief of the management that the property embraces some of the well-known veins of the district running in a general direction of northwest by southeast, and that it is in the ore zone which has been proven by developments at the Tuolumne, North Butte, Butte-Duluth and Bullwhacker.

At a meeting last week of the directors of the Butte Main Range Copper Co. J. J. Harrington, secretary of the Tuolumne Copper Co., was elected president of the former company. Other matter transacted was of a routine character.

The strike made by the Tuolumne at the Sinbad is attracting attention in that vicinity. The report for November shows an average daily shipment of about 125 tons. This has been handled partly at the Granby smelter and partly at the Pittsmont. The smelter returns show an average of over 3½% copper, while some cars have shown a much higher percentage. One car of 50 tons gave returns of 11.22% copper and 3 ozs. silver. The profits for November were greater than for the entire preceding 9 months, and the December returns will show still greater profits. The Wall syndicate, which is operating the Bullwhacker, is about to make a payment of \$50,000 on its option and receive in return 100,000 shares of the company's stock, under the terms of the contract. This makes a total of \$115,000 that has been paid and the acquirement of 230,000 shares of stock. The contract calls for eventually giving the operating syndicate a majority of the stock. With the present high price of both copper and silver and the increase in the output, the Bullwhacker is making money. All the ore being shipped is being taken from the 100 level. The manager hopes to get the tonnage up to 300 a day by the first of the year. The proposed railroad spur would be an advantage and would make a big saving in the cost for hauling.

Maxville.

Spokane men have obtained a lease and a bond for 3 years on the Buena Vista mine, situated 9 miles southeast of here. The property has not been worked since the fall of silver 20 years ago. Identified with the new organization are W. P. Russell, J. D. Chickering, F. Leslie, J. Millspaugh, George P. Larson, J. P. Boyd, G. F. Russell, D. K. McDonald and Victor Rapp, of Spokane, and William Coleman, of Deer Lodge, from whom the property was obtained. The property is comprised of three claims, patented in 1883. Good ore was followed down a shaft. A tunnel will be driven to tap the shaft at a depth of 500 ft. The formation is granite and limestone. The main vein carries in width from 12 to 20 ft. and has a strike nearly east and west in granite. A parallel vein, nearly 300 ft. south, has a width of 12 to 16 ft. and lies in a contact between granite and limestone. The principal values are in silver, assays showing a content as high as 400 ozs. and some copper. The new owners have associated themselves together as the Buena Vista Mines Co., capitalization 15 units, all subscribed. G. F. Russell has been made business manager and J. L. Magney has been made operating manager. Underground operations and the repair of camp buildings have been started. All the mining equipment and the boarding house supplies have been shipped from Spokane.

Helena.

The East Butte Mining Co., in the Elkhorn district, is getting its mill along toward completion and should be running the first of the year. It is a large affair and will treat 300 tons a day; is also sinking its main shaft another 100 ft. The Rothfuss & Dickman mill is running and doing well. The Elkhorn Queen is shipping regularly and has a large body of ore.

Bannack.

Through a contract that has been entered into by an autotruck company with the Original Bannack Mining Co. ore shipments will be started by the first of the year. The contract calls for 100 tons a day and preparations are being pushed at the mine so as to be ready to care for the tonnage. Bins are being constructed, and the mine placed in readiness. At the present high prices for copper the mine can ship a large amount of ore which under normal conditions would have to be milled. The vein, that has been opened up by two shafts, shows ore for a length of 800 ft.

and a width of 40. The width of the vein averages from 3 to 4% copper and \$2.40 gold, with an excess of iron. In spite of the haul to the railroad, much of this ore can make a nice profit. On the foot-wall side of the vein there are 15 ft. of ore that will average 5% copper and \$3 gold. This is direct shipping material. The contract for hauling the ore becomes operative on Dec. 20, but it will probably be the first of the year before everything will be in running order.

Troy.

At the annual meeting of the Montana Morning Mining Co., held in Spokane, William Hogan, of Troy, Mont., was elected president, George W. Stannard, Kalispell, Mont., vice-president, and Stanley T. Wood, of Troy, secretary-treasurer. The officers, with Glenn B. Harrington and Joseph Rosslow, Spokane; E. S. Williamson, Kalispell, and D. T. Wood, Troy, compose the directorate. "Our company owns the property, has no outstanding indebtedness and is in position to finance further development," said Secretary Wood. "We expect to begin shipping a car a week of crude ore in the next 10 days, and probably will be able to continue production indefinitely. The property is traversed by several veins and that upon which we are engaged in mining has been traced on the surface for 150 ft. and opened by a shaft of 110 ft. and a tunnel in 500 ft. that have been connected. The shoot varies in width from 1 to 4½ ft. and has an average content of 35% in lead and zinc together, and some silver. Selection will raise the value of the product to 40 or 50%. Bins have been provided, and men are sorting. Another shoot has been encountered in an advance of the tunnel beyond the shaft. Another vein, has a width of 16 to 18 ft. and contains ore of a concentrating grade. Operations are proceeding on the L. & V. and other properties of the field where ore is exposed. Work on the big property of the Snowstorm Con. is nearing completion in its several departments."

Libby.

At a recent meeting of the stockholders of the Fairbault Mining Co. O. B. Nygard was elected president and John R. Lewis secretary-treasurer.

NEVADA.

Tonopah.

The local miners have accepted the wage increase offered by the Mine Operator's Association. Some opposition developed because the increase was based on the market price of silver, the additional wage to cease automatically with the dropping of silver below 70 cts., and a secret vote was taken to determine whether the offer be accepted or a strike called. According to well-informed miners the strike proposition was overwhelmingly defeated.

Sinking of the Victor shaft has been temporarily discontinued by the Tonopah Extension pending repairs. A heavy tonnage of excellent-grade ore is going to the mill from the Murray and North Merger veins, which at several points are yielding material across faces ranging from 12 to 15 ft. wide.

Goldfield.

The discovery of a strong vein of \$45 to \$65 ore in the Kewanas has stirred considerable interest. Found at a depth of 840 ft., and about 800 ft. north of the main working station, the vein averages 3 ft. wide and is gradually gathering additional width with developments. It occurs in the shale-latite contact and contains gold and copper. The company has increased its development crew and is prosecuting work at other points where ore indications are deemed favorable.

Goldfield Con. is devoting much attention to development of copper-gold ore in the Laguna and Red Top mines, where a large tonnage of this material has been demonstrated. Equipment for the first 500-ton unit of the improved flotation plant is in place, and an abundance of excellent-grade ore is available for treatment. The second unit will probably go into service on or before the 15th of February. Recent reports that important ore discoveries had been made

in the Grizzly Bear mine were without foundation in fact, as the company has not done any work in the Grizzly Bear for nearly a year. However, the lower portion of this mine is being developed under a lease arrangement by the Atlanta Co.

Within 10 days the shaft of the Grandma Con. is expected to penetrate the Wheeler vein, one of the strongest and most heavily mineralized ledges of the district. The shaft is near the 200-ft. level and should intersect the ore body within a short distance from the present working face. The Sandstorm-Kendall, Cracker Jack, Spearhead, Blue Bull, Great Bend and several other companies are exploring interesting ground. Shipments of high-grade ore continue to be made at intervals from the Great Bend.

Yerington.

The report that the smelter of the Mason Valley Mines Co. will be blown in at an early date has been confirmed by General Manager F. W. Guernsey. One of the two furnaces will be blown in within 6 weeks, and the other as soon thereafter as ore contracts warrant. With both furnaces in operation a force of 120 men will be employed and 1500 tons of ore smelted daily. It is reported that 1000 to 1200 tons of ore will be supplied the plant daily from the Bluestone group, owned by the Delamar interests. A large tonnage will be supplied by the Mason Valley mine, and ore also smelted for several California producers. A heavy tonnage of copper, gold, silver and lead ore is expected from the numerous small companies operating in territory tributary to Yerington.

Battle Mountain.

J. M. Pine reports the discovery of high-grade antimony ore in his Antimony King mine, north of Galena canyon. The shoot is 18 ins. wide, and besides carrying large quantities of antimony, contains considerable silver and some gray copper. The strike was made at a depth of 100 ft.

Cherry Creek.

This famous old silver district is again claiming a goodly share of the interest being manifested in Nevada mines by outside capital. From the Hunter mine much ore is being shipped, and several leasing companies are working along profitable lines. The Downer plant has been placed in commission and is stated to be making a high metal recovery from rather low-grade ores. The company owning the Mud Springs group has been re-organized, and \$50,000 is reported to have been set aside for future work. Numerous old producers in the district are being re-opened, and the general outlook is encouraging.

Rochester.

Construction of the 2-mile tramway from the Rochester mine to the mill is being rushed to completion. With the exception of a tube mill, in transit from the East, all mill equipment has been installed.

Las Vegas.

Las Vegas and Eldorado mining and business men have incorporated the Eldorado Mining & Milling Syndicate. The company will do a general custom mill business besides furnish water, light and develop the property upon which the townsite is located. This incorporation also owns the townsite and will dispose of the lots, using the money derived from this source to assist in developing the property. With the establishment of a custom mill, properties in Eldorado Canyon will begin shipping. Heretofore they have been forced to remain idle on account of being unable to mill the ores.

I. R. Landis and Peter Buol have organized and are now incorporating on the following claims: Helen M. Porter, Cycle, Evans, Dewey, Mary H. Longfellow, Combination, Combination No. 1, Combination No. 2, Triangle, Nelson No. 1 and Nelson No. 2, the last two claims adjoining the townsite of Eldorado. Landis will go to Los Angeles next week and purchase hoist, compressor and other machinery. Active operations will begin within 2 weeks.

The management of the Eldorado Enterprise have been mapping out a big development campaign for this property. The ledge in the tunnel is widening, the assays showing good values. It is the intention to install a plant of machinery on this fine property in the near future to facilitate

development. The Enterprise is a very promising youngster.

Frank A. Doherty, Geo. A. Fayle, Hugh Welk, and others, have formed the Eldorado-Good Springs Gold Mining Co. and are incorporating on the Texas group, a splendid property near the Wall Street mine. Active development will begin at once.

Work has been started on the M. & D. group, known as the Black Prince in Copper canyon. High grade copper has been mined in property.

NEW MEXICO.

Mogollon.

At the Pacific mine, construction work is about completed to effect hoisting from adit level to collar of shaft. The ore will be dumped into chute to crusher, thence by belt conveyor to feed bins at terminal of aerial tramway to Socorro's mill. At present a large number of burros are employed moving old ore dump to terminal station.

A new headframe has been installed at collar of shaft on Trilby group, and sinking and drifting will be started at once. Supt. James, who has had considerable experience in Alaska mining centers, is in charge of the work, representing the estate of the late Capt. Kirkpatrick.

The Oaks Co. has resumed sinking of shaft on the Meridian claim. This is a fraction lying between the Top, on the east, one of the properties under operation by Mogollon Mines Co., and the Confidence group on the west, which together have produced five or six million dollars to date. Although surface rights are restricted, the fraction is considered quite valuable, as it embraces a constantly increasing length of this important vein as depth is gained.

Work has been started on the Grand Central claim, one of the promising locations in camp.

At the Gold Dust group, a winze is being sunk on an ore body about 900 ft. from portal of lower tunnel. Crosscuts at various points are also under way.

The Oaks Co. is doing work on the Susje and other claims in vicinity. A cut sample assaying \$14 is reported for width of breast in South drift from bottom of shaft on Eberle mine, one of the Queen vein properties.

Socorro Mining & Milling Co. shipped 13 bars of gold and silver bullion from operations covering last half of November, a total of 31 bars for the month, from a treatment of approximately 6900 tons of ore.

Bullion output of Mogollon Mines Co. for last half of month past was 12 bars, making a total of 20 bars for November. Ore reduction for the past 30 days was 4000 tons.

On Dec. 1 the Oaks Co. paid its initial dividend of 1% on preferred stock issued. It is understood a like amount will be disbursed monthly for an indefinite period.

OREGON.

Lebanon.

At the Crown mines good discoveries have been made and preparations are under way to ship the ore to the smelter at Tacoma. The principal value is zinc. R. E. Peery is manager.

Sumpter.

The Columbia mine, which has been in continuous operation for 20 years, has been closed. For about a year the mine has been a subject of litigation which is now pending. It is thought that this has influenced the closing of the mine, as it still contains known commercial ore. About a month ago the mill was closed. At that time it was the intention to continue underground work during the winter. Pulling the pumps completes the shut down and the mine will be allowed to fill with water. Recent work in the mine cut new water courses, increasing the flow of water to the point where it was with the greatest difficulty that pumps kept it down.

SOUTH DAKOTA.

Deadwood.

The Cuyahoga Mining Co., according to J. H. Snyder, vice-president, who was recently in the city from the Southern Hills, states that the company is sinking the main shaft to the 200 level and has reached a depth of 160 ft. to date. In going down the shaft passed through 40 ft. of the vein, and for nearly all of its depth has been in pyritic ore. After the 200 level has been reached a station will be cut and drifts made on the vein. The company has been making regular shipments of ores to chemical works at Cleveland, O., and recently sent 2 cars there which will average 43% sulphur. These shipments will be continued while the development of the property is proceeding. The mine is not primarily being opened for pyritic ores, for on the hanging wall of the vein which has been uncovered is 11 ft. of ore which contains from \$4.50 to \$60 in gold. This part of the vein is now receiving attention and when it has been opened arrangements will probably be made for the erection of a mill. The company is also talking of erecting a plant for the manufacture of sulphuric acid, and it may be started in the spring.

At present expectations are to start the mill of the New Puritan Co. in the spring. At the mine drifting has been in progress from a station on the 160 level of the main working shaft. It has reached a point directly beneath the quartzite ore body and is expected to cut the ore body on its dip. Raises will be made from the drift and the ore drawn off from the levels which will be run on it into cars and taken to the main shaft.

Hill City.

The Hill City Production Co. began the smelting of its own tin concentrates on Dec. 14. The results were satisfactory and a considerable amount of concentrates are on hand waiting to be smelted.

UTAH.

Milford.

Moscow mine, in Star district, 10 miles southwest of Milford, is controlled by Matthew Cullen and associates, Salt Lake, and is under the management of G. S. Wilkin. The ore occurs in limestone, cut by east-west fissures. Among these is one main fissure, extending from monzonite on the west to quartzite on the east. It has a width ranging from 2 to 60 ft., and has a dip of 35 to 45° north. The ore not only occurs in this main fissure, but in shoots in the adjacent bedded limestone. These limestone beds strike north-south and dip east. In this formation, north of the main fissure, are two great ore shoots, 200 ft. apart, which have a pitch to the east of 45°, corresponding to the dip of the bedding planes; and there are numerous other minor ore shoots. In the big fissure are bodies of lead carbonate, carrying silver, and carbonate of zinc below the lead stopes; also detached lenses of zinc sulphide. The grade of the lead carbonate is about 17% and 15 ozs. silver, 20% iron and 15% silica. The zinc carbonates contain 30 to 35% zinc; the zinc sulphide runs over 38% and 11.8% lime. About 1000 tons of zinc sulphide ore is blocked out in the big fissure. The ore in the shoots, occurring in the lime beds, is more continuous and of higher grade than that of the main fissure. In the bedded formation it has been found continuous from the surface to 1100 ft. depth, except where faulting occurs. Here the lead carbonates carry 30 to 40% lead, and 15 to 40 ozs. silver. At and below the 1100-ft. level are bodies of sulphide ore, running 15% lead, 30% zinc, 1% copper, 6 ozs. silver. On the higher levels copper carbonate ore has been found contiguous to the lead bodies. It runs 10% copper and is accompanied by some silver and zinc.

The principal ore shipments consist of lead carbonates, amounting to 500 tons per month; the zinc carbonate ship-

ments are now running about 90 tons per month. The sulphide shipments are variable. The net production of the mine, after hauling, railroad freight and smelting charges are paid, has amounted to \$100,000 to \$150,000 per year during the last 5 years. There is a wagon haul of 9 miles to Laho station, costing \$1.65 per ton.

The property has been developed and is being operated through three vertical shafts. The old shaft, 200 ft. deep, and the Cullen shaft, 500 ft., are 300 ft. apart, and situated at the old camp on the west side of the divide; the new shaft, 1100 ft. deep, is on the east slope of the range, 2000 ft. east of the old camp. The collar of the new shaft is 300 ft. lower than that of the Cullen. The workings on the west side and those on the east side are connected by drifts and inclines. At present the greater tonnage of ore is coming from the Cullen workings, but eventually the new 1100-ft. shaft will be the center of operations. The Cullen shaft is near the apex of the ore zone, which dips toward the east side. In the new shaft the ore body was caught on its dip at 1100 ft. depth. This fact, demonstrating that the ore bodies are persistent to that depth, is of interest to other operators in that district, among which are the Commonwealth, Cedar, Talisman and Leonora.

The new shaft has two compartments for hoisting and one for ladderway. It is equipped with a Wellman-Seaver-Morgan double-drum electric hoist, and an electric driven air compressor, 700-cu. ft. capacity. Besides using compressed air for drills, it is used for operating the hoist at Cullen shaft and several underground hoists for winze work. Water at the camp is supplied from a well in the valley. This requires an electric-driven pump, forcing water through a 5-mile pipe line, and making a lift of 1000 ft. Beaver River Power Co. has a hydro-electric plant in Beaver canyon, 20 miles east, which furnishes the power.

WASHINGTON.

Spokane.

Approximately \$50,000 is to be expended in further development of the Lead-Zinc Mining Co.'s holdings near Metaline, and in additions to the mill and in diamond drill exploration of undeveloped ground, according to Lewis P. Larsen, president and general manager of the corporation, who was in Spokane recently. It is announced that New York men have become heavily interested in the property, and that finances for the contemplated work is being provided by them. "We now are employing 25 men, but the force probably will be increased to between 40 and 50 by January 1, when we hope to have the mill completed and operating. The capacity of the plant now is 125 to 150 tons daily, but it will be increased soon to 250 and a flotation system installed. A new hoist and compressor plant, each actuated by a 100-hp. electric motor, are being placed in the mine, which will be in shape for steady production when the concentrator is finished. The sources of production include a shoot opened for a length of 600 ft., having a width of 25 to 75 ft. and a metallic content averaging 10%. There is ore in the faces, so the extent of the ore body is not known. Diamond drilling is to be conducted from the 550 level. The property, which is of large area, embraces several veins. It has been opened by a shaft, tunnels and other workings for 3000 to 4000 ft. Our mine is unique in its possession of free zinc sulphide ore. It contains no iron. We have made a metallic recovery of 62.7% in tests by flotation, and expect to make 62% concentrates when a maximum of efficiency is attained in the plant. We will separate the lead and zinc and float the slimes, producing perhaps 25 to 30 tons a day of high-grade concentrates. A mill of larger capacity will be built at the lower level ultimately."

The Loon Lake-Blue Bird Copper Mining Co., capitalized for 1,500,000 shares at 25 cts. each, of which 500,000 shares are to be held in the treasury, has been incorporated by Andrew Laidlaw, H. H. Schallenberger, Lester P. Edge, Joseph McCarthy and M. L. Moe, all of Spokane, to take over and develop the Blue Bird and Dupont claims, adjoining the Loon Lake Copper Co.'s holdings, 45 miles north of Spokane.

Charles E. Agnew, of Sharpsville, Pa., and J. C. Haas, a local mining engineer, also are interested in the corporation. "The same veins from which the Loon Lake Copper Co. is extracting present shipments for the Trail smelter extends into our ground," said Mr. Schallenberger. "The ledges are clearly defined within our lines and the surface showing on the Blue Bird, which was the first claim located in the camp, is regarded as the largest and most promising in the district. We intend to rush development as rapidly as possible, and work will begin as soon as a crew can be recruited and supplies and material assembled. The Blue Bird claim was located 20 years ago and a shaft 82 ft. deep was sunk about that time. According to men who worked at the property there is a fine showing of ore at the bottom of this shaft, the dump showing some excellent chalcopryite. The principal surface showing is on the Blue Bird a few hundred feet from the Loon Lake Copper workings. The malachite and azurite quartz is apparently identical with that obtained from the original surface workings on the O. K. claims of the Loon Lake Copper Co."

Articles of incorporation of the Coyote Mining Co. have been filed with the county auditor at Colville. The capital stock is fixed at \$250,000 with shares of \$1 each. The trustees are J. E. Herron, L. W. Cook and George Osterhout, all of Northport.

Water in large volume has appeared in the shaft of the Loon Lake Copper Co. This suggests proximity of a ledge for which we will crosscut when the 300-ft. depth is attained. The shaft, sunk from the 200 level lacks 10 ft. of its objective. Three carloads of ore are in transit. A check for \$1800 has been received on a lot of 33 tons shipped Nov. 17.

Dayton.

The Nisling Mining company held its annual meeting last Tuesday. Officers and directors were elected as follows: C. H. Day, president; George Spalinger, vice-president; A. F. Appleton, secretary, and J. W. Jessee, treasurer. The directors are William Chandler, George Brown, J. W. Imlay, W. F. McCauley and John Romain. Reports from the officers and a detailed statement by the company engineer, Robert Smart, of the work for the year were received.

WISCONSIN-ILLINOIS.

Platteville, Wis.

Returns for the field for week ending Dec. 9 showed deliveries to track of 149 cars of zinc concentrate, 5800 tons. Heavy shipments seemed to be in order for low grades to reduction plants. Four cars of lead ore were shipped, 124 tons, in all. Pyrites came in volume from the Mineral Point Separating Co., 427 tons; National Separators, 377 tons; Linden Zinc, 80 tons, and Optimo mines, crude pyrites, 74 tons. Production was fair considering the fact that severe winter weather retarded milling at many points, a total of 5000 tons of mine run ore being turned in. Net deliveries of high grade ore from reduction plants to smelters were light, 2300 tons, with an additional 14 cars of high grade under contract direct from mines to the Grasselli Chemical Co., 577 tons.

Local producers were again light on mine-run ore, the Hodge sending 3 cars to Cuba, 133 tons; West Hill Mining Co. high grade to La Salle, 32 tons; Bell Mining Co. initial shipment to La Salle, 28 tons, and Utt-Thorne Co. small lots, 14 tons.

A sharp decline was experienced in the price of blende, the base receding to \$93 per ton for standard grade or down to \$89 for medium and second grades. Under 50% zinc content was in good demand at \$1.20 per unit.

Benton, Wis.

Shipments for the week of Dec. 9 totaled 56 cars, 4,554,000 lbs., of zinc concentrates. Three of the 4 cars of lead ore from the field came from this section. Frontier Mining Co. and Wisconsin Zinc Co. were tied with 10 cars each for a combined total of 815 tons. New Jersey Zinc Co. to Mineral Point from the Fox and Penna-Benton mines, 4 cars

each, 329 tons. Fields Mining & Milling Co. to Mineral Point, 2 cars, 70 tons, and to Grasselli, 3 cars, 120 tons. Vinegar Hill Zinc Co. to Cuba from the Blackstone, Martin and Kittoe mines, 6 cars, 242 tons. Indian Mound Co. to Wisconsin Zinc roasters, 2 cars, 88 tons; Grand View Mining Co. to Linden Zinc, 35 tons, and Sally Mining Co. to Cuba, 37 tons. Benton roasters were in on the high grade shipments, sending 2 cars, 83 tons, to American Zinc of Illinois. Skinner roasters to American Zinc, 3 cars, 120 tons; American Metals Co., 2 cars, 88 tons; American Zinc & Lead Smelting Co., 1 car, 43 tons, and to Eagle-Picher Lead Co., 5 cars, 207 tons.

A rich strike was completed at the Buchan mine where after great tribulation the shaft was put down to the ore bed and good deposits are being opened up. A small sinking plant will now be replaced with a complete modern mining establishment.

Highland, Wis.

National Zinc Co. of Springfield seems to have established itself in this district. The Saxe-Lampe Mining Co. shipped 2 cars high-grade carbonate, 60 tons, and New Jersey Zinc Co. to Mineral Point, 30 tons. Lack of water, for which diligent quest is being made with drills, is halting the operation of a new mill at the Kennedy mine and withholding employment from a force of 50 men.

Linden, Wis.

The Spring-Hill Mining Co. makes its initial shipment with 1 car of zinc delivered to the Benton roasters, 40 tons. Saxe-Pollard are sending from 8 to 10 cars out weekly to Mineral Point, the Gilman mine offering most of this yield. Stoner, Ross and Optimo mines sent between them 4 cars to separators last week, 146 tons.

One of the rare finds of the year in zinc ore producers is being opened up fully on the Gilman property for the Pollard-Saxe Co. At present a recovery of 25 tons of zinc concentrate is made each 9-hour shift and shipments have been made weekly to the Mineral Point Zinc Co. in volume, the report for week of Dec. 9 accounting for 10 cars, 345 tons. A 10% recovery of lead ore is being made in milling. Other shippers for the week were Stoner Bros., Ross Bros., and Optimo companies.

Mifflin, Wis.

Shipments of zinc ore continued with 15 cars going to track. The Cokers are making a light run due to lack of water supply for milling. Drilling operations are being extended on the Big Tom property. Shipments of high grade jack are regular. Grunow Mining Co. is improving its output. Peacock Mining Co., one of the dividend payers of the field for 1915, is running conservatively and new equipment has been installed.

Dodgeville, Wis.

Much excitement has been occasioned in this camp by recent developments on the Ed Berryman farm. A rich strike of zinc ore was made in deepening an old well. This well was deepened to go through the glass rock and a sheet of zinc ore 14 ins. thick was cut. Some of the miners engaged in this section claim it is an extension of the McKinlay range.

Shullsburg, Wis.

The Mulcahy mine, a new producer, shipped 12 cars of high-grade separator ore to Edgar Zinc Co., 440 tons. The Winskill mine sent 3 cars to Skinner roasters, 117 tons. Rodhams & McQuitty Co. are putting the finishing touches on a new 100-ton mill.

Galena, Ill.

The few producers who reported were heavy on zinc ore last week, the Black-Jack sending 8 cars to Mineral Point, 320 tons; Graham mine and North Unity to Cuba made 5 cars, 215 tons. The Birkbeck mine, a new Wisconsin Zinc Co. producer, is now opened up to better advantage and giving evidence of its value as a producer, 7 cars going to separators last week, 283 tons. The plant is one of about 40, built in the field during the year and a heavy production is predicted regularly.

The Ophir Mining Co., a recent organization, is developing a strong east-west lead range on the Stephen's farm. The shaft has reached a depth of 108 ft. and is in fine lead ore. Shipments will commence this week.

WYOMING.

Cody.

The Midwest Sulphur Co. is in the midst of prosperity, as its product has been sold into the fall of 1917. Officials state that on this account an addition will probably be necessary to the plant which now has a capacity of 200,000 lbs. daily. The new brimstone pit near the plant can now be driven into for a distance of 40 ft., and the sulphur walls are 30 ft. thick. It looks like a 2 or 3-year proposition according to present conditions.

Casper.

Another well has been brought into the Big Muddy field in the shallow sand formation. The Standard Exploration Co., drilling for the Merritt Oil & Gas Co., made the strike at a depth about equal to the other shallow wells in the field. Tankage was ready for the coming in of the well and it was quickly hooked onto a pump and is today producing a little better than 500 bbls. daily. Both the upper and lower sands are now proved producers in this field.

Kemmerer.

The Plains Oil Co., Kansas City, is going to develop the La Barge oil field, 35 miles north of here. A company has also been formed to develop a field at Fossil, 15 miles west of here. A rig will be put to work there within a few weeks.

Conroy.

The Rock Springs Fuel Co. was recently organized and has taken over coal mines near here which belonged to the Wyopa Coal Co. Much reconstruction work has been found necessary and a force of 70 men is being employed. Two shifts are working and some coal is being produced.

CANADA.

BRITISH COLUMBIA.**Illicillewaet.**

The new mill of the Lanark Mining Co., a 150-tons daily capacity plant, now is more than half completed, and it is believed that it will be ready for service not later than Feb. 1, according to reports from William B. Dornberg, general manager. The company is controlled by Spokane interests, and money is available to finance construction of the concentrator and other betterments to the property that are contemplated. Large quantities of ore ready for mill treatment have been blocked out and much of it broken down. Because the mountain is too steep to permit of storing much ore, there has not been much work done in the mine pending the building of the mill.

Silverton.

Dividends will be paid quarterly by the Standard Silver-Lead Mining Co. after the end of the current year, according to announcement accompanying the regular monthly report to stockholders. Heretofore disbursements have been made monthly. The company operated at a loss in October, but the deficit will be more than balanced by sale of accumulated zinc concentrates, now being shipped. Among other things the loss results from a reduction in the receipts on preliminary shipments, which were \$26,386 in October as compared with \$33,066 in September, and a reduction in the zinc sales, which were \$8503 in October, as compared with \$17,137 in September. "We have not shipped any accumulated zinc concentrates, of which we made 500 tons this month over our regular shipments, worth approximately \$15,000," says Charles Hussey, secretary, in the report. "At the date of this statement, Dec. 11, we have commenced shipping our accumulated zinc concentrates, estimated to amount to 3000 tons, worth about \$30 a ton net. At the last regular monthly meeting the directors decided to pay all future dividends quarterly on account of the long distance from the transfer office and the great amount of detail connected with monthly disbursements." The surplus at the end of October was \$202,669, as compared with \$264,319 at the end of September. The receipts for October were

\$46,670, as compared with \$61,149 in September, \$18,824 in February, \$180,943 in March, \$131,309 in April and \$88,227 in May. The disbursements for production, tramming, milling, power, shipping and selling, taxes, insurance, casualty insurance, salaries and general expenses were \$37,114. They differ little from those of any other month except February for which they were less. These figures show a relative operating profit of \$9555 in October as compared with \$24,188 in September, \$143,065 in March, \$93,542 in April and \$55,443 in May. There was a relative operating loss of \$8,743 in February. Disbursements in October for development construction work in the Aylard and No. 7 tunnels and store supplies were \$10,867, which is higher than some months and lower than others of the current year.

Nelson.

The Granby Co. proposes to carry out extensive diamond drill operations on its properties at Phoenix. It has given a contract to Boyle Brothers, who have moved their outfit from Lake Chelan, Wash., to the Granby properties.

ONTARIO.**Cobalt.**

The McKinley-Darragh-Savage Co. has purchased a 17 by 5-ft. ball mill from the Power & Mining Machinery Co., Milwaukee, Wis., and this will be in operation by February, 1917. The new mill will take care of the ore which formerly went to the 50-stamp mill, which will be cut out entirely. At present, underground work is centered in raising from the 400 to the 250 level. By Feb. 15 these levels will be connected, and will permit ore to be hoisted from the 400 direct to surface.

Though development has been satisfactory to date more of it is needed before the Peoples' Mining Co. can have a fair chance. The second vein has been cut in the crosscut above the contact. The No. 1 vein, cut some time ago, has been drifted on for 75 ft. It is 8 ins. wide and looks promising. The No. 2 vein carries some cobalt and is fairly strong. At the place where cut the vein is about 8 ins. wide. This vein will be drifted on also and possibly some raises put up. Silver has not yet been found in the vein, but the character of the vein is such as to warrant possibilities.

Kirkland Lake.

At the Wright-Hargraves buildings, including an assay office, have been erected and a \$25,000 plant installed. The main vein has been traced for a distance of 2800 ft., and has a width of about 12 ft. It shows mineralization of fine consistency. At the east side of the property this vein contains values of a good milling grade. About 1800 ft. west, near the center of the property, the main shaft is located, in which high-grade values have been encountered. Surface exploration has exposed the vein at 1000 ft. west from the main shaft. Here the vein is 14 ft. wide, and contains average values of \$50 per ton across its entire width.

Porcupine.

The new south shaft at the Davidson is down over 50 ft. and at that point a vein was encountered. It is 5½ ft. wide of quartz, and a channel assay over that width assayed \$7.20 gold. There is also a pay streak 42 ins. wide in the center of the vein which went over \$40.00. The main vein is showing up satisfactorily at depth. Financial arrangements have been completed whereby the company is assured of no less than \$400,000 for development work. It is planned to explore the 300 level thoroughly and at the same time work along the ore body on the two upper levels. On the 300 they picked up the main vein some weeks ago but owing to unavoidable delays have not yet reached the hanging wall. The values are about the same as those on the 100 and 200 levels, where a large body of high grade milling ore is being blocked out. A mill may be built in the spring of 1917.

A contract for extensive diamond drilling has been awarded Smith & Durkee for holes varying from 500 to 1000 ft. deep on the property of the Apex Co. The main shaft will be sunk 300 ft. further, work commencing with 2 machines running three shifts. Crosscutting will be done south to the Dome Lake line to intercept the ore body on that property, which is understood to run into Apex at the southwest. It will also drift on the main vein towards West Dome where free gold showings were uncovered on surface.

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I. GEOLOGY

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(I) METALS AND ORES

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Singewald, Joseph T., Jr.; Miller, Benjamin L.—*The Mining Industry of Bolivia*. [A general description, with some details of the people, geography of the country and operation and production of the mines].—E. & M. J. Dec. 9 1916; p 1005; pp 5*; 25c.

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—*Ontario's Metal Production*. [From the Canadian Bureau of Mines report].—Canadian Mg. Jnl. Dec. 1 1916; p 555; pp 1¼; 35c.

—*The Influence of Silver Contents on Treatment of Gold Residues*. [From the W. A. Chamber of Mines Jnl., in which the results of tests made by the Great Boulder Perseverance Gold Co. are given and show that it is easier to dissolve the gold when the silver content is low].—Mg. & Engg. Rev. Nov. 6 1916; p 35; pp 1; 35c.

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, Etc.

Tungsten

Hess, Frank L.—*Tungsten Production During First Six Months of 1916*. [A report of the U. S. G. S.].—Chem. Eng. & Mfg. Nov. 1916; p 232; pp 1; 30c.

Jimenez, Carlos P.—*Estadística Minera en 1914, Peru*. [Mineral statistics of Peru in 1914].—Cuerpo de Ingenieros de Minas Boletín No. 82; pp 150.

Singewald, Joseph T., Jr.; Miller, Benjamin L.—*The Mining Industry of Bolivia*. [A general description, with some details of the people, geography of the country and operation and production of the mines].—E. & M. J. Dec. 9 1916; p 1008; pp 5*; 25c.

Worthing, A. G.—*Tungsten-Molybdenum Equilibrium Diagram and System of Crystallization*. [Discussion of a paper by Zay Jeffries].—A. I. M. E. Bull. Dec. 1916; p 2231; pp 1; 35c.

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Zinc

Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Arizona* in 1915. [Separate reviews of the metals and activities in each of the counties in the state].—Min. Res. of U. S. 1:17; pp 37.

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(II) NON-METALS

(A) FUELS

Coal Fields and Mining

Brown, J. F. K.—*The Tonnage Available*. [A description of methods of com-

puting the tonnage available in a coal seam and discussion of various factors entering into the figuring of the same].—Coal Age Dec. 9, 1916; p 956; pp 3½*; 20c.

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Graham, Thomas.—*The Coal Creek Collieries, British Columbia*. [Abstract of a paper read before the Mine Inspectors' Inst., in which special stress is given analysis of the air in the mine workings].—Coal Age Dec. 9 1916; p 964; pp 2¾*; 20c.

Jimenez, Carlos P.—*Estadística Minera en 1914, Peru*. [Mineral statistics of Peru in 1914].—Cuerpo de Ingenieros de Minas Boletín No. 82; pp 150.

Ramsberg, C. J.—*Problems in Byproduct Coking*. [A paper read before the Eng. Soc. of West Pennsylvania, in which reference is made to the mixing of coals for coking and not the mechanical side of the question].—Coal Age Dec. 9 1916; p 969; pp 1¼; 20c.

Weber, Heinrich.—*Die Schlagwetterexplosion auf dem Steinkohlenbergwerk Minister Achenbach I/II bei Dortmund am 30 Januar, 1914*. [A heavy explosion at the Minister Achenbach I/II mine near Dortmund, Germany].—Zts. Berg, Hütten & Salinenw. Band 62, 1914; p 428; pp 15*; \$1.50.

Coal Preparation, Marketing, Etc.

Burroughs, William G.—*A Concrete Tipple in Ohio*. [A tipple for handling a moderate production, built by the Black Diamond Coal Co.].—Coal Age Nov. 25 1916; p 872; pp 1¼*; 20c.

Edsall, Henry J.—*American Coal Tipples*. [A description of the Warrior Coal Co.'s plant in West Virginia].—Coll'y Guard. Nov. 24 1916; p 1005; pp 2*; 35c.

Equipment of the Valleyford Colliery. [Gives drawings and description of the steam-turbo and electric plants besides a description of the coal washing plant and fan and boiler house].—Coll'y. Guard. Nov. 17 1916; p 951; pp 2½*; 35c.

Coal Dust, Fire Damp, Etc.

Blatchford, A. S.—*The Influence of Incombustible Substances on Coal-Dust Explosions*.—Trans. N. Eng. Inst. Mg. & Mech. Eng. No. 46; 1916; p 235; pp 17.

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Mitteilungen über einige der bemerkenswertesten Explosionen beim preussischen Steinkohlenbergbau im Jahre 1913. [A review of explosions in the anthracite mines of Prussia].—Zts. Berg, Hütten & Salinenw. Band 62, 1914; p 339; pp 4*; \$1.50.

Coal and Coke By-Products

Egloff, G.; Twomey, T. J.; Moore, Robert J.—*The Effect of Temperature and the Time Factor in the Formation of Gasoline in the Gas Phase at Constant Pressure*. [The testing was mostly done with a Pennsylvania crude petroleum oil].—Jnl. of Ind. & Engg. Chem. Dec. 1916; p 1102; pp 3¾*; 60c.

Coke

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Still, C.—*Kritische Streifzüge durch das Gebiet der Kokerindustrie*. [A general talk on the coking industry, in which several formulas relative thereto are given].—Glückauf Oct. 1 1916; p 829; pp 7½*; 50c.

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Condict, G. Herbert.—*Is Dewatering Peat by Machinery Commercially Practicable*.—Jnl. Amer. Peat Soc. Oct. 1916; p 204; pp 2; \$1.60.

Huels, Frederick William.—*The Peat Resources of Wisconsin*. [Abstract of Bulletin 45 of the Wisconsin Geol. Surv., in which the nature of the beds and properties of the peat found in the several localities is given].—Jnl. Amer. Peat Soc. Oct. 1916; p 237; pp 12; \$1.60.

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Petroleum

De Beque, G. R.—*The Bituminous-Shale Industry in Northwestern Colorado*. [Brief description of activities with respect to treating the shale for its oil and a more detailed description of the geology of the formation].—E. & M. J. Dec. 9 1916; p 1011; pp 1¾*; 25c.

Du Toit, Alex. L.—*Report on the Oil-Shales in Impendhle County, Natal, South Africa*. [Part of a report of a Geol. Survey Memoir].—S. Afr. Mg. Jnl. Oct. 28 1916; p 193; pp 2; 35c.

Galpin, S. L.—*Petroleum Engineering*. [A talk on what are the duties of a petroleum engineer].—Iowa Eng. Nov. 1916; p 45; pp 4; 25c.

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Baku Russian Petroleum Co., Russia.—Petro. World Sept. 1916; p 426; pp 3; 35c.

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Natural Gas

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III. TECHNOLOGY

MINES AND MINING

Ore Reserve

Brown, J. F. K.—*The Tonnage Available*. [A description of methods of computing the tonnage available in a coal seam and discussion of various factors entering into the figuring of the same].—Coal Age Dec. 9 1916; p 956; pp 3½*; 20c.

Huels, Frederick William.—*The Peat Resources of Wisconsin*. [Abstract of Bulletin 45 of the Wisconsin Geol. Surv., in which the nature of the beds and properties of the peat found in the several localities is given].—Jnl. Amer. Peat Soc. Oct. 1916; p 237; pp 12; \$1.60.

Scott, Herbert K.—*Manganese Ores of Russia, India, Brazil and Chile*. [Discussion of a paper by E. C. Harder].—A. I. M. E. Bull. Dec. 1916; p 2222; pp 5½; 35c.

Mine Sampling

Hanchett, F. B.—*Daily Sampling in Square-Set Mining, Arizona*. [A method used in the Clifton-Morenci district, whereby the metal content of a set can be told before it is mined out].—Mg. World Dec. 2 1916; p 949; pp 1¼*; 10c.

Staley, Homer F.; Beecher, Milton F.—*Practical Handling of Iowa Clays with Application of Ceramic Principles*. [Methods of prospecting and testing the clay bodies are given, as well as descriptions of methods of manufacturing and properties of the burned product].—Iowa State College; Bull. 43; pp 48*.

Webber, Morton.—*Sampling of Mines*.—M. & S. P. Dec. 9 1916; p 846; pp ¾*; 20c.

Accidents

Weber, Heinrich.—*Die Schlagwetterexplosion auf dem Steinkohlenbergwerk Minister Achenbach I/II bei Dortmund am 30, Januar 1914*. [A heavy explosion at the Minister Achenbach I/II mine near Dortmund, Germany].—Zts. Berg, Hütten & Salinenw. Band 62, 1914; p 528; pp 15*; \$1.50.

Mitteilungen über einige der bemerkenswertesten Explosionen beim preussischen Steinkohlenbergbau im Jahre 1913. [A review of explosions in the anthracite mines of Prussia].—Zts. Berg, Hütten & Salinenw. Band 62, 1914; p 339; pp 4*; \$1.50.

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Labor and Management

Kemble, William F.—*Standardizing the Characteristics of Men*. [A general talk with some details on methods by which character of employes may be depicted and further kept track of].—Industrial Management Dec. 1916; p 308; pp 16*; 35c.

Baku Russian Petroleum Co., Russia.—Petro. World Sept. 1916; p 426; pp 3; 35c.

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Firgueroa, T.; Carbonell, A.—*Notas Sobre Los Yacimientos Bismutíferos de Azuel, Cordoba, Spain*. [Notes on the nature and production of a bismuth ore in Spain].—*Revista Minera* Oct. 16 1916; p 491; pp 2; 35c.

Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Arizona* in 1915. [Separate reviews of the metals and activities in each of the counties in the state].—*Min. Res. of U. S. I*: 17; pp 37.

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Heikes, V. C.—*Gold, Silver, Copper, Lead and Zinc in Utah* in 1915. [The production of each mineral is reviewed separately, as are the activities in each county of the state].—*Min. Res. of U. S. I*: 15; pp 25.

Jimenez, Carlos P.—*Estadística Minera en 1914, Peru*. [Mineral statistics of Peru in 1914].—*Cuerpo de Ingenieros de Minas Boletín* No. 82; pp 150.

Mills, E. W.—*Leading Gold Mining Operations in Korea*. [Abstract of a paper read before the Korean branch of the Royal Asiatic Soc. Deals with the production, operation and history of several concessions in the country].—*Mg. World Dec.* 9 1916; p 989; pp 1½; 10c.

Ortega, Pablo.—*Boletín De Minas, Cuba*. [Reviews the operations and production of the mines, mostly in the province of Pinar del Rio. The nature of the deposits and mines of the various companies are described. Several tables of statistics are given in the concluding pages].—*Secretaría de Agricultura, Comercio y Minas, Bull.* No. 1; pp 157*.

MILL AND MILLING**Sampling**

Herr, Irving.—*Some Observations on Sampling*. [Points out instances in this process where errors may be made to as great an extent as 49%].—*E. & M. J. Dec.* 9 1916; p 1015; pp 2¼*; 25c.

Trewartha-James, W. H.—*Taylor's Pulp Sampler*. [A discussion of the original article].—*Inst. of Mg. & Met. Bull.* 146; pp 15*; 50c.

Flotation

Laist, Frederick; Wiggi, A. E.—*Flotation Concentration at Anaconda*. [Parts of a paper read before the A. I. M. E.].—*M. & S. P. Dec.* 9 1916; p 847; pp 2; 20c.

Motherwell, William.—*Chronology of Flotation*. [A list of the companies which adopted flotation before 1914. Daily tonnage, metals in the ores and process employed are given in this table].—*E. & M. J. Dec.* 9 1916; p 1012; pp 1½; 25c.

Concentration: Sorting, Sizing, Washing

Fleck, Herman.—*Metallurgical Treatment of Molybdenum Ores*. [Abstract of an article in the Colorado School of Mines Q'tly, dealing in a general way with molybdenum, its concentration, thermic refining and marketing].—*Mg. World Dec.* 9 1916; p 994; pp 1¼; 10c.

Lilburne, A. S.—*The Milling of Gold Ores*. [A general discussion regarding the general practices followed in Australia in the milling of gold ores].—*Mg. & Engg. Rev. Nov.* 6 1916; p 33; pp 1¼; 35c.

Cyaniding

Bryan, R. R.—*From Precipitate to Bul-*

lion. [A description of the handling of gold from the time it is taken from the zinc-boxes till it is refined gold, which has passed through the furnace].—*M. & S. P. Dec.* 9 1916; p 834; pp 2½*; 20c.

Lilburne, A. S.—*The Milling of Gold Ores*. [A general discussion regarding the general practices followed in Australia in the milling of gold ores].—*Mg. & Engg. Rev. Nov.* 6 1916; p 33; pp 1¼; 35c.

— *The Influence of Silver Contents on Treatment of Gold Residues*. [From the W. A. Chamber of Mines Jnl., in which the results of tests made by the Great Boulder Perseverance Gold Co. are given and show that it is easier to dissolve the gold when the silver content is low].—*Mg. & Engg. Rev. Nov.* 6 1916; p 35; pp 1; 35c.

METALLURGY**Electrometallurgy**

Antisell, F. L.; Skowronski, S.—*Electrolytic Refining of Copper*. [Describes the electrolytic refining and method of melting the cathode copper].—*Amer. Inst. of Metals Adv. Copy* 20; pp 11*; 35c.

Peters, Franz.—*Die Elektrometallurgie der weniger häufigen Metalle in den Jahre 1906 to 1915*. [On the electrometallurgy of some of the more common metals from 1906 to 1915].—*Glückauf Oct.* 1 1916; p 836; pp 6½; 50c.

Thermic Metallurgy

Antisell, F. L.; Skowronski, S.—*Electrolytic Refining of Copper*. [Describes the electrolytic refining and method of melting the cathode copper].—*Amer. Inst. of Metals Adv. Copy* 20; pp 11*; 35c.

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Fleck, Herman.—*Metallurgical Treatment of Molybdenum Ores*. [Abstract of an article in the Colorado School of Mines Q'tly, dealing in a general way with molybdenum, its concentration, thermic refining and marketing].—*Mg. World Dec.* 9 1916; p 994; pp 1¼; 10c.

Rickard, T. A.—*E. P. Mathewson, an All-Round Metallurgist*. [A bibliography of Mathewson's life in the form of a conversation. Most of his experience was in thermic metallurgy].—*M. & S. P. Dec.* 9 1916; p 837; pp 8*; 20c.

POWER AND MACHINERY**Electricity**

Wheeler, R. V.; Thornton, W. M.—*Electric Signaling with Bare Wires*. [Report on the danger of ignition of inflammable gaseous mixtures by the break-flash of the signal wires].—*His Majesty's Stationery Office, London*; 35c.

— *Baku Russian Petroleum Co., Russia*.—*Petro. World Sept.* 1916; p 426; pp 3; 35c.

— *Ray Consolidated Copper Co., Developing the Property with an Electric Dragline Excavator*. [Describes an electrically operated dragline excavator mounted on caterpillars at Hayden, Ariz.].—*Excavating Eng. Dec.* 1916; p 95; pp 3½*; 20c.

— *Unfälle in elektrischen Betrieben auf den Bergwerken Preussens im Jahre 1913*. [Accidents in electrical work in the mines of Prussia in 1913].—*Zts. Berg, Hütten & Salinenw. Band* 62, 1914; p 343; pp 241½*; \$1.50.

Combustion Engines

Potter, A. A.; Buck, W. A.—*Internal Combustion Engines as Applied to Tractors*. [A paper read before the A. S. M. E.].—*Pract. Eng. Dec.* 15 1916; p 1031; pp 1½; 20c.

Smith, Philip H.—*Unsolved Problems of the Diesel Engine*.—*Petro. World Sept.* 1916; p 438; pp 1½; 35c.

Steam and Steam Engines

Newman, M. F.—*Methods of Softening and Filtering Mine Water*. [Describes a plant for filtering the water so as to make it suitable for use in boilers].—*Mg. World Dec.* 9 1916; p 985; pp 2¼*; 10c.

Streeter, Robert L.—*Power Equipment for Power Plants*. [Different kinds of boilers are described and the work to which each is peculiarly adapted is spoken of].—*Industrial Management Dec.* 1916; p 355; pp 17*; 35c.

IV. MISCELLANEOUS**Miscellaneous Costs**

Clark, Earl S.—*Practical Costs*. [A talk and description of methods by which the actual cost of a product may more accurately be determined].—*Industrial Management Dec.* 1916; p 299; pp 6½*; 35c.

Potter, A. A.; Buck, W. A.—*Internal Combustion Engines as Applied to Tractors*. [A paper read before the A. S. M. E.].—*Pract. Eng. Dec.* 15 1916; p 1031; pp 1½; 20c.

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Staley, Homer F.; Beecher, Milton F.—*Practical Handling of Iowa Clays with Application of Ceramic Principles*. [Methods of prospecting and testing the clay bodies are given, as well as descriptions of methods of manufacturing and properties of the burned product].—*Iowa State College Bull.* 43 pp 48*.

— *The Influence of Silver Contents on Treatment of Gold Residues*. [From the W. A. Chamber of Mines Jnl., in which the results of tests made by the Great Boulder Perseverance Gold Co. are given and show that it is easier to dissolve the gold when the silver content is low].—*Mg. & Engg. Rev. Nov.* 6 1916; p 35; pp 1; 35c.

History

Best, W.—*Ancient and Modern Construction of Miners' Safety Lamps*. [A paper read to the National Assn. of Coll'y Mng.].—*I. & C. Tr. Rev. Nov.* 24 1916; p 637; pp 1; 35c.

Mills, E. W.—*Leading Gold Mining Operations in Korea*. [Abstract of a paper read before the Korean branch of the Royal Asiatic Soc. Deals with the production, operation and history of several concessions in the country].—*Mg. World Dec.* 9 1916; p 989; pp 1½; 10c.

Ortega, Pablo.—*Boletín De Minas, Cuba*. [Reviews the operations and production of the mines mostly in the province of Pinar del Rio. The nature of the deposits and mines of the various companies are described. Several tables of statistics are given in the concluding pages].—*Secretaría de Agricultura, Comercio y Minas, Bull.* No. 1; pp 157*.

Financial

— *Baku Russian Petroleum Co., Russia*.—*Petro. World Sept.* 1916; p 426; pp 3; 35c.

Ore and Metal Markets; Prices-Current

New York, Dec. 21, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ended Dec. 20 were as follows:

		New York. Cents.	London. Pence.
Dec. 14.....	75%	36%	
15.....	76%	37	
16.....	76%	36 13/16	
18.....	76%	36 13/16	
19.....	76%	36 13/16	
20.....	76%	36 13/16	

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London	
	1916	1915	1915	1916	1915
January.....	High. 57% Low. 56% Avg. 56.775	48.890	26.875	22.744	
February.....	57 56% 56.755	48.477	27.000	22.759	
March.....	60% 56% 57.395	49.926	27.080	23.650	
April.....	73% 60% 64.415	50.034	31.375	23.259	
May.....	77% 68% 74.27	49.915	34.182	23.660	
June.....	68% 62% 65.02	49.072	31.038	21.577	
July.....	65 60 62.94	47.519	29.870	22.950	
August.....	67 64 65.60	47.178	31.25	22.750	
September.....	69% 67% 68.515	48.68	32.18	23.600	
October.....	69% 67% 67.855	49.385	32.21	23.923	
November.....	74% 68% 71.60	51.713	34.1805	24.640	
December.....	.....	55.038	.....	26.232	
Year.....	.....	49.690	.....	23.470	

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 8.925 fine.

Copper.—Whatever metal speculators dumped upon the market was readily absorbed especially in that price concessions of 1½ cts. a lb. were available. Electrolytic for the first quarter was sold down to 33½ cts. as against the former price of 34¼ cts. Spot casting copper was sold at 32 cts. as against 35 cts. First quarter prime lake copper sold off to 33¼ cts. as against 34½ cts. Second quarter electrolytic dropped to 32½ cts. Speculative interests took the peace movement as a cue for short selling of third and fourth quarter electrolytic and it was in these positions that the largest price concessions were offered, third quarter delivery being quoted by these interests at 30½ cts. as against 31½ to 32 cts. asked by the producers, while fourth quarter was offered as low as 29½ cts. as against 30¼ to 31 cts. asked by producers. With metal available from resellers at concessions the producers did only a small business, most of which came from consumers who preferred to deal with interests who were sure to make deliveries. The producers are confident that as soon as the market absorbs the resale copper the prices will return to their former levels. Of course, the stopping of short selling for future deliveries will not be so easy, but this is a problem for which the producers will no doubt soon find a panacea.

Foreign demand for copper dropped flat on the German announcement but domestic buying was a good volume. The opinions of leading producers who were interviewed as to the possible effect that peace could have on the copper situation can be summed up as follows: "There can be no serious underselling for the first half for the simple reason that there is little copper to sell for that period. If peace should materialize the price of copper for the last half of next year will be regulated by the demand. We believe that the present rate of production need not undergo any contraction even if peace develops early next year. We still are confident that Europe will consume enormous amounts of copper for reconstruction purposes and that the world consumption will remain as large as it has been over the past year if not possibly increase. If underlying conditions indicate that consumption of copper would be affected by holding prices above 25 cts. then the price will be lowered to around 20 cts. or to any level where it will be compatible with stimulating consumption rather than putting a burden on absorption. It is fortunate both for the producer and the consumer that the output for the first half of next year

is sold out, as this condition will militate against any uncertainty and prove beneficial in maintaining a strong situation over the period of readjustment in Europe. A consumer who paid above 25 cts. for his first half copper need not fear that the market will go lower before that copper is consumed. Generally the consumer of copper is in as strong a position as the producer, having sold finished products against his forward copper purchases."

The situation at London has developed no essential change what with the government putting into effect new regulations affecting consumption. London prices are now fixed by the government and while they show the leanings of the officials who fix the prices they are of no earthly value or importance.

Quotations for copper per pound at New York for the week ended Dec. 20 were as follows:

	(For First Quarter Delivery.)		
	Lake.	Electrolytic.	Casting.
Dec. 14.....	34 @ 34½	34 @ 34½	33 @ 33½
15.....	33¾ @ 34	33¾ @ 34	32½ @ 33
16.....	33¾ @ 34	33¾ @ 34	32½ @ 33
18.....	33¾ @ 34	33¾ @ 34	32½ @ 33
19.....	32½ @ 33	32½ @ 33	31½ @ 32
20.....	32½ @ 33	32½ @ 33	31½ @ 32

Note—These are prices quoted by second hands and are applicable only to the small lots held by these sellers. Producers' prices remain unchanged.

Quotations for copper per ton at London for the week ended Dec. 20 were as follows:

	Standard		Electrolytic	
	Spot.	Futures.	Spot.	Futures.
Dec. 14.....	£142 10 0	£136 10 0	£164 0 0	£159 0 0
15.....	142 10 0	136 10 0	164 0 0	159 0 0
16.....	142 10 0	136 10 0	164 0 0	159 0 0
18.....	142 10 0	136 10 0	162 0 0	157 0 0
19.....	142 10 0	136 10 0	161 0 0	156 0 0
20.....	142 10 0	136 10 0	161 0 0	156 0 0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915.	
	High.	Low.	Average.	Average.	
January.....	25.50	23.00	24.101	13.891	
February.....	28.50	25.25	27.437	14.72	
March.....	28.25	27.25	27.641	15.11	
April.....	30.00	28.60	29.40	17.398	
May.....	29.75	28.25	29.05	18.312	
June.....	29.25	27.25	27.90	19.92	
July.....	27.20	26.10	26.745	19.423	
August.....	28.00	25.00	26.320	17.472	
September.....	29.00	28.00	28.75	17.758	
October.....	29½	29.00	29.18	17.925	
November.....	35.00	29.50	33.60	18.856	
December.....	.....	.....	.....	20.375	
Year.....	.....	.....	.....	17.647	

New York—Electrolytic.

Month.	1916			1915.	
	High.	Low.	Average.	Average.	
January.....	25.50	23.00	24.101	13.707	
February.....	28.50	25.25	27.462	14.572	
March.....	28.25	27.25	27.410	14.96	
April.....	30.50	28.25	29.65	17.057	
May.....	29.75	28.00	28.967	18.601	
June.....	29.25	27.25	27.90	19.173	
July.....	27.20	26.10	26.745	19.08	
August.....	28.00	25.00	26.320	17.222	
September.....	29.00	28.00	28.75	17.705	
October.....	29½	29.00	29.18	17.859	
November.....	35.00	29.50	33.60	18.826	
December.....	.....	.....	.....	20.848	
Year.....	.....	.....	.....	17.47	

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

New York—Casting Copper.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January.....	24.25	22.00	23.065	88.008	60.760
February.....	27.00	24.12½	26.031	102.760	63.392
March.....	27.75	25.50	26.210	106.185	66.235
April.....	28.00	26.75	27.70	103.681	77.461
May.....	27.75	26.00	26.692	104.794	77.860
June.....	25.25	24.00	24.33	94.316	82.350
July.....	24.00	23.25	23.80	101.30	74.807

August	25.50	24.75	24.90	111.100	87.350
September	27.00	25.50	26.40	116.10	68.560
October	28.50	27.00	27.31	117.25	72.577
November	34.00	28.50	32.70	137.10	77.400
December .....	.....	.....	.....	.....	80.400
Year .....	.....	.....	.....	.....	.....

Tin.—This metal seemed to secure a new lease of life with the advent of peace on the horizon. Ever since the detailed statistics were announced on Dec. 1 tin has been receding and while the downward movement has not been entirely stopped the recessions are not so severe or frequent. As previously pointed out in these reports tin is expected to have its prosperous days after the war, when Germany and Austria are again buyers in the open market. The English consumers, especially the Welsh tin plate makers, will also benefit by peace and increase the consumption of tin abroad. This favorable development combined with the large American consumption will, it is expected, result in a sharp upward movement of prices. Business done in the past week has been small, due mainly to the disinclination of sellers to part with futures. The permit situation is slightly easier, but there is still a goodly amount of tin to be released by England, permits for which were asked over a month ago.

Spot Straits held around 43 cts. and then eased off to 42½ cts. The limits from the east for April, May and June sailings have been around 41½ cts. For January arrival sellers have been asking 42½ cts., with February and March arrivals quoted at 42 cts. Banka tin on the spot is scarce, but December arrival has been offered at 41¼ cts. Foreign markets receded last week, but the recessions were due mainly to the government restrictions on trading rather than to technical conditions of the market. Arrivals since the first of the month total 910 tons with an aggregate of 6393 tons afloat to this country. All indications point to ample arrivals this month.

Quotations for tin per lb. at New York and per ton at London for the week ended Dec. 20 were as follows:

—New York—		London.		Singapore.	
Spot.	December.	Straits, spot.		Shipments.	
Dec. 14.....	43c	42½c	£184 5 0	•	£185 10 0
15.....	43c	42½c	184 15 0	•	•
16.....	42½c	42½c	184 15 0	•	•
18.....	42½c	42½c	183 0 0	•	185 10 0
19.....	42½c	42½c	182 10 0	•	185 0 0
20.....	42c	41¼c	181 0 0	•	184 0 0

*No cable received.

MONTHLY AVERAGE PRICES OF TIN, NEW YORK.

Month.	1916			1915.
	High.	Low.	Average.	
January	45.00	40.87½	41.881	34.296
February	50.00	41.25	42.634	37.321
March	56.00	48.25	50.48	48.934
April	56.00	49.50	52.27½	44.38
May	52.00	45.75	49.86½	38.871
June	45.50	38.75	43.18	40.373
July	39.25	37.12½	38.34	37.498
August	39.50	37.75	38.58	34.386
September	39.50	38.00	39.00	33.13
October	44.00	39.37½	41.17	33.077
November	45.75	41.75	44.15½	39.375
December .....	.....	.....	.....	38.765
Year .....	.....	.....	.....	38.654

Lead.—The boom in lead has been cut short by the German peace move, this development bringing out a number of resale lots which were offered at concessions ranging from 1 ct. to 1½ cts. Producers, however, being sold up for January and in some cases even over February and March ignored the weakness of spot. For the first time in many months lead futures were quoted higher than spot. Second hands who were holding lead for higher prices dumped their holdings on the market at prices ranging from 7½ cts. down to 7½ cts. New York. This compares with 8¼ cts. paid for spot lead immediately prior to the German announcement. Demand fell off coincident with the weaker spot market. Producers being well sold up are not forcing business, being content to wait for a definite trend towards peace before engaging in price concessions. Lead is fairly well entrenched to meet the ending of the war, and aside from softness on the part of second hands no decided reaction is expected. At London the prices have remained unchanged at the government maximums. Quotations for lead per lb. at New York and per ton at London for the week ended Dec. 20 were as follows:

	—New York—		—London—	
	Indpts.	A. S. & R. Co.	Spot.	Futures.
Dec. 14.....	7.75c	7.50c	£30 10 0	£29 10 0
15.....	7.62½c	7.50c	30 10 0	29 10 0
16.....	7.50c	7.50c	30 10 0	29 10 0
18.....	7.62½c	7.50c	30 10 0	29 10 0
19.....	7.75c	7.50c	30 10 0	29 10 0
20.....	7.65c	7.50c	30 10 0	29 10 0

MONTHLY AVERAGE PRICES OF LEAD.

Month.	—New York—			—London—	
	High.	Low.	Avg.	1915.	1916.
January	8.20	5.50	5.926	5.730	31.92
February	6.55	8.10	6.271	3.350	23.108
March	8.00	6.50	7.47	4.056	34.410
April	8.00	7.37½	7.70½	4.206	33.70
May	7.50	7.22½	7.34	4.235	33.209
June	7.20	4.75	6.88	5.875	29.760
July	6.85	6.25	6.37	5.738	28.035
August	6.70	5.95	5.32	4.750	30.260
September	7.10	6.70	6.88	4.627	31.25
October	7.10	7.00	7.05	4.612	30.20
November	7.40	7.02½	7.10½	5.152	30.10
December .....	.....	.....	.....	5.346	.....
Year .....	.....	.....	.....	4.676	23.099

Lead Ore.—In the Missouri-Kansas-Oklahoma district lead-ore prices were still on the increase during the week ended Dec. 16 and concentrates were sold at from \$90 to \$100. A cold wave hindered production somewhat, but during the week it was sufficient to allow shipments totaling 2,482,100 lbs., which were valued at \$111,951. The total for the year was 101,831,212 lbs., valued at \$4,213,239.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	81.00	70.00	73.15	47.90
February	90.00	83.00	86.45	47.00
March	100.00	87.00	93.56	43.70
April	118.00	94.40	106.20	50.50
May	97.00	92.00	94.75	50.50
June	82.50	75.00	76.35	63.50
July	75.00	70.00	71.9375	59.00
August	67.00	63.00	65.625	47.50
September	78.00	65.00	72.50	48.25
October	87.00	70.50	79.875	51.80
November	90.00	82.00	85.5625	63.00
December .....	.....	.....	.....	71.375
Year .....	.....	.....	.....	53.34

Zinc Ore.—Zinc-ore concentrates in the district during week were still on the decline insofar as prices were concerned and a \$5 drop brought the second grades to \$75 and the better grades to as high as \$95. There were shipped during the week 19,268,160 lbs. of concentrates valued at \$836,199, and this brought the total for the year to 697,291,097 lbs. valued at \$28,152,375.

Calamine.—The market for this ore was fairly steady and prices ranged from \$40 to \$55. The week's production was 685,960 lbs., valued at \$16,854, and the year's production was 37,618,450 lbs., valued at \$1,114,523.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE.

Month.	1916			1915.
	High.	Low.	Average.	
January	120.00	85.00	108.25	58.90
February	130.00	86.00	119.75	64.487
March	115.00	80.00	100.50	63.50
April	100.50	98.00	99.25	61.25
May	115.00	60.00	85.125	60.60
June	90.00	60.00	77.00	115.00
July	80.00	50.00	65.00	111.00
August	70.00	50.00	53.75	60.25
September	65.00	45.00	55.00	76.75
October	75.50	50.00	63.375	82.40
November	105.00	70.00	86.25	92.00
December .....	.....	.....	.....	87.00
Year .....	.....	.....	.....	102.95

Spelter.—Peace is what spelter producers have dreaded, using this phrase from a business and not humanitarian standpoint. What the turning loose of German spelter production means to the American producer is too well known to require elucidation here. Suffice to say the spelter market acted according to form following the German bid for peace. Prices were on the down-grade before the German move, but the decline took on more speed afterwards. Second hands who were liquidating became rather frenzied and spot prime western sold as low as 10½ cts. Short selling of futures added to the weakness of the market, first quarter prime western dropping to 10 cts., with second quarter down to 9½ cts. St. Louis. Very little business was done on the decline. Consumers being well posted on spelter, condi-

tions were not attracted by the concessions. Their point of view is that while peace may not eventuate at this time the position of spelter is such that the price will not go above 15 cts. again, so that it is good business to limit spelter purchases, taking advantage of the ups and downs of the market. Producers missed a very fine opportunity to dispose of first quarter output about 3 weeks ago when there was a very good demand and prices were around 12½ cts. The producers were waiting for better prices. Since the reaction some of the producers have been seeking business at prices below that which they could have obtained a few weeks ago. That the market is ignoring conditions that would in other times stimulate prices is shown by the fact that prices are dropping in face of curtailed production in the west due to cold weather. At London spelter dropped to £2 in spot and £2 10s in futures last week.

Quotations for spelter per lb. at New York and per ton at London for the week ended December 20 were as follows:

	New York	London	
	Spot.	Spot.	Futures.
Dec. 14.....	11.50c	£56 10 0	£52 0 0
15.....	10.75c	56 10 0	52 0 0
16.....	10.60c	56 10 0	52 0 0
18.....	10.50c	55 0 0	52 0 0
19.....	10.75c	54 5 0	50 10 0
20.....	10.50c	54 5 0	51 5 0

MONTHLY AVERAGE PRICES OF SP. LTER.

Month.	New York			London		
	1916	1916	1916	1916	1916	1916
January.....	19.42½	17.30	18.801	6.519	89.840	30.819
February.....	21.17½	18.67½	20.094	8.866	97.840	39.437
March.....	20.50	16.50	18.40	10.125	100.720	44.278
April.....	19.37½	17.76	18.76	11.48	98.103	48.942
May.....	17.50	13.75	15.98	15.825	89.507	67.320
June.....	13.62½	11.25	12.72	22.625	67.410	100.320
July.....	10.75	8.75	9.80	20.803	53.00	98.150
August.....	9.75	8.37½	9.11½	16.110	56.00	68.250
September.....	9.70	8.12½	9.22	14.493	51.30	64.400
October.....	10.42½	9.42½	9.99	14.196	53.15	64.196
November.....	13.30	10.55	11.92	16.875	56.00	88.240
December.....	.....	.....	.....	16.675	.....	89.153
Year.....	.....	.....	.....	13.914*	.....	66.959

*For the first nine months; spot market nominal thereafter.

MISCELLANEOUS METALS.

Antimony.—Business has been very dull with the market holding barely steady. Chinese interests having large forward contracts at high prices, some as high as 35 cts. still to fill, are content to quote 14½ cts. for spot, but metal can be obtained under that price, probably as low as 14 cts. from some second hands. Some munition makers were recent buyers, but demand has been sporadic and many handlers report difficulty in interesting consumers.

Aluminum.—Conditions continue unchanged with the market quiet but uncertain as to tone, due mainly to the German peace overtures. Spot virgin ingots while quoted at 63 to 65 cts. may possibly be shaded, as some sellers are beginning to feel the suspense based on the prospect of peace.

Quicksilver.—There has been no change in the situation, the market holding steady at \$80 per flask. Supplies have been a little more plentiful, some buyers satisfying their needs after having first reported inability to secure sizable lots.

Ferro-Manganese.—Scarcity of ores has forced the price of ferro-manganese upwards, some domestic makers quoting as high as \$175 delivered, this price comparing with business done at \$155 delivered a fortnight ago. There is a good demand for ferro-manganese for shipment next year, and with English makers indicating that they are unable to take much more business, it is predicted that the domestic product will soon sell up to \$200 delivered.

Tungsten.—Nervous holders of tungsten began to offer freely on the German peace announcement. In order to understand the tungsten situation it must be borne in mind that a considerable amount of this metal is held by speculators who bought when prices were above what they are now and have been holding on hopes of recovering the lost ground. England and France have just been in the market taking both prompt and forward ores, paying from \$16.50

to \$18 per unit, the outside price being paid for Argentine ore. A prominent domestic consumer is now in the market and has been quoted from \$17.50 to \$20 per unit.

Molybdenite.—An advance has been made in molybdenite, handlers quoting \$1.80 to \$2 per lb. for MoS₂. There is a very active demand, but supplies are small.

Manganese Ore.—Increases in ocean freight rates have forced higher prices on manganese ore, especially the Indian ore on which some sellers are asking as high as 78 cts. per unit at tidewater. Brazilian ore is quoted at 70 cts. tidewater, but a large consumer in eastern Pennsylvania reports being able to buy some Brazilian ore at as low as 60 cts.

PRICES-CURRENT.

Acids—Muriatic, 18 deg.....	1.75	to	2.00
Muriatic, 20 deg.....	2.00	to	2.25
Nitric, 36 deg.....	.06½	to	.06¾
Nitric, 40 deg.....	.06¾	to	.07
Alcohol—U. S. P., gal., Grain, 190 proof....	2.74	to	2.75
Grain, 188 proof, gal.....	2.72	to	2.73
Wood, 97 p. c.....	.95	to	1.00
Denatured, bbl.....	.65	to	.70
Alum—Powdered, lb.....	.04½	to	.04¾
Lump, lb.....	.04	to	.04½
Ground, 11 lbs.....	4.20	to	4.25
Ammonia—			
Muriate, white grain, lb.....	.17½	to	.18½
Muriate, lump.....	.18	to	.19
Arsenic—White, lb.....	.07	to	.07½
Red, lb.....	.65	to	.70
Barium Chloride—Ton.....	110.00	to	115.00
Nitrate, kegs, lb.....	.13½	to	.15
Bismuth—Metallic, lb.....	3.15	to	3.25
Subnitrate.....	3.10	to	3.15
Bleaching Powder—			
Drums, 100 lbs.....	4.50	to	5.00
Borax—100 lbs., car lots.....	7.75	to	8.00
Coke—Connellsville furnace.....	6.50	to	6.75
Foundry.....	9.00	to	9.25
Copperas—Spot, bbl.....	1.25	to	1.50
Ferrosilicon, 50%.....			100.00
Ferrotitanium, per lb.....	.08	to	.12½
Fuller's Earth, 100 lbs.....	.80	to	1.05
Glaucous Salts, bags.....	.50	to	.75
Calcined.....			2.50
Iron Ore—			
Bessemer, old range, ton.....			5.95
Bessemer, Mesabi.....			5.70
Non-Bessemer, old range.....			5.20
Non-Bessemer, Mesabi.....			6.05
Lead—Granulated, lb.....	.14½	to	.15½
Brown sugar.....	.11½	to	.11¾
White crystals.....	.13	to	.13½
Broken, cakea.....	.12½	to	.12
Powdered.....	.13½	to	.14
Litharge, American, lb.....	.09	to	.09½
Mineral Lubricants—			
Black summer.....	.13½	to	.14
29 gr., 15 c. t.....	.14	to	.16
Cylinder, light, filtered, gal.....	.21	to	.26
Neutral, filtered, lemon, 29 gr.....	.37½	to	.32
Wool grade, 30 gr.....	.19½	to	.20
Paraffin—High viscosity.....	.29½	to	.30
Naphtha (New York)—			
Gasoline, auto.....	.22	to	.24
Benzine, 59 to 62°, gal.....	.28	to	.28½
Nickel Salt, double.....	.08	to	.08½
Single.....	.11	to	.11½
Petroleum—			
Crude (jobbing), gal.....	.15	to	.18
Platinum—Oz. ref.....	105.00	to	111.00
Potash Fertilizer Salts—			
Kainit, min. 16% actual potash.....			32.00
Muriate, 80 to 85%, basis 80%, ton.....	450.00	to	475.00
Refined, bbl.....			.12
High grade sulphate, 90 to 95%, basis of 90%.....	400.00	to	460.00
Hard salt, man., 12.4% actual potash.....	Nominal		22.00
Potassium—			
Bichromate.....	.42	to	.42½
Carbonate, cal. 96 to 98%.....	1.80	to	1.85
Cyanide, bulk, per 100%.....	2.50	to	3.00
Chlorate.....	.64	to	.70
Prussiate, yellow.....	.92½	to	.95
Prussiate, red.....	2.50	to	2.76
Saltpeter—Crude, lb.....	.12	to	.14
Refined.....	.31	to	.35
Soda—Ash, 48% (43% basis), bbl.....	2.90	to	4.00
Strontia Nitrate, casks, lb.....	.28	to	.30
Sulphur—			
Crude, ton.....	28.50	to	29.00
Roll, 100 lbs.....	1.95	to	2.25
Tin—Bichloride, 50°, 100 lbs.....	.15	to	.15½
Crystals, bbls., lb.....	.30½	to	.31
Oxide, lb.....	.50	to	.52
Zinc Chloride.....	.10½	to	.11½

Dividends of United States Mines and Works

Gold, Silver, Copper, Lead, Nickel, Quicksilver, and Zinc Companies.

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1916	Total to date	Latest						Paid in 1916	Total to date	Latest	
						Date	Am't.							Date	Am't.
Acacia, G. & Co.	1,438,999	\$1	\$.....	\$136,194	Dec. 25, '12	\$0.01	Golden Eagle, G. & Co.	480,915	\$1	\$.....	\$98,918	Sept. 1, '01	\$0.01		
Adams, S. & Co.	80,000	10	.....	778,000	Dec. 18, '09	.04	Golden Star, G. & Co.	400,000	10	.....	120,000	Mar. 15, '10	.06
Adventure, C. & Co.	100,000	25	50,000	60,000	July 20, '16	.50	Gold Com. Fra. & Co.	922,000	1	.....	92,111	Oct. 15, '09	.10	
Admeek, C. & Co.	200,000	25	2,000,000	8,050,000	Oct. 10, '16	4.00	Goldfield Con. & Co.	3,558,148	1	.....	28,999,831	Oct. 31, '15	.10	
Alaska Goldfield, G. & Co.	250,000	5	.....	403,250	Jan. 10, '16	.15	Good Hope, G. & Co.	500	100	.....	941,250	Jan. 1, '03	.25
Alaska Mexican, G. & Co.	180,000	5	.....	3,507,381	Nov. 28, '15	.10	Good S. Anchor, S. & Co.	550,000	1	33,000	119,755	June 15, '16	.01	
Alaska Mine Sec. Co.	600,000	U. S.	.....	90,000	Nov. 1, '06	.....	Grand Central, G. & Co.	500,000	1	20,000	1,635,250	Oct. 25, '16	.04
Alaska Trenchwell, G. & Co.	200,000	25	250,000	15,780,000	May 29, '16	.50	Grand Gulch, C. & Co.	239,845	2.60	17,790	19,187	Sept. 6, '16	.03		
Alaska United, G. & Co.	150,200	5	84,060	2,452,270	Feb. 28, '16	.30	Granite, G. & Co.	430,000	1	17,200	17,200	May 10, '16	.02		
Alouette, C. & Co.	100,000	25	700,000	800,000	Oct. 4, '16	2.60	Hazel, G. & Co.	100,000	10	.....	481,500	Feb. 1, '06	.25	
Amalgamated, C. & Co.	1,538,829	Mont.	.....	103,444,983	Aug. 30, '15	3.77	Hecla, G. & Co.	1,000,000	0.25	1,400,000	5,155,000	Nov. 20, '16	.15	
Am. Sm. & R. Co.	500,000	U. S.	.....	31,833,333	Sept. 1, '16	1.50	Hercules, G. & Co.	1,000,000	1	2,450,000	13,200,000	Nov. 15, '16	.20	
Am. Sm. & R. pf.	500,000	U. S.	.....	57,421,386	Sept. 1, '16	1.75	Hidden Treasure, G. & Co.	30,000	10	.....	457,452	Sept. 1, '00	.10
Am. Sm. Sec. A. pf.	170,000	U. S.	.....	11,720,000	Oct. 2, '16	1.50	Holy Terror, G. & Co.	500,000	1	.....	71,000	Jan. 1, '00	.01
Am. Sm. Sec. B. pf.	300,000	U. S.	.....	17,010,000	Oct. 2, '16	1.25	Homestake, G. & Co.	251,160	100	1,795,798	37,501,602	Nov. 25, '16	.65	
Am. Zinc, & Sm.	193,120	Mo.	.....	4,147,180	Nov. 1, '16	1.50	Hope Dev. Co.	500,000	1	5,000	6,000	Dec. 31, '15	.01	
Anacosta, C. & Co.	2,331,250	Mont.	.....	180,576,771	Nov. 28, '16	2.00	Horn Silver, I. & Z.	400,000	1	40,000	5,182,000	June 30, '16	.05	
Annie Laurie, G. & Co.	25,000	100	.....	439,561	Apr. 22, '06	.50	Imperial, C. & Co.	600,000	10	.....	300,000	June 24, '07	.20
Argonaut, G. & Co.	200,000	Cal.	.....	1,698,000	Sept. 28, '16	.07	Inspiration Con.	920,687	20	5,454,989	5,454,989	Oct. 31, '16	2.00	
Arizona, C. & Co.	.....	Ariz.	.....	30,379,862	Nov. 1, '16	.....	Intermountain, C. & Co.	1,615,020	1	8,705	8,705	Oct. 20, '16	.00%
Arizona Com. Co.	.....	Ariz.	.....	130,000	Oct. 2, '16	.50	Inter'l Nickel, com.	1,673,384	25	7,949,574	33,451,414	Sept. 1, '16	1.60
Arizona United, G. & Co.	2,600,000	1	25,000	25,000	Oct. 2, '16	.50	Inter'l Nickel, pf.	89,125	100	634,756	5,682,202	Nov. 1, '16	1.60		
Atlantic, C. & Co.	100,000	25	.....	990,000	Feb. 21, '06	.50	Intern'l Sm. & Ref.	100,000	100	.....	42,000	May 2, '16	2.00
Bagdad (Cuba), G. & Co.	84,819	6	.....	292,394	Jan. 1, '09	.10	Interstate-Callaiban	464,980	1	2,092,465	5,449,900	Sept. 30, '16	1.50	
Bald Butte, S. & Co.	250,000	1	.....	1,354,648	Nov. 1, '07	.04	Iowa, G. & Co.	1,666,867	1	.....	270,167	Dec. 31, '15	.00%
Baldie, C. & Co.	100,000	25	.....	7,950,000	Dec. 31, '13	2.00	Iowa Tiger, G. & Co.	3,000	1	.....	25,179	Jan. 15, '16	.50
Barnes-King, G. & Co.	40,000	5	60,000	80,000	June 1, '16	.07	Iron Blossom, I. & G.	1,000,000	1	260,000	2,850,000	Oct. 20, '16	.10		
Beck Tunnel Con.	1,000,000	0.10	.....	940,000	Nov. 15, '07	.02	Iron Cap pf. Co.	33,481	10	8,422	29,803	July 1, '16	.35	
Big Four Expl.	400,000	1	100,000	110,000	Sept. 4, '16	.05	Iron Clad, G. & Co.	1,000,000	1	.....	50,000	Nov. 1, '06	.06	
Board of Trade, S. & Co.	120,000	1	.....	78,000	Jan. 15, '11	.06	Iron Silver	500,000	20	.....	5,050,000	Dec. 31, '15	.10
Bonanza Dev.	800,000	1	.....	1,425,000	Oct. 28, '11	.20	Isabella, G. & Co.	2,250,000	1	.....	742,500	Mar. 1, '01	.01
Bouth (Reorganized)	998,296	5	349,949	349,949	June 26, '16	.....	Isle Royale, C. & Co.	150,000	25	450,000	600,000	Oct. 31, '16	.00	
Boss, G. & Co.	408,500	Nev.	.....	49,020	Nov. 1, '16	.08	Jamison, C. & Co.	390,000	10	.....	373,300	Jan. 1, '11	2.00
Boston & Colo. Sm.	100,000	10	.....	402,350	Nov. 1, '02	.76	Jerry Johnson, G. & Co.	2,500,000	10	.....	187,500	Nov. 5, '14	.00%
Host & Mont. Con.	200,000	25	.....	63,225,000	May 15, '11	4.00	Jim Butler	1,718,020	1	848,694	815,406	Jan. 31, '16	.10	
Brunswick Con. Co.	800,000	1	.....	220,000	Dec. 15, '13	.08	John Bull & Spelter	400,000	5	194,000	684,396	June 30, '16	.05	
Bullion-B & Champ	100,000	10	.....	2,768,400	July 11, '08	.10	Jumbo Ext. G. & Co.	1,550,000	1	60,000	1,550,000	Apr. 3, '16	.10	
Bunker Hill Con.	200,000	1	55,000	876,000	Nov. 4, '16	.02%	Kendall, G. & Co.	200,000	.....	60,000	60,000	June 20, '16	.10	
Bunker Hill & Sulph.	827,000	10	1,563,250	13,326,250	Nov. 4, '16	.10	Kenecott Zinc	2,780,999	10	11,200,000	16,200,000	Sept. 30, '16	1.50		
Butte Alex. Scott	75,000	10	844,662	1,064,119	Apr. 10, '16	10.60	Kenecott, C. & Co.	100,000	100	.....	1,801,001	June 1, '00	.06	
Butte-Ballaklava, C. & Co.	250,000	10	.....	125,000	Aug. 1, '10	.50	Keeney, G. & Co.	200,000	1	.....	396,000	Aug. 2, '09	.12
Butte Coalition, C. & Co.	1,000,000	15	.....	4,700,000	Dec. 1, '11	.25	King of Arizona, G. & Co.	20,000	1	.....	157,500	Dec. 16, '12	.25
Butte & Superior, Z. & Co.	272,697	10	7,676,734	13,196,758	Sept. 30, '16	6.25	Klar Piquet, L. & Co.	1,000,000	1	.....	70,000	Aug. 1, '13	.00%	
Caledonia, I. & C. Co.	2,805,000	1	889,680	1,742,381	Nov. 3, '16	.03	Knob Hill, G. & Co.	250,000	1	.....	1,200,500	Oct. 1, '02	.01	
Calumet & Ariz. Co.	641,923	10	3,849,522	26,997,847	Sept. 25, '16	2.00	La Fortuna, G. & Co.	500,000	.05	60,000	114,500	June 12, '16	.01		
Calumet & Hecla, C. & Co.	100,000	25	5,000,000	134,250,000	Sept. 22, '16	20.00	Lake View	1,500,000	1	.....	180,000	Feb. 23, '08	.02	
Camp Bird, G. & Co.	1,750,000	25	113,584	10,245,000	Feb. 5, '16	.06	Liberty Bell, G. & Co.	335,551	5	.....	175,179	Jan. 31, '16	.05	
Cardiff, G. & Co.	500,000	1	375,000	600,000	Sept. 19, '16	.25	Lightner, G. & Co.	102,255	1	.....	331,179	June 1, '06	.06	
Carina, G. & Co.	600,000	25	.....	60,000	Dec. 1, '06	.01	Linden, S. & Co.	1,020	10	.....	11,200	Dec. 31, '16	3.00
Centennial, C. & Co.	1,000,000	1	100,000	100,000	Sept. 1, '16	1.00	Little Bell, S. & Co.	300,000	1	15,000	49,000	Apr. 22, '16	.05		
Centennial Eureka, G. & Co.	100,000	25	100,000	4,000,000	Apr. 25, '16	1.00	Little Florence	1,000,000	1	.....	430,000	Jan. 1, '08	.03	
Center Creek, L. & Co.	100,000	10	65,000	615,000	Dec. 4, '16	.10	Lost Packer	160,000	1	.....	37,500	Oct. 23, '13	.25	
Central Eureka, G. & Co.	100,000	1	.....	799,150	Mar. 5, '06	.06	Lower Mammoth	1,000,000	1	.....	67,000	Dec. 15, '15	.01
Century, G. & Co.	1,000,000	1	41,000	392,087	Feb. 15, '16	.06	MacNamara, G. & Co.	734,578	1	.....	46,800	Apr. 23, '16	.12	
Cerro Gordo, I. & Z.	1,000,000	1	25,000	25,000	Sept. 23, '16	.02%	Magma, C. & Co.	240,000	5.00	360,000	600,000	Sept. 30, '16	.60		
Champion, C. & Co.	100,000	25	6,920,000	17,920,000	Nov. 14, '16	6.40	Mammoth, G. & Co.	400,000	10	60,000	2,380,000	Sept. 30, '16	.60		
Chief Con. Co.	882,960	1	176,471	627,508	Nov. 14, '16	.06	Manhattan-Big 4, G. & Co.	1,302,252	1	.....	30,248	Aug. 15, '11	.02	
Chino Copper Co.	889,880	N. M.	5,002,395	11,700,377	Sept. 30, '16	2.25	Mary McKinney, G. & Co.	769,251	1	13,098	1,192,399	Nov. 28, '16	.01		
C. K. & N. G. Co.	1,431,800	1	.....	171,528	Nov. 1, '04	.01	Mary Murphy, G. & Co.	370,000	5	25,067	25,067	May 1, '16	.07	
Chloride, G. & Co.	100,000	10	.....	115,000	Feb. 5, '16	.06	Mass Con. Co.	100,000	25	200,000	200,000	Jan. 1, '16	1.00	
Chloride, S. & Co.	800,000	10	.....	90,000	Jan. 1, '13	.10	May Day	800,000	0.25	40,000	284,000	May 26, '16	.02	
Clinton, G. & Co.	1,000	100	.....	60,000	Dec. 1, '03	.30	Mexican, G. & Co.	201,800	3	.....	171,360	June 4, '14	.75
Colo. O. Dredging	200,000	10	109,000	425,000	Feb. 23, '16	1.00	Miami, C. & Co.	747,114	5	4,295,905	9,895,784	Nov. 15, '16	1.50		
Colorado, A. L. & Co.	1,000,000	0.20	.....	2,600,000	Mar. 15, '13	.03	Mine La Motte, L. & Co.	300,000	10	.....	300,000	Jan. 23, '04	.20
Columbus Con. I. & C.	283,540	5	.....											

Dividends of Mines and Works—Continued

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization			
				Paid in 1918	Total to Date	Latest						Paid in 1918	Total to Date	Latest	
						Date	Am't.							Date	Am't.
Petro, g. s.	Utah	600,000	\$ 1	\$55,000	Aug. 9, '06	\$0.04	Success	Ida.	1,500,000	\$1	\$345,000	\$1,125,000	July 23, '16	\$0.03	
Pharmacist, g.	Colo.	1,500,000	1	91,500	Feb. 1, '10	.00%	Superior, c.	Mich.	1,000,000	25	100,000	100,000	Oct. 10, '16	1.00	
Phelps, Dodge & Co	U. S.	450,000	100	9,000,000	57,371,527	Sept. 30, '16	8.00	Superior & Pitta, c.	Ariz.	1,499,792	10	10,318,568	Dec. 21, '16	.38	
Pioneer, g.	Alaska	5,000,000	1	2,041,526	Oct. 7, '11	.03	Tamarack, c.	Mich.	80,000	25	9,620,000	July 23, '07	4.00		
Pittsburg, L. Z.	Mo.	1,000,000	1	20,000	July 15, '07	.02	Tamarack-Custer	Idaho	2,000,000	1	71,060	71,060	Aug. 30, '16	.07	
Pittsburg-Idaho, I.	Ida.	1,000,000	1	42,600	291,004	Oct. 2, '16	.04%	Tennessee, c.	Tenn.	200,000	25	5,206,250	Apr. 15, '16	.75	
Pitts Silver Peak	Nev.	2,790,000	1	840,600	Dec. 1, '14	.02	Tightner	Cal.	100	100	160,000	Jan. 3, '14	....	
Platteville, L. z.	Wis.	500	60	179,500	June 16, '07	10.00	Tomboy, g. s.	Colo.	310,000	6	74,400	3,861,555	June 30, '16	.24	
Plumas Eureka, g.	Cal.	150,625	10	2,831,294	Apr. 9, '01	.06	Tom Reed, g.	Ariz.	909,555	1	2,555,934	Sept. 5, '16	.01		
Plymouth Con.	Cal.	240,000	5	289,300	Aug. 10, '16	.24	Ton. Belmont, g.	Nev.	1,500,000	1	750,000	8,393,027	Oct. 2, '16	.17%	
Portland, g.	Colo.	3,000,000	1	380,000	10,637,080	Oct. 20, '16	.03	Ton. Extension, g. s.	Nev.	1,272,301	1	604,890	1,591,778	Oct. 1, '16	.15
Prince Con. s. l.	Nev.	1,000,000	2	200,000	325,000	Oct. 5, '16	.02%	Tonopah, g. s.	Nev.	1,000,000	1	600,000	13,600,000	Oct. 21, '16	.15
Quartette, g. s.	Nev.	100,000	10	376,000	July 31, '07	.20	Tonopah Midway, g.	Nev.	1,000,000	1	250,000	250,000	Jan. 1, '07	.06%	
Quicksilver, pf.	Cal.	43,000	100	1,931,411	Apr. 8, '03	.50	Tremblis	Cal.	200,000	2.50	234,000	Apr. 23, '16	.02		
Quip, g.	Wash.	1,500,000	2	67,000	Feb. 1, '12	.01	Tri-Mountain, c.	Mich.	100,000	25	1,100,000	Oct. 30, '12	3.00		
Quincy, c.	Mich.	110,000	25	12,000	22,987,600	Sept. 25, '16	4.00	Tuolumne, c.	Mont.	800,000	1	495,625	Apr. 15, '13	.10	
Ray Con., c.	Ariz.	1,571,279	10	2,743,748	7,322,875	Sept. 30, '16	.75	Uncle Sam Con. s.	Utah	600,000	1	470,000	Sept. 20, '11	.06	
Red Metal, c.	Mont.	100,000	10	1,200,000	Apr. 1, '07	4.00	Union Basin, z.	Ariz.	835,350	1	167,070	Nov. 15, '10	.10		
Red Top, g.	Nev.	1,000,000	1	128,175	Nov. 25, '07	.10	United, c. pf.	Mont.	60,000	100	1,500,000	Apr. 15, '07	3.00		
Republic, g.	Wash.	1,000,000	1	85,000	Dec. 28, '10	.01%	United, c. com.	Mont.	450,000	100	6,125,000	Aug. 6, '07	1.75		
Richmond, g. s. l.	Nev.	64,000	1	4,453,797	Dec. 23, '00	.01	United, z. l. pf.	Mo.	19,556	25	211,627	Oct. 15, '07	.60		
Rocco-Home, I. s. c.	Nev.	300,000	1	152,600	Dec. 22, '06	.02	United Copper, c. a.	Wash.	1,000,000	1	40,000	Dec. 21, '12	.01		
Rochester Ld. & L.	Mo.	4,800	100	190,840	July 1, '12	.50	United Crisp, Ck.	Colo.	4,009,100	1	4,404,355	Jan. 1, '10	.04		
Round Mountain, g.	Nev.	898,018	1	363,964	Aug. 25, '13	.64	United Globe, c.	Ariz.	23,000	100	1,173,000	Sept. 30, '16	18.00		
Sacramento, g.	Utah	1,000,000	6	308,000	Oct. 22, '06	.00%	United Metals Sell.	U. S.	50,000	100	11,000,000	Nov. 23, '10	6.00		
St. Joseph, I.	Mo.	1,409,466	10	1,781,830	12,029,729	Sept. 30, '16	.75	United Verde, c.	Ariz.	300,000	10	3,600,000	39,397,000	Nov. 1, '16	.75
St. Mary's M. L.	Mich.	160,000	25	3,040,000	7,840,000	Nov. 18, '16	2.00	United Verde Ext.	Ariz.	1,000,000	50	1,150,000	Nov. 1, '16	.50	
Schoenh'r Wal'n. z. l.	Mo.	10,000	10	90,000	Sept. 20, '11	.20	U. S. Red. & R. com.	Colo.	59,139	100	414,078	Oct. 9, '03	1.00		
Scratch Oravel, z.	Cal.	1,000,000	1	20,000	Feb. 1, '16	.02	U. S. Red. & R. pf.	Colo.	39,458	100	1,775,936	Oct. 1, '07	1.50		
Seven Tro. Co., g. s.	Nev.	1,443,077	1	36,076	252,532	Apr. 1, '16	.02%	U. S. R. & M. com.	USMx	351,116	50	7,911,681	Oct. 15, '16	1.00	
Shannon, c.	Ariz.	300,000	10	160,000	900,000	Nov. 16, '13	.60	U. S. R. & M. pf.	USMx	486,350	60	18,513,922	Oct. 15, '16	.87%	
Shattuck-Ariz, c.	Ariz.	350,000	10	1,663,300	4,637,000	Oct. 20, '16	1.25	Utah, c.	Utah	1,624,480	10	13,808,165	Sept. 30, '16	3.00	
Silver Hill, g. s.	Nev.	108,000	1	88,200	June 24, '07	.05	Utah-Apex, s. l.	Utah	528,200	5	394,154	Sept. 30, '16	.25		
*Silver King Coal'n	Utah	1,250,000	5	750,000	14,334,985	Oct. 1, '16	.15	Utah Con., c.	Utah	300,000	5	675,000	9,826,000	Sept. 26, '16	.75
Silver King Con.	Utah	637,582	1	1,006,131	Oct. 22, '15	.10	Utah M. & T. f.	Utah	750,000	1	1,285,482	Aug. 15, '16	.50		
Silver Mines Expl.	N. Y.	10,000	100	250,000	June 16, '10	2.00	Utah-Missouri, z.	Mo.	10,000	1	10,000	May 29, '10	1.00		
Sioux Cons. I. s. c.	Utah	745,389	1	872,106	July 20, '11	.04	Victoria, g. s. l.	Utah	250,000	1	207,500	Apr. 23, '10	.04		
Skidoo, g.	Cal.	1,000,000	5	365,000	Oct. 2, '14	.01	Vindicator Con., g.	Colo.	1,600,000	1	225,000	3,457,500	Oct. 25, '16	.06	
Smuggler, s. l. z.	Colo.	1,000,000	1	2,235,000	Nov. 22, '06	.03	Wasp No. 2, g.	S. D.	600,000	1	1,000,000	619,466	May 16, '16	.02%	
Snowstorm, c.	Idaho	1,600,000	1	1,169,610	Oct. 10, '13	.01%	Wellington, I. z.	Colo.	10,000,000	1	600,000	1,250,000	Oct. 2, '16	.02	
Socorro, c.	N. M.	377,342	5	66,699	198,070	Sept. 1, '16	.05	West End Con.	Nev.	1,788,486	1	69,124	625,969	Oct. 24, '16	.06
South Eureka, g.	Cal.	299,981	1	1,409,754	Aug. 15, '16	.07	West Hill	Wis.	20,000	2	8,000	40,000	June 29, '16	.20	
South Hecla, c.	Ida.	600,000	1	39,450	Aug. 10, '16	.16	White Knob, g. pf.	Cal.	200,000	10	60,000	190,000	Aug. 25, '16	.10	
So. Swansea, g. s. l.	S. D.	300,000	1	287,500	Apr. 3, '04	.01%	Wilbert	Ida.	1,000,000	1	60,000	Nov. 15, '16	.01		
Spearfish, g.	Cal.	1,600,000	1	165,600	Jan. 7, '08	.01	Wolverine, c.	Mich.	60,000	25	720,600	9,120,000	Oct. 15, '16	.80	
Standard Con., g. s.	Cal.	178,394	10	6,274,408	Nov. 17, '13	.25	Wolverine & Ariz. c	Ariz.	118,874	15	53,403	Dec. 15, '15	.25		
Standard, c.	Ariz.	425,000	1	69,600	Sept. 8, '16	.06%	Work, g.	Colo.	1,500,000	1	1,597,855	Apr. 31, '12	.02		
Stewart, I. z.	Idaho	1,238,382	1	7,043,297	Dec. 31, '05	.06	Yak.	Colo.	1,000,000	1	2,197,685	Sept. 30, '16	.07		
Stratton's Crisp, Ck.	Colo.	2,000,000	1	300,000	Sept. 6, '08	.02%	Yankee Con., g. s. l.	Utah	1,000,000	1	167,500	Feb. 1, '13	.01		
Stratton's Ind.	Colo.	1,000,000	6	6,028,568	Dec. 23, '06	0.12	Yellow Aster, g.	Cal.	100,000	10	2,205,758	Nov. 6, '16	.06		
Str'n's Ind. (new) g.	Colo.	1,000,000	.30	180,000	691,250	Jan. 31, '16	.16	Yellow Pine, z. l. s.	Nev.	1,000,000	1	7,793,008	Nov. 26, '16	.10	
Strong, g.	Colo.	1,000,000	1	2,275,000	July 9, '08	.02	Yosemite Dredg.	Cal.	24,000	10	102,553	July 15, '14	.10		

Corrected to December 1, 1918

*Includes dividends paid by Silver King Mx. Co. to 1907—\$10,675,000.

†Consolidated with Bingham-New Haven.

Dividends of Foreign Mines and Works

NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization					NAME OF COMPANY		Number Shares Issued	Par Val	Dividends on Issued Capitalization				
				Paid in 1916	Total to Date	Latest							Paid in 1918	Total to Date	Latest		
						Date	Am't.	Am't.							Date	Date	Am't.
Ajuchitlan	Mex...	50,000	\$ 5	\$.....	\$237,500	July 1, '13	\$0.25	Las Caballeros	Mex...	1,040	\$10	\$.....	\$591,400	June 3, '12	10.00		
Amistad y Concordia g.s	Mex...	9,600	60		429,358	July 15, '08	1.28	Le Roi No. 2, g.	B. C.	120,000	25		1,527,320	Dec. 15, '16	\$0.24		
Amparo, s. g.	Mex...	2,000,000	1	360,000	2,292,176	Nov. 10, '16	.05	Lucky Tiger	Mex...	715,337	10	440,061	3,714,063	Nov. 20, '16	.10		
Armatol de Medina Mill	Mex...	2,000	25		103,591	Aug. 1, '07	.50	McKinley-Darragh-Sav.	Ont.	2,247,692	1	269,724	4,877,492	Oct. 2, '16	.03		
Batopilas, s.	Mex...	446,263	20	60,000	55,870	Dec. 31, '07	1.0%	Mexican, l. pf.	Mex...	12,800	100		1,018,750	May 1, '12	3.50		
Beaver Con., s.	Ont.	2,000,000	1		710,000	Apr. 29, '16	.03	Mexico Con.	Mex...	240,000	10		660,000	Mar. 10, '08	.25		
Boleo, c.	Mex...	120,000	20		721,871	May 8, '11	5.00	Mexico Mines of El Oro	Mex...	180,000	5		4,478,500	June 26, '14	.96		
British Columbia, c.	B. C.	591,709	6		615,399	Jan. 5, '13	.16	Minas Pedrazzini	Mex...	1,000,000	1		497,500	Jan. 23, '11	.06%		
Buena Tierra, c.	Mex...	330,000	5		160,380	Jan. 30, '15	.74	Mines Co. of Am.	Mex...	900,000	10		4,968,600	July 25, '13	.12%		
Buffalo, Ont.	Ont.	1,000,000	1		2,787,600	July 1, '14	.05	Mining Corp. of Canada	Can.	2,075,000	1	570,625	1,348,750	Sept. 30, '16	.15		
Canadian Goldfields	Can.	600,000	0.10		237,099	July 15, '14	.01%	Monteruma, l. pf.	Mex...	5,000	100		402,500	Nov. 15, '12	3.50		
Cananea Central, c.	Mex...	600,000	10		360,000	Mar. 1, '12	.60	Montezuma M. & Sm.	Mex...	500,000	1		100,000	July 20, '09	.04		
Cariboo-Cobalt	Ont.	1,000,000	1		295,000	Sept. 1, '15	.09	Mother Lode	B. C.	1,250,000	1	137,500	137,500	Jan. 3, '16	.11		
Cariboo-McKinney, g.	B. C.	1,250,000	1		66,250	Dec. 1, '09	.00%	Nalca, s. l.	Mex...	100	300		3,190,000	Oct. 11, '09	\$23		
City of Cobalt	Ont.	500,000	1		138,375	May 15, '09	.01	N. Y. & Hond. Rosario	C. A.	200,000	10	300,000	4,050,000	Oct. 25, '16	.50		
Cobalt Central, s.	Ont.	4,751,500	1		192,485	Aug. 24, '09	.01	Nipissing, s. l.	Ont.	1,200,000	5	1,500,000	14,940,000	Oct. 20, '16	.50		
Cobalt Lake, s.	Ont.	3,000,000	1		465,000	May 29, '14	.02%	North Star, s. l.	B. C.	1,300,000	1		533,000	Feb. 1, '10	.02		
Cobalt Silver Queen	Ont.	1,500,000	1		316,000	Dec. 1, '08	.03	Paloma, g.	Mex...	3,000	....		99,600	Dec. 1, '12	5.00	
Cobalt Townsite, s.	Ont.	199,282	6		1,042,259	Aug. 20, '14	.24	Panuco	Mex...	10,000	....		7,465,000	Nov. 4, '09	6.00	
Coniasas, g.	Ont.	800,000	5	400,000	8,240,000	Aug. 5, '16	.25	Penoles, s. g.	Mex...	120,000	20		6,451,687	Sept. 30, '13	1.25		
Con. Mg. & Sm., g. s. c.	B. C.	65,650	100	631,204	2,351,341	Oct. 1, '16	2.50	Pesgrina, pf.	Mex...	10,000	100		328,656	Sept. 1, '10	3.00		
Crown Reserve, s.	Ont.	1,999,357	1		6,102,408	July 15, '16	.03	Peterson Lake	Ont.	2,401,820	1	125,096	328,319	Oct. 2, '16	.01%		
Dolores	Mex...	400,000	5		1,374,855	July 24, '11	.22%	Pinguico, pf.	Mex...	20,000	100		780,000	Apr. 15, '13	3.00		
Dome Mines, s.	Ont.	400,000	10	600,000	1,090,000	Sept. 1, '16	.50	Porcupine Crown	Ont.	2,000,000	1	240,000	660,000	Oct. 2, '16	.03		
Dos Estrellas, (El Oro)	Mex...	300,000	0.50		15,405,000	Sept. 30, '13	1.50	Providencia, (S. J.)	Mex...	8,000	15		963,360	Apr. 1, '08	1.00		
El Favor	Mex...	3,500,000	1		210,000	Apr. 30, '14	.01	Rambler-Cariboo	B. C.	17,500	100	87,500	507,500	Nov. 15, '16	.01		
El Oro, g. s.	Mex...	1,147,500	5		9,136,842	July 11, '13	.24	Rea Mines, Leasing	Ont.	200,000	1		12,750	Febr. 20, '15	.05%		
El Rayo, g. s.	Mex...	250,020	2		140,410	Apr. 24, '11	.16	Right of Way	Ont.	1,685,600	1	25,251	669,600	Sept. 15, '16	.00%		
El Triunfo, c.	Mex...	2,000,000	1		30,000	Aug. 29, '11	.01	Rio Plata	Mex...	374,618	5		345,744	Feb. 1, '13	.06		
Esperanza, s. g.	Mex...	450,000	6		12,521,250	Dec. 31, '16	.10	San Francisco Mill	Mex...	2,400	25		445,026	Oct. 15, '08	1.00		
Granby, c. g. s.	B. C.	149,986	100		6,650,281	Nov. 1, '16	2.00	Sanabel	Mex...	2,400	25		6,798,260	Jan. 11, '12	2.00		
Greene-Cananea, c.	Mex...	474,411	100	3,403,463	7,639,268	Nov. 23, '16	2.00	San Toy, s.	Mex...	6,000,000	1.00		640,000	July 24, '13	.01		
Greene Con., c.	Mex...	1,000,000	10	3,500,000	13,544,000	Oct. 25, '16	1.00	Santa Gertrudis, Hdgo.	Mex...	1,500,000	5	364,500	2,819,772	June 16, '16	.24		
Greene Gold-Silver, pf.	Mex...	300,000	10		194,871	Mar. 28, '07	.40	Sta. Gertr. y Guadalupe, g.s	Mex...	60,000	....		3,960,000	Mar. 27, '09	1.00	
Guanajuato Con.	Mex...	540,000	5		600,000	Oct. 8, '06	.07%	Sta. Maria del Par.	Mex...	9,600	12%		5,006,000	Jan. 2, '13	2.50		
Guanajuato Dev., pf.	Mex...	10,000	100		274,356	Jan. 1, '11	3.00	Seneca-Superior	Ont.	478,544	1	957,750	1,878,902	Nov. 14, '16	.20		
Guggenheim Explorat.	Mex...	833,732	25	10,713,456	34,032,760	Apr. 3, '18	11.85	Soledad, s. l.	Mex...	960	20		4,439,840	July 17, '11	8.00		
Hallebury, s.	? 50,000	1			60,000	Apr. 3, '11	.50	Sorpresa, g. s.	Mex...	19,200	20		3,973,240	Jan. 5, '11	14.00		
Hedley	B. C.	120,000	1	180,000	2,003,520	Sept. 30, '16	.50	Standard, s. l.	B. C.	2,000,000	1	550,000	2,350,000	Nov. 10, '16	.02%		
Hinde Con., g. s. l.	Mex...	5,000,000	1		83,000	Feb. 27, '03	.02	Temiscamg' & Hud. Bay	Ont.	7,761	1		1,940,250	Nov. 14, '14	3.00		
Hollinger	Ont.	4,000,000	1	1,730,000	6,090,000	Nov. 8, '18	.06	Temiskaming, s.	Ont.	2,500,000	....	150,000	1,609,150	Oct. 27, '13	.09	
Humboldt, c. g. s.	Mex...	10,000	100		1,000	Feb. 27, '11	.10	Tenipian, c.	Mex...	1,000	100		1,850,000	Jan. 8, '10	1.50		
Kerr Lake, s.	Ont.	600,000	5	550,000	5,570,000	Sept. 1, '16	.25	Tough-Oak	Ont.	531,500	5	258,745	332,187	Oct. 8, '16	.17		
La Blanca	Mex...	140,000	20		2,775,200	Mar. 31, '13	.90	Tretheway, s.	Ont.	1,000,000	....		1,061,988	July 15, '14	.05%	
La Republica, s.	Mex...	400,000	5		110,000	Aug. 15, '11	.06	Wettlaufer-Lorrain, s.	Ont.	1,416,590	1		656,386	Oct. 20, '13	.05		
La Rose Con., s.	Ont.	1,499,627	5	299,724	5,686,844	Oct. 20, '16	.06	Yukon, g.	Y. T.	3,500,000	5	787,500	8,370,610	Sept. 30, '16	.07		

